Knowledge Exchange on Ecosystem Accounting 2015

Presented by: John Power, ABS
Date: 24 February, 2015

Land and ecosystem accounting
Presentation Overview

• Why land accounting?
• Scope and definitions of land accounting (SEEA Experimental Ecosystem Accounting)
• Spatial units
• Data sources and methodology
  - Classifications
  - Data Sources
  - Tables
• Uses of land accounts
• Lessons learned
Why land accounting?

- Links the SEEA Central Framework to the SEEA Experimental Ecosystem Accounting
- The starting point for most assessments of ecosystem services
- Fundamental to economic production
- A major proportion of most nations’ total assets
- Using land effects the condition and capacity of ecosystems
Why land accounting?

Which of the following statements is true?

A. Land cover mapping provides the starting point for most assessments of ecosystem services

B. Land represents a major proportion of most nations’ total assets and is fundamental to economic production

C. The way we use land affects the condition and capacity of ecosystems

D. Land accounting links the SEEA Central Framework to the SEEA Experimental Ecosystem Accounting
Definitions of land
SEEA Sec. 6.5.2 Definition and classification of land

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 ownership – by industry (e.g. agriculture, mining) or by sector (e.g. public or private)
Spatial units in the SEEA-EEA

- Ecosystem Accounting Unit (EAU)
- Land cover/ ecosystem functional unit (LCEU)
- Basic spatial unit (BSU)
Basic spatial unit (or ‘BSU’)  
Can be more than just cells in a grid

Land parcels: Areas of land defined by land ownership as identified in land title registers.

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 (e.g. via coordinates of latitude and longitude).
Accounting for land cover and land use in a land parcel

Accounting for land cover
A: Forest  39.0 ha
B: Water    3.5 ha
C: Residence 1.8 ha
D: Irrigated crop 13.5 ha
E: Other crop  3.8 ha
F: Grassland 68.0 ha

Total area 129.5 ha

Accounting for land use
A: Forestry  ?39.0 ha
B: Water storage 3.5 ha
C: Household 1.8 ha
D: Agriculture 13.5 ha
E: Agriculture  3.8 ha
F: Agriculture 68.0 ha

Is a land parcel a basic spatial unit?
### Net change in land cover

<table>
<thead>
<tr>
<th>Land use</th>
<th>Opening stock</th>
<th>Built Up Surface</th>
<th>Irrigated Cropping</th>
<th>Trees</th>
<th>Inland Waterbodies</th>
<th>Total Net Change</th>
<th>Closing Stock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Built Up Surface</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Irrigated Cropping</td>
<td>1</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Trees</td>
<td>3</td>
<td></td>
<td></td>
<td>-3</td>
<td></td>
<td>-3</td>
<td>0</td>
</tr>
<tr>
<td>Inland Waterbodies</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Land use by land cover – time series

Property/Grid A 2006

- Built Up Surface: 1 ha
- Primary Production: 6 hectares
- Irrigated Cropping: 1 ha
- Trees: 1 ha
- Inland Waterbodies: 1 ha

Property/Grid A 2011

- Built Up Surface: 1 ha
- Primary Production: 6 hectares
- Irrigated Cropping: 1 ha
- Trees: 1 ha
- Inland Waterbodies: 1 ha

Land use by cover

<table>
<thead>
<tr>
<th>Land use by cover</th>
<th>2006</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prim Prod / Built Up</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Prim Prod / Irrigated</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Prim Prod / Trees</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Prim Prod / Inland W</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
What do land accounting tables look like?

E.g. Land use net change matrix for Great Barrier Reef region

![Land use net change matrix](image-url)
Example output: map of rateable value by Natural Resource Management Region

Natural Resource Management regions are an example of Ecosystem Accounting Unit (EAU)

What management areas (or EAUs) would be appropriate for your country or organisation?
Example output

Mapping data in Google Earth

• 13,355 regions across the state of Victoria
Example output: data linked to Google Earth

- Summary data is provided for each statistical area (SA1)

Is a statistical area a basic spatial unit, a land cover ecosystem functional unit or ecosystem accounting unit?
How do you produce a Land Account?

- Integrate existing environmental and economic information at the finest level possible.
- Use GIS technology to integrate
- Presenting results at various geographic levels.
- Present results for at least two time periods
The Method in Australia
Integrating at the property level (basic spatial unit)

Input

State Valuations data for properties (cadastre):
- Land Use
- Land value

Geoscience Australia’s Dynamic Land Cover gridded data

Output

Primary Land Account tables – NRM and State

Land Cover

Units = Hectares or dollars

Statistical Area Level 1 summary data with additional information
- Land value
- Land cover
- Land use
- Population
- Building approvals
- Cadastral change

Inland Water body

Trees - open

Trees - closed

Land parcel (Cadastral parcel)

Land Use

Irrigated Pasture

Rainfed pasture

Input

Output
Possible issues with data

- Different reference periods ("currency") for data sources
- Multiple classifications used
- Linking economic units does not geocode accurately to cadastral parcel.
- Data inaccuracy – e.g. cadastral boundaries shift over time
- Multiple land uses allocated to the same property

What other issues have you experienced?
Uses of Land Accounting

Informing debate on:

- Population settlement
- Agricultural productivity
- Health of the environment
- Costs and benefits of economic activities
- Investment environmental protection, e.g. biodiversity conservation

What uses can you see?
Lessons learnt

- Many data sources – Takes time locate and understand
- Conflicting data sources - For land use and land cover
- Data Quality – Variable between datasets, particularly for measuring change
- Confidentiality – Fine levels of geographic presentation posses challenges
- Consistency – Remain comparable to national accounts

Have you experienced any of these problems?
Further information

ABS Publications

4609.0.55.001 - Land Account: Great Barrier Reef Region, Experimental Estimates, 2011
4609.0.55.001 - Land Account: Great Barrier Reef Region, Experimental Estimates, 2014

ABS Contact

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Exercise: Handout provided

Completing a land cover change matrix

<table>
<thead>
<tr>
<th>Land cover</th>
<th>Opening area, time 1</th>
<th>Closing area, time 2</th>
<th>Net change (increase – decreases)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artificial surfaces</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crops</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grassland</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tree covered area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mangroves</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shrub covered area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regularly flooded areas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sparse natural vegetated areas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terrestrial barren land</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permanent snow, glaciers and inland water bodies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coastal water and inter-tidal areas</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Net increases (positive numbers) and decreases (negative numbers) from other land covers, time 1 to time 2

(1,000 ha)
Stylized land cover map – Time 1 (e.g. 2000)
Stylized land cover map – Time 2 (e.g. 2010)

Artificial surfaces
Crops (a)
Grassland
Tree covered area
Mangroves
Shrub covered area
Regularly flooded areas
Sparse natural vegetated areas
Terrestrial barren land
Permanent snow, glaciers and inland water bodies
Session feedback

Please rate the session on a scale of 1 to 5

1. Very poor,
2. Poor,
3. Average,
4. Good,
5. Very good