Linking Ecosystem Accounts to Policy in South Africa
Mandy Driver

Regional Perspectives on Natural Capital Accounting
Nairobi, 21-23 June 2016
Overview

• Introduction to SA ecosystem accounting
• Ecosystem accounting pilots – key results
• Six lessons
• Next steps
South African National Biodiversity Institute

- Government agency
- Falls under Department of Environmental Affairs
- Bridging role between science and policy
- Often works in partnership with other organisations
Environmental Accounts in South Africa

Environmental-economic accounts compendium produced annually by Stats SA

Includes:
• Energy
• Fisheries
• Minerals

Underway:
• Water
Key partners in ecosystem accounting in SA

• **Main agencies currently involved**
  - SANBI: Biodiversity for Life
    - South African National Biodiversity Institute
  - CSIR: Our future through science
  - Ezemvelo KZN Wildlife: Conservation, Partnerships & Ecotourism
  - Water & Sanitation: Department of Water and Sanitation, REPUBLIC OF SOUTH AFRICA
  - Environmental Affairs: Department of Environmental Affairs, REPUBLIC OF SOUTH AFRICA

• **With additional support:** Advancing SEEA Experimental Ecosystem Accounting project – SA one of 7 pilot countries
  - United Nations Statistics Division
  - UNEP
  - Convention on Biological Diversity
  - Norwegian Ministry of Foreign Affairs
Relationship between eco accounting and NCA

Environmental accounting*
(individual environmental assets – renewable & non-renewable, biotic & abiotic)

Ecosystem accounting
(ecosystem assets & services)

*Also called “environmental-economic accounting”
Ecosystem accounting

• Inherently spatial
• Distinguishes between
  – Ecosystem assets
  – Ecosystem services

stock of ecosystem assets

flow of ecosystem services
South Africa’s pilot ecosystem accounts

- Land and ecosystem accounts for KwaZulu-Natal (a province of South Africa)
- National river ecosystem accounts
Overview of ecosystem accounts

Physical accounts

Monetary accounts

Land and ecosystem accounts for KZN

• Possible because of
  – Large investment in land cover data – time series
  – Existing map of vegetation types (ecosystem units)

KwaZulu-Natal (KZN)
• 11 million people
• 16% of GDP
• Major port, coal mining, steel production, sugar cane, fruit farming, crops, stock farming, timber plantations, ecotourism
Land cover datasets for KZN – excellent data

(summarised classes)
Physical account for land cover in KZN

Key elements:
- Opening stock
- Additions to stock
- Reductions in stock
- Closing stock

Organised according to a set of land cover classes

<table>
<thead>
<tr>
<th>hectares</th>
<th>Natural</th>
<th>Degraded</th>
<th>Fallow lands</th>
<th>Timber plantations</th>
<th>Subsistence agriculture</th>
<th>Dryland cultivation</th>
<th>Irrigated cultivation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Land cover 2005</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Total</td>
<td>6284888.4</td>
<td>641270.5</td>
<td>43114.2</td>
<td>694125.8</td>
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<td>0.0</td>
<td>176067.0</td>
<td>26288.9</td>
<td>66319.4</td>
<td>398723.8</td>
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<td>Total reductions in stock</td>
<td>672172.8</td>
<td>110397.4</td>
<td>3742.8</td>
<td>23070.3</td>
<td>26965.0</td>
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<td>Net additions (additions - reductions)</td>
<td>-672172.8</td>
<td>65139.6</td>
<td>22546.1</td>
<td>43249.1</td>
<td>371758.8</td>
<td>57871.9</td>
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<td>Net additions as % of opening land cover</td>
<td>-10.7</td>
<td>10.2</td>
<td>52.3</td>
<td>6.2</td>
<td>154.6</td>
<td>23.1</td>
<td>16.0</td>
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<td>Total turnover (reductions + additions)</td>
<td>672172.8</td>
<td>287004.5</td>
<td>300317</td>
<td>89388.4</td>
<td>425688.9</td>
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<td>Total turnover as % of opening land cover</td>
<td>10.7</td>
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<td>63.7</td>
<td>9.3</td>
<td>82.7</td>
<td>91.3</td>
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<tr>
<td>No land cover change</td>
<td>5612715.6</td>
<td>5303333.0</td>
<td>393714</td>
<td>89.3</td>
<td>82.7</td>
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<tr>
<td>No land cover change as a % of opening LC</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
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<td><strong>Land cover 2008</strong></td>
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<td>Total</td>
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<td>8002.3</td>
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<td>Total reductions in stock</td>
<td>126361.4</td>
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<td>4147.3</td>
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<td>Net additions (additions - reductions)</td>
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<td>Net additions as % of opening land cover</td>
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<td>-4.7</td>
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<td>Total turnover (reductions + additions)</td>
<td>127086.4</td>
<td>4947.6</td>
<td>5788.4</td>
<td>5788.4</td>
<td>4947.6</td>
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<tr>
<td>Total turnover as % of opening land cover</td>
<td>2.3</td>
<td>7.0</td>
<td>8.8</td>
<td>8.8</td>
<td>7.0</td>
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<td>No land cover change</td>
<td>5485734.2</td>
<td>664926.2</td>
<td>62273.5</td>
<td>97.7</td>
<td>94.1</td>
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<td>No land cover change as a % of opening LC</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
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<tbody>
<tr>
<td><strong>Land cover 2011</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Total</td>
<td>5485839.2</td>
<td>672329.0</td>
<td>64655.2</td>
<td>87.0</td>
<td>97.7</td>
<td>87.9</td>
<td>87.9</td>
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<tr>
<td>Total</td>
<td>57562.4</td>
<td>51253.1</td>
<td>237484.0</td>
<td>2733.5</td>
<td>172728.2</td>
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<tr>
<td>Total</td>
<td>8395976.8</td>
<td>9359787.6</td>
<td>9359787.6</td>
<td>9359787.6</td>
<td>9359787.6</td>
<td>9359787.6</td>
<td>9359787.6</td>
</tr>
</tbody>
</table>
% change in land cover classes

-30 0 30 60 90 120 150 180

Natural
Degraded
Fallow lands
Timber plantations
Subsistence agriculture
Dryland cultivation
Irrigated cultivation
Sugarcane
Severe erosion
Dams
Low density settlement
Golf courses
Built up areas
Mines
Transport network

% change 2005-2008
% change 2008-2011
% change 2005-2011
Subsistence agriculture

Photo: John Craigie, Ezemvelo KZN Wildlife
Hectare changes per local municipality

- Subsistence agriculture
- Low density settlement
- Dryland cultivation
- Sugarcane
- Built-up areas
- Transport network

Could summarise to e.g. quaternary catchments
Ecosystem extent accounts for KZN

- Useful to summarise at biome level

Vegetation types (~100)

... nested within biomes →
• Largest absolute decline in extent – Grassland biome

• Largest proportional decline in extent – Indian Ocean Coastal Belt

graham application threshold
extinction threshold
## A few examples

<table>
<thead>
<tr>
<th>Vegetation type</th>
<th>hectares</th>
<th>Natural</th>
<th>Degraded</th>
<th>Fallow lands</th>
<th>Timber plantations</th>
<th>Subsistenc e agriculture</th>
<th>Dryland cultivation</th>
<th>Irrigated cultivation</th>
<th>Sugarcane</th>
<th>Rehabilitated mines</th>
<th>Severe erosion</th>
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<tbody>
<tr>
<td>Freshwater Wetlands (all)</td>
<td></td>
<td>-8,335</td>
<td>1,039</td>
<td>563</td>
<td>365</td>
<td>3,104</td>
<td>2,331</td>
<td>548</td>
<td>-1,102</td>
<td>-193</td>
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<tr>
<td>Alluvial Wetlands (all)</td>
<td></td>
<td>-18,363</td>
<td>-344</td>
<td>775</td>
<td>209</td>
<td>10,066</td>
<td>5,045</td>
<td>680</td>
<td>-2,710</td>
<td>-1,961</td>
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<tr>
<td>Subtropical Dune Thicket</td>
<td>-285</td>
<td>293</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-11</td>
<td>0</td>
<td></td>
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<tr>
<td>Mangrove Forests</td>
<td>-245</td>
<td>233</td>
<td>0</td>
<td>-3</td>
<td>39</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-2</td>
<td>0</td>
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<tr>
<td>Midlands Mistbelt Grassland</td>
<td>-53666</td>
<td>8033</td>
<td>334</td>
<td>13143</td>
<td>12296</td>
<td>11508</td>
<td>1619</td>
<td>-2785</td>
<td>-124</td>
<td>37</td>
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<td>Mabela Sandy Grassland</td>
<td>-144</td>
<td>-98</td>
<td>0</td>
<td>-1</td>
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<td>215</td>
<td>16</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>

- Conversion of **alluvial wetlands** (floodplains) and **freshwater wetlands** to subsistence agriculture, dryland cultivation and dams → flood risk?
- Degradation of **Subtropical Dune Thicket** → coastal storm risk?
National river ecosystem accounts

- **Extent**
- **Condition**

Based on two national assessments of condition of rivers by Department of Water & Sanitation in 1999 and 2011.
### Ecosystem condition account for rivers

<table>
<thead>
<tr>
<th>All rivers (km)</th>
<th>Natural</th>
<th>Moderately modified</th>
<th>Heavily modified</th>
<th>Unacceptably modified</th>
<th>No Data</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Opening stock 1999</strong></td>
<td>86 835</td>
<td>29 784</td>
<td>4 875</td>
<td>1 354</td>
<td>40 684</td>
<td>163 533</td>
</tr>
<tr>
<td>Opening stock as % total river length</td>
<td>53</td>
<td>18</td>
<td>3</td>
<td>1</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>Increases/decreases</td>
<td>-41 163</td>
<td>20 806</td>
<td>17 935</td>
<td>2 422</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Increases/decreases as % opening</td>
<td>-47</td>
<td>70</td>
<td>368</td>
<td>179</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Opening stock 2011</strong></td>
<td>45 673</td>
<td>50 591</td>
<td>22 810</td>
<td>3 776</td>
<td>40 684</td>
<td>163 533</td>
</tr>
<tr>
<td>Opening stock as % total river length</td>
<td>28</td>
<td>31</td>
<td>14</td>
<td>2</td>
<td>25</td>
<td>100</td>
</tr>
</tbody>
</table>

- Big decrease in extent of river length in natural category
**Ecological Condition Index**

<table>
<thead>
<tr>
<th>Year</th>
<th>Main rivers</th>
<th>Tributaries</th>
<th>All rivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>81.3</td>
<td>84.9</td>
<td>82.8</td>
</tr>
<tr>
<td>2011</td>
<td>70.1</td>
<td>75.2</td>
<td>72.2</td>
</tr>
</tbody>
</table>

Change between 1999 and 2011:

<table>
<thead>
<tr>
<th></th>
<th>Main rivers</th>
<th>Tributaries</th>
<th>All rivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999 and 2011</td>
<td>-11.2</td>
<td>-9.7</td>
<td>-10.6</td>
</tr>
</tbody>
</table>

Overall 10% decline in ecological condition of rivers 1999 - 2011.
Ecological Condition Index by Water Management Area (WMA)

- Biggest decline: Limpopo WMA (>20%)
- Smallest decline: Mzimvubu-Tsitsikamma WMA
Ecosystem accounting reports available at SANBI’s Biodiversity Advisor website http://biodiversityadvisor.sanbi.org (under “Planning and Assessment” section)
Six lessons

1. Initial work is often supply-driven
   – not requested by decision-makers

2. Physical accounts are powerful in their own right
   – not just as a precursor to monetary accounts

3. Accounting framework helps to translate ecosystem science into a form that speaks to decision-makers
Six lessons

4. Ecologists need to be centrally involved in producing ecosystem accounts
   – Ecological perspective is different from environmental economics perspective

5. Good-enough science is sufficient
   – Don’t wait for perfect science/perfect data

6. No need to involve all stakeholders in all aspects
   – e.g. distinguish technical stakeholders from strategic stakeholders
Next steps

• Early days but lots of interest and enthusiasm from wide range of sectors
• Clear set of priorities for national ecosystem accounting going forward
• Integrating natural capital accounts into National Statistical System
• Linking natural capital accounts to reporting on SDGs