Ecosystem Accounting in South Africa

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South African National Biodiversity Institute
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New Delhi, 16 October 2014

South African National Biodiversity Institute

- Government agency
- Falls under Department of Environmental Affairs
- **Bridging role between science and policy**
- Often work in partnership with other organisations

Overview

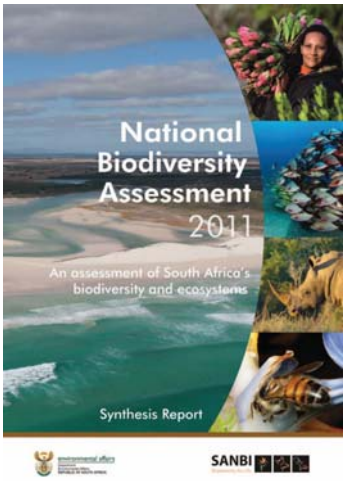
- National Biodiversity Assessment
  - springboard for national ecosystem accounting
- National river ecosystem accounts
  - Approach
  - Draft results
- Land accounts – initial work
- Where does biodiversity fit in?

National Biodiversity Assessment

- Strong focus on ecosystems
- Every 5 to 7 years
- Part of SANBI's mandate to monitor and report on the state of biodiversity

→ Assessment of ecosystems across terrestrial, freshwater, estuarine, coastal & marine environments

→ Also includes indigenous species, invasive species, climate change

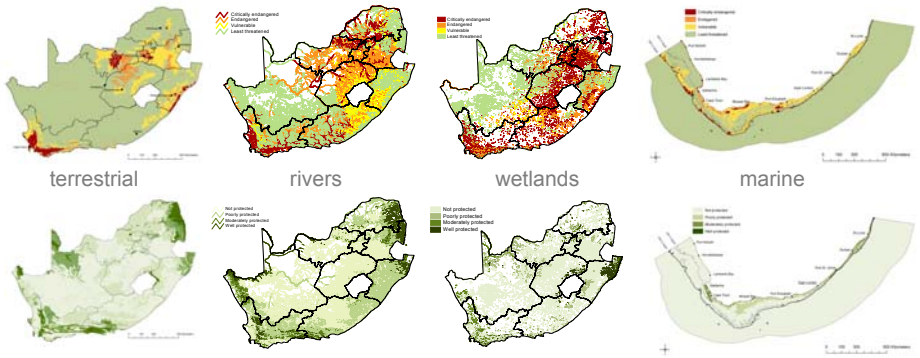


More than 200 scientists & practitioners from over 30 organisations contributed, 3 year process

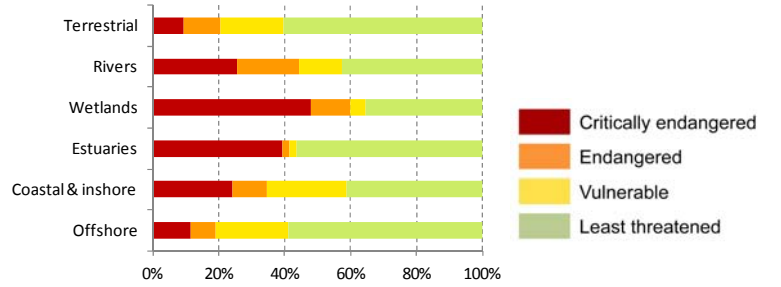
and many more…

National ecosystem indicators

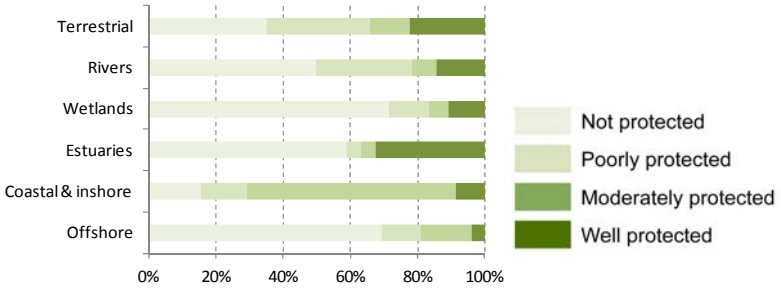
- How threatened are our ecosystems?
- How well protected are our ecosystems?



Ecosystem threat status

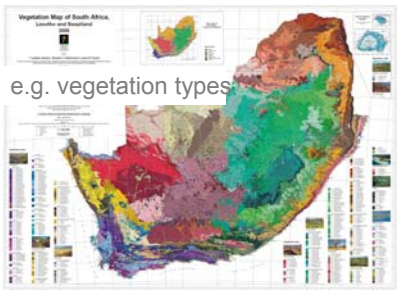


Ecosystem protection level

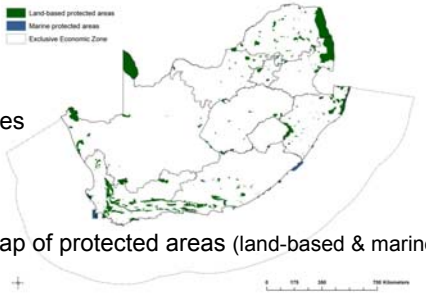


Essential data inputs

→ Classification & mapping of ecosystem types

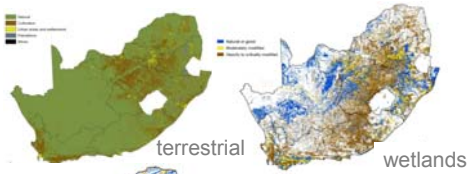


e.g. vegetation types



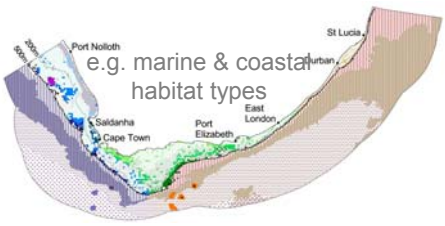
→ Map of protected areas (land-based & marine)

→ Maps of ecological condition



terrestrial

wetlands



e.g. marine & coastal habitat types

rivers

marine

Aha! moment…

- NBA includes substantial national work on mapping and classifying ecosystems and assessing their condition
- Foundational science and data that can be used in ecosystem accounting
  - Especially ecosystem asset accounting
  - Same building blocks – translated into a different framework

Key partners for ecosystem accounting

- Main agencies currently involved

Statistics South Africa

SANBI Biodiversity for Life
South African National Biodiversity Institute

CSIR

water & sanitation
Department: Water and Sanitation
REPUBLIC OF SOUTH AFRICA

environmental affairs
Department: Environmental Affairs
REPUBLIC OF SOUTH AFRICA

- Now with additional support: Advancing SEEA Experimental Ecosystem Accounting project

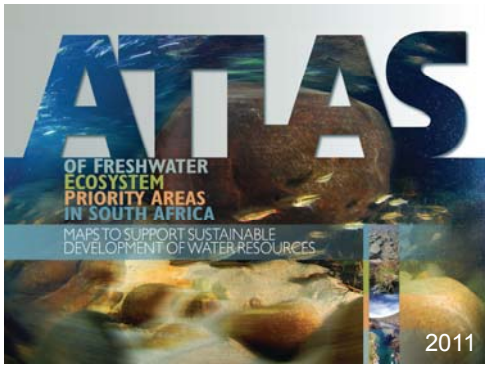
United Nations Statistics Division

Ecosystem accounts in SA to date

- Pilot **national river ecosystem accounts** underway – draft results for 1999 & 2011
  - Began work June 2013
- Pilot **provincial land cover accounts** – draft results for one province 2005-2011
  - Began work August 2014

National river ecosystem accounts

- Freshwater ecosystems are the most threatened ecosystems in SA – water scarce country
- River ecosystem assets support a range of provisioning, regulating and cultural services
- National data layer on ecological condition of rivers available for 1999 and 2011



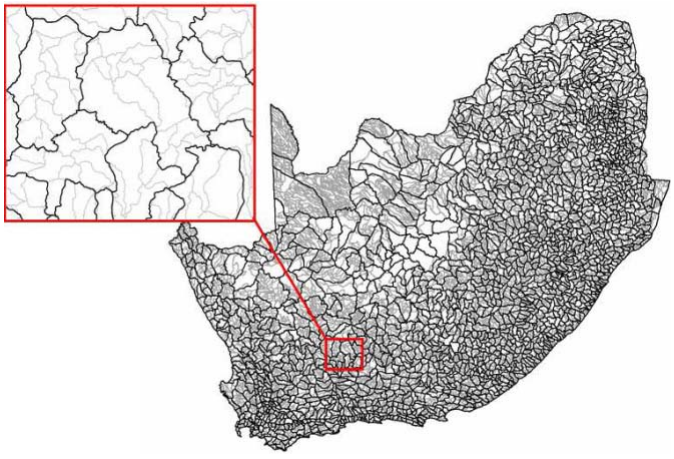
National river ecosystem accounts

- Complement to National Water Accounts
  - National Water Accounts produced by StatsSA focus on the water resource (ecosystem service)
  - National River Ecosystem Accounts focus on the underlying ecosystems (ecosystem asset)

Spatial scale: sub-quaternary catchments

- **Quaternaries**
  Average size ~650 km²

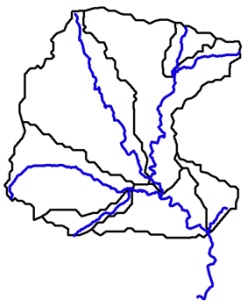
- **Sub-quaternaries** 8547
  Average size ~170 km²



→ Results can be aggregated to a range of scales/units e.g. municipalities, provinces, water management areas

OR river reaches within sub-quaternary catchments

River network topology



Sub-quaternaries

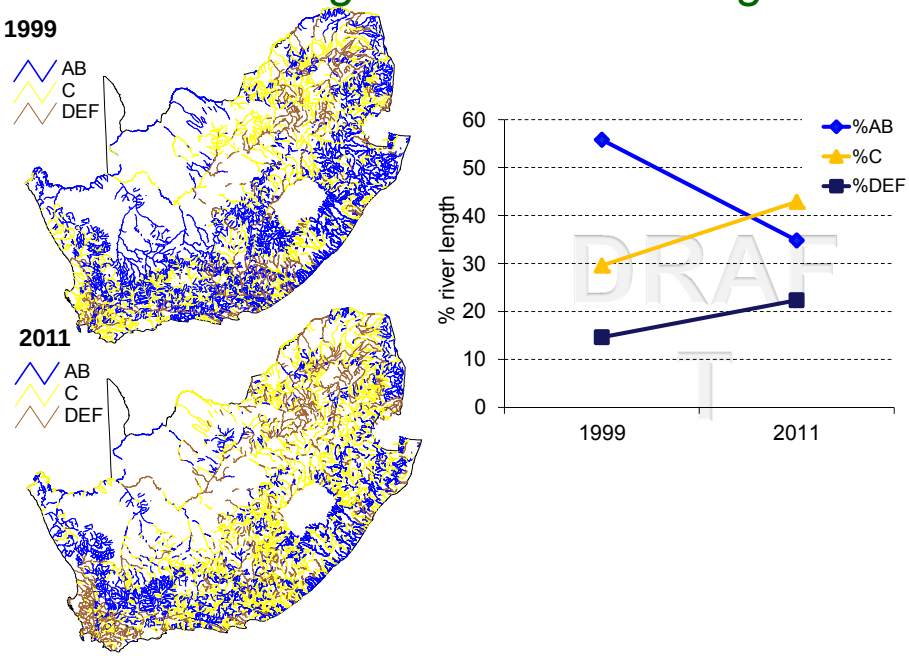
Department of Water & Sanitation: system of ecological condition categories

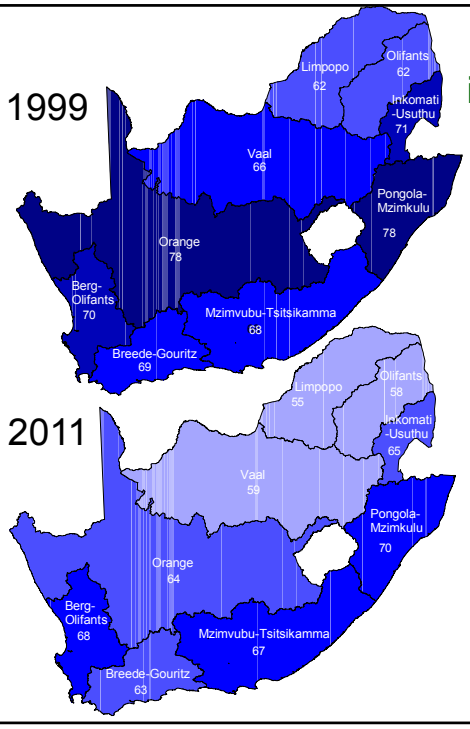
Ecol condition	Description
A	Unmodified, **natural** (reference condition)
B	**Largely natural**, with few modifications. A small change in natural habitats & biota may have taken place but the ecosystems functions are essentially unchanged
C	**Moderately modified**. A loss and change of natural habitat & biota have occurred but the basic ecosystem functions are still predominantly unchanged
D	**Largely modified**. A large loss of natural habitat, biota & basic ecosystems functions has occurred
E	**Seriously modified**. The loss of natural habitat, biota & basic ecosystems functions is extensive
F	**Extremely modified**. Modifications have reached a critical level & the system has been modified completely with an almost complete loss of natural habitat & biota. Worst instances: the basic ecosystem functions have been destroyed & the changes are irreversible

Based on 6 attributes / drivers of condition ("ecosystem characteristics")

- Attributes/characteristics:
  - Flow (e.g. quantity, timing, velocity)
  - Inundation (dams, weirs, other obstructions in the channel)
  - Water quality
  - Stream bed condition
  - Introduced instream biota
  - Riparian or stream bank condition
- For each attribute:
  - Extent of modification from natural is assessed
  - Based on data and expert input, with a confidence rating

Trends in ecological condition categories





Converted to an index of ecological condition

Index of ecological condition for rivers

- 70-75
- 70-75
- 65-70
- 60-65
- 55-60
- 50-55

(Graph of draft results removed from presentation)

Trends in index of ecological condition for rivers per province and Water Management Area

Province

WMA

(Graphs of draft results per province and Water Management Area removed from presentation)

- 1999
- 2011

- Ecological condition of rivers has decreased in every province and Water Management Area

Need to explore trends in river condition vs trends in other national statistics…

…from national accounts, water accounts, census

For example:

- GDP
- Irrigation water use
- Population and urbanisation
- Water service supply backlogs

NB: Substantial task to distil key messages and policy implications

NB: Condition ≠ health

- Ecological condition = degree of modification from a reference condition
- Can have a heavily modified ecosystem that is "healthy"
- Not all ecosystems must remain natural
- Targets in SA:
  - 20% of each ecosystem type should remain in natural/near-natural ecological condition
  - Another 40% in moderately modified condition

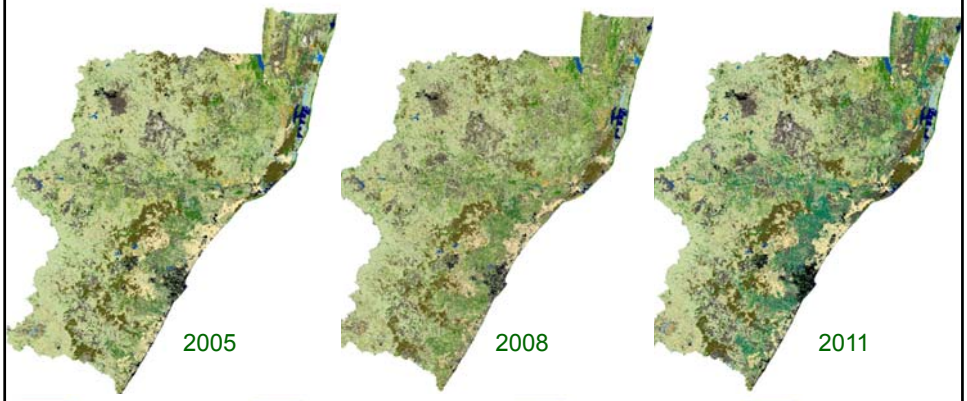
  → spatial biodiversity plans identify best configuration

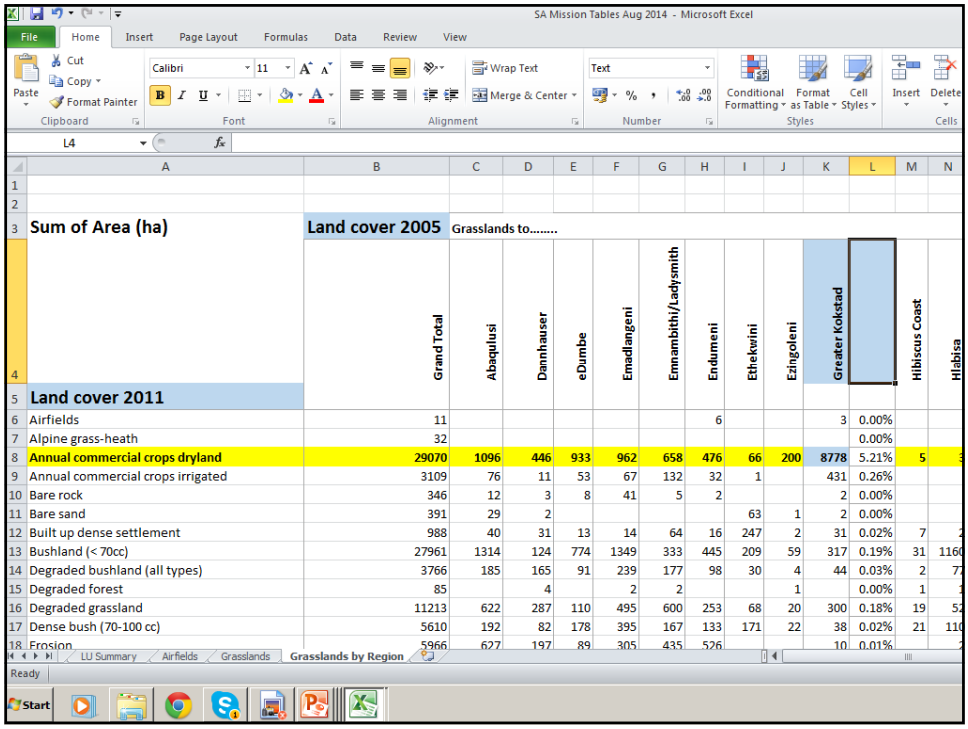
Land cover accounts

- National Land Cover 1996 & 2000
  …BUT different methods and resolution
- KwaZulu-Natal (KZN) – best provincial land cover data
  – 2005, 2008, 2011, (2014)

EZEMVELO KZN WILDLIFE

KZN land cover – 20m resolution





Sum of Area (ha)	Land cover 2005	Grasslands to.....											
Land cover 2011	Grand Total	Abaqulusi	Dannhauser	eDumbe	Emadlangeni	Emnambithi/Ladysmith	Endumeni	Ethekwini	Ezingoleni	Greater Kokstad		Hibiscus Coast	Hlabisa
Airfields	11						6			3	0.00%		
Alpine grass-heath	32										0.00%		
Annual commercial crops dryland	**29070**	**1096**	**446**	**933**	**962**	**658**	**476**	**66**	**200**	**8778**	5.21%	**5**	
Annual commercial crops irrigated	3109	76	11	53	67	132	32	1		431	0.26%		
Bare rock	346	12	3	8	41	5	2			2	0.00%		
Bare sand	391	29	2					63	1	2	0.00%		
Built up dense settlement	988	40	31	13	14	64	16	247	2	31	0.02%	7	
Bushland (< 70cc)	27961	1314	124	774	1349	333	445	209	59	317	0.19%	31	1160
Degraded bushland (all types)	3766	185	165	91	239	177	98	30	4	44	0.03%	2	77
Degraded forest	85		4		2	2			1		0.00%	1	
Degraded grassland	11213	622	287	110	495	600	253	68	20	300	0.18%	19	52
Dense bush (70-100 cc)	5610	192	82	178	395	167	133	171	22	38	0.02%	21	110
Erosion	5966	627	197	89	305	435	526			10	0.01%		

Next steps

- Linking river accounts and land accounts
  - E.g. what are the land cover trends in sub-quaternary catchments with declining condition of river ecosystem assets?
- Links with socio-economic data
- Quantifying implications of changes in ecosystem assets
  - For flows of ecosystem services
  - For cost of maintaining and restoring ecological infrastructure

Where does biodiversity fit in?

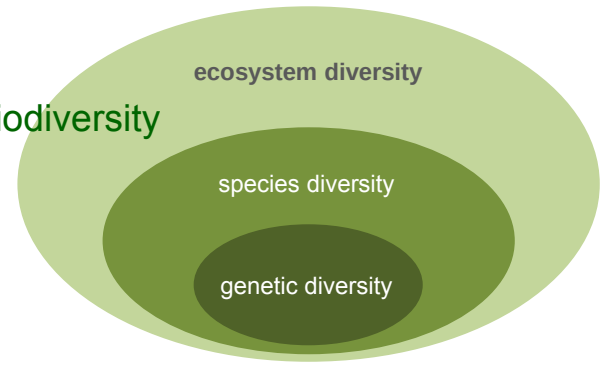
- Is biodiversity a characteristic of ecosystems?
- OR are ecosystems a component of biodiversity?

Biodiversity ≠ species

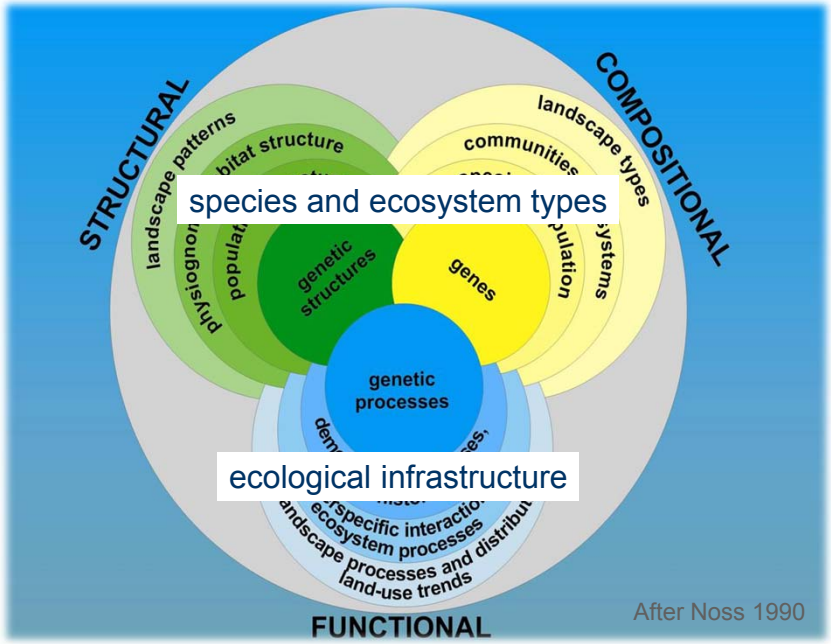
In a mega-diverse country,

our focus is often at the ecosystem level

Components of biodiversity



What do we mean by biodiversity?



What do we mean by biodiversity accounting?

Ecosystem accounting

Species accounting

Genetic accounting?

= Biodiversity accounting