The shifting nature of South Africa's landscape: a 24 year snapshot of land and ecosystem change

10 December 2020

Africa Natural Capital Accounting Community of Practice

New Country Experiences Webinar Series

Land and Terrestrial Ecosystem Accounts, 1990 to 2014

- Released on 2 Dec 2020 in Natural Capital series
- Natural Capital Accounting and Valuation of Ecosystem Services (NCAVES) project

- In South Africa, led jointly by Statistics South Africa (Stats SA) and the South African National Biodiversity Institute (SANBI), in collaboration with the Department of Environment, Forestry and Fisheries (DEFF) and a range of national and sub-national stakeholders.

Shifting nature of SA's landscape: a 24 year snapshot of land and ecosystem change

- Aimee Ginsburg, SANBI: **Introduction**
- Gerhardt Bouwer, Stats SA**: Developing the land and terrestrial ecosystem accounts: process and partnerships**
- Nokuthula Mahlangu, SANBI**: South Africa's approach and methods for compiling the land and terrestrial ecosystem accounts**
- Mandy Driver, SANBI**: The shifting nature of South Africa's landscape: key indicators and findings from the accounts**
- Department of Environment, Forestry and Fisheries (DEFF)**: Reflections on value and application of the accounts**

Developing the land and terrestrial ecosystem accounts: process and partnerships

Gerhardt Bouwer

Stats SA Chief Director: Independent Assessment Unit

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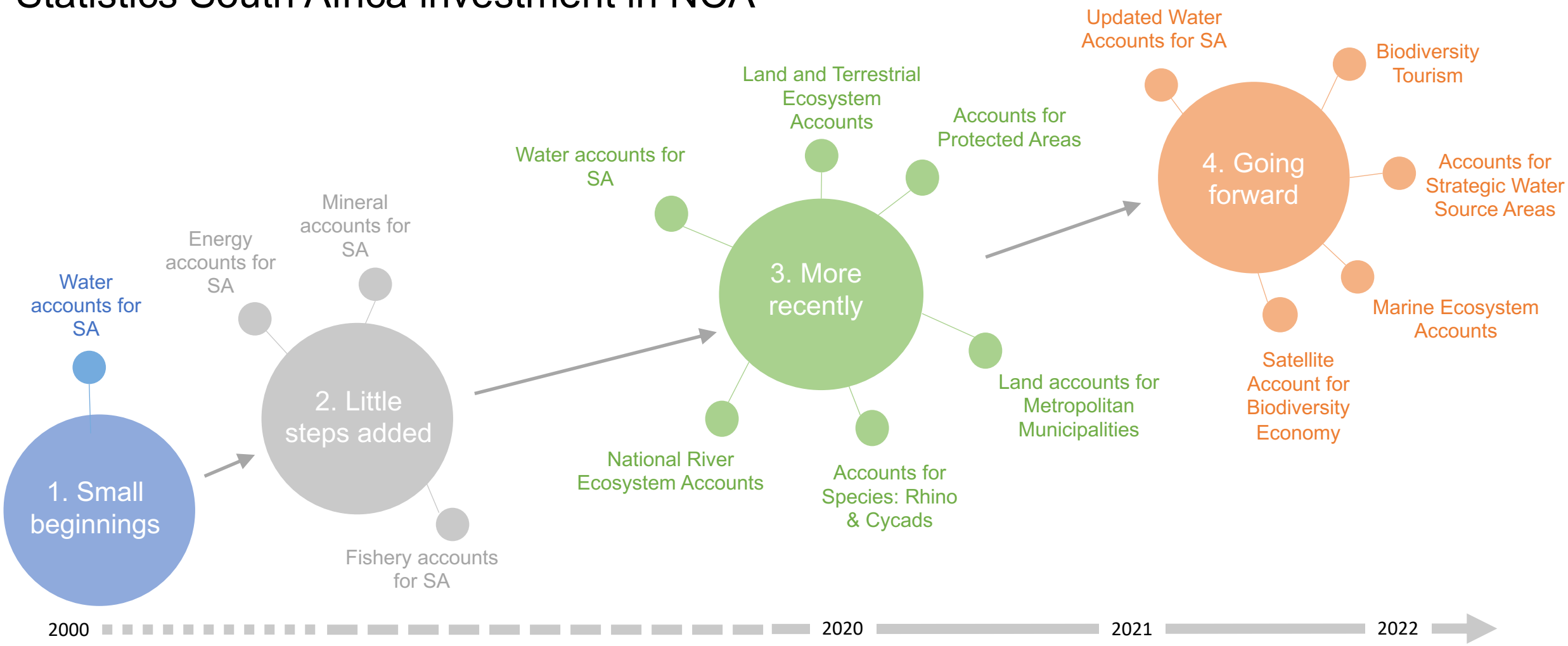
“*The future of policymaking and implementation is upon us and experience has taught us that without measurement, our boat will not sail far*.” (Mr Jackson Mthembu, Minister in the Presidency)

Stats SA Strategic Plan (20/2021 – 2024/25) vision: ‘Improving lives through data ecosystems’

Statistics South Africa investment in NCA



Advancing NCA (ANCA) Project

SANBI Biodiversity for Life South African National Biodiversity Institute
iSimangaliso Wetland Park
water & sanitation Department: Water and Sanitation REPUBLIC OF SOUTH AFRICA
environmental affairs Department: Environmental Affairs REPUBLIC OF SOUTH AFRICA
CSIR our future through science
United Nations Statistics Division
UNEP
Convention on Biological Diversity
NORWEGIAN MINISTRY OF FOREIGN AFFAIRS

NCA & Valuation of ES (NCAVES) Project

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How did we coproduce the Land and Terrestrial Ecosystem Accounts?

1. **Different institutional mechanisms** to deal with different parts of the project, enabling involving a broader group of people without burdening everyone in the same way.
2. **Meetings facilitated in a way that enables sharing of perspectives, discussion and learning.**
3. **Focused responsibilities.**
4. **Sharing with an ever broader audience as we went to share, get feedback and stretch ourselves.**

Institutional mechanisms for the NCAVES Project in SA

5

Project Reference Group

EU | UNSD | UN Environment | Dept of Environment, Forestry & Fisheries

Reports to

PMU+

2

1

Project Management Unit (PMU)

Gerhardt Bouwer (Stats SA) — Mandy Driver (SANBI)

Robert Parry (Stats SA) — Aimee Ginsburg (UN contract) — Thuli Mahlangu (SANBI)

Report to

SANBI consultants

NCA expert advisor

NCA specialists

•Anchor Environmental Consultants

•GeoTerraImage

Stats SA staff regularly supporting the project

Reports to

4

Global project team support meetings

Other SA support to NCAVES Project

Stats SA

SANBI

Department of Environment and Fisheries

Department of Agriculture, Rural Development and Land Reform (National Geo-spatial Information)

Department of Monitoring and Evaluation

3

Would also create short-term task teams to tackle specific technical issues, as needed.

2. Meetings facilitated to enable social process of learning and information sharing

- Meetings of the different groups mentioned in previous slide
- Also involved wider stakeholders in the process

National Stakeholder Workshop (19 March)

- >70 people & 30 organisations
- Used voting/ranking, in combination with assessment of data availability and policy applications, to prioritise accounts to be produced.

National Training Workshop

- 21-23 May 2019
- 27 participants across 14 institutions

Focused responsibilities

- Enabled by allocation of resources (skill sets where it was applicable and needed from different resource persons and different line ministries and institutions).

- Project Manager (Aimee Ginsburg) was **crucial** for coordination and the success of the NCAVES project (Land and Terrestrial Ecosystem Accounts were a deliverable of the NCAVES project).

Sharing with a wider audience including users of the information from accounts

- E.g. at the National NCA Forum in 2019:
  - 131 Forum participants
  - 24 institutions
- presenting the draft results and getting feedback highlighted a range of useful things that made the final accounts better.
- Feedback helps!

What worked well about multi-institutional meetings

- A platform that bring together various partners together to take ownership on NCA.
- Working together with the national partners in mainstreaming NCA through an official platform that brings people together.
- Provided really valuable strategic guidance and helped to clarify roles.
- Virtual meetings worked well.
- It was useful to have a relatively small Project Reference Group (PRG) with consistent membership over the course of the project.
- Communication (constant information sharing and role-players involvement).

Concluding comments: collaborative coproduction

- Would not have been possible without partnership and collaboration
- Meets Stats SA's standards through application of the SEEA and national classification systems
- At a time of resource constraint, even more important to collaborate and build partnerships with strategic entities in the state, private sector, in Africa and internationally to further advance NCA in SA

Concluding comments: Future partnering

- Embrace partners as data providers, compilers of accounts or users of information from accounts to drive advancement of NCA.
- Able to inform partners on the link between economy, society and environment.
- Able to coordinate among producers of official and other statistics in order to advance quality, comparability and optimum use of official statistics and to avoid duplication.

South Africa's approach and methods for compiling land and terrestrial ecosystem accounts, 1990 to 2014

Nokuthula Mahlangu

SANBI GIS Specialist: Ecosystem Accounts

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Outline

1. Spatial framework for accounts
2. Foundational data layers
3. Summary of the methodology

Spatial framework for accounts in South Africa

Spatial framework *for accounting*

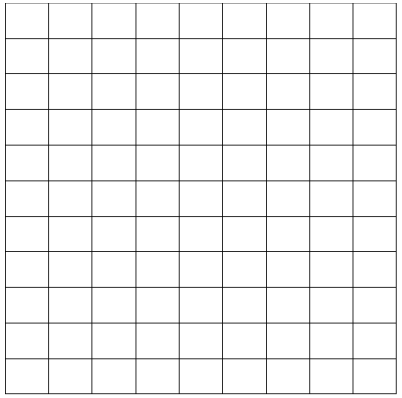
- Spatial framework provides the key for integrating environmental, social and economic information to inform decision-making.

- A key feature is the integration of **spatially referenced data**, such as
  - data about the location,
  - size and condition of ecosystems within a given area, and
  - change occurring over time.

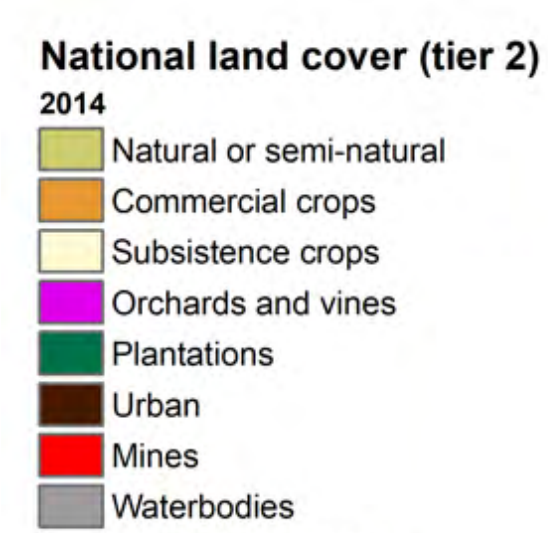
- The spatial framework for accounting in South Africa includes:
  1. A **basic spatial unit** to divide the country up into the smallest units practicable
  2. **Ecosystem accounting area**
  3. **Sub-accounting areas**

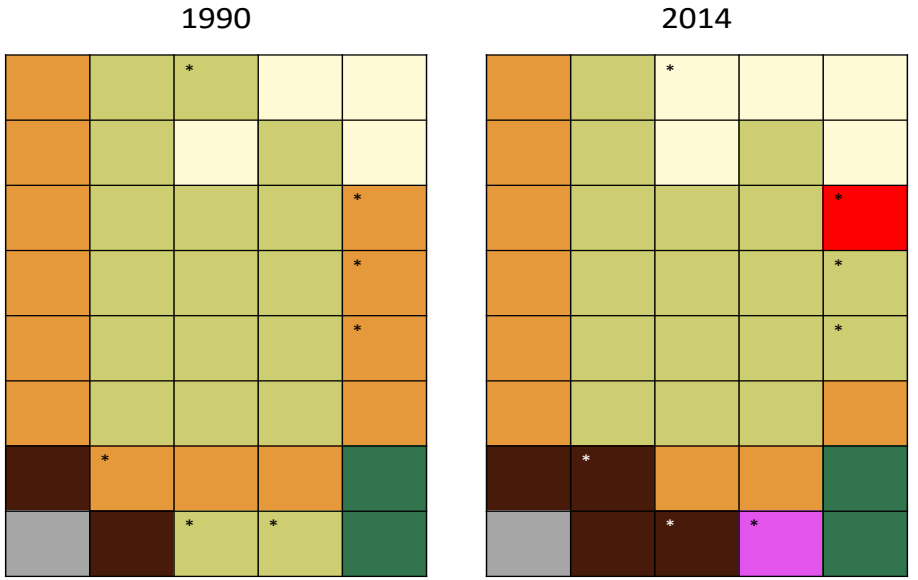
Basic Spatial Unit

- A geospatial construct to which a range of different spatial data and information can be attributed
- Set of grids with a standardised set of coordinates & known projection that fully overlaps the country's terrestrial and marine areas
- Consistent and independent framework
- Used to look at change in each cell over time



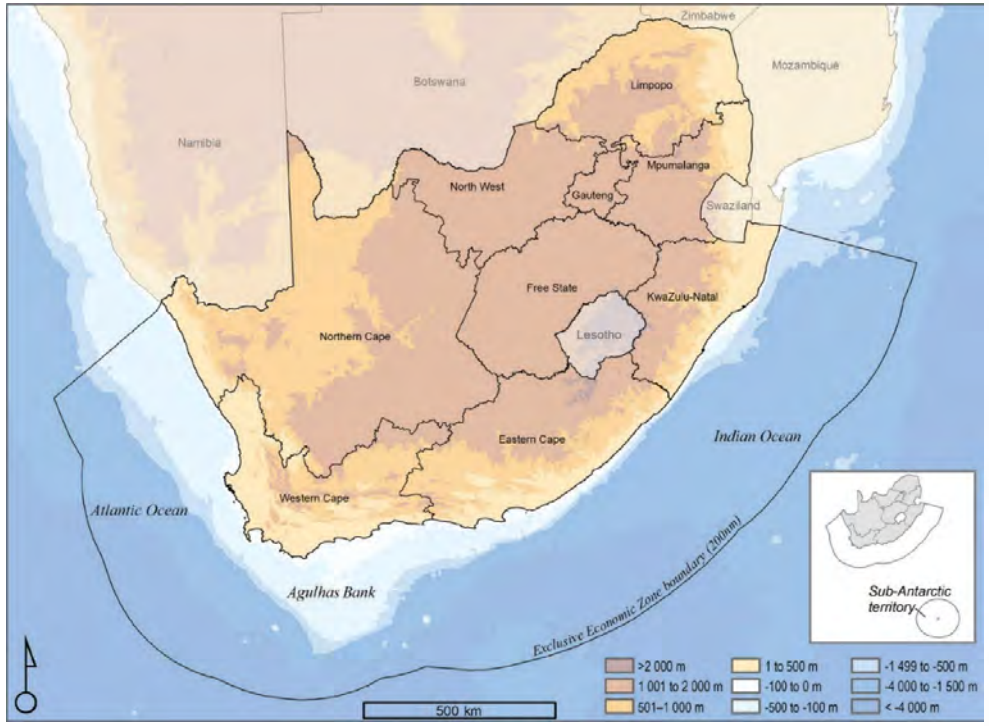
BSU layer
100m x 100m
= unit for analysis to which all data gets synthesized

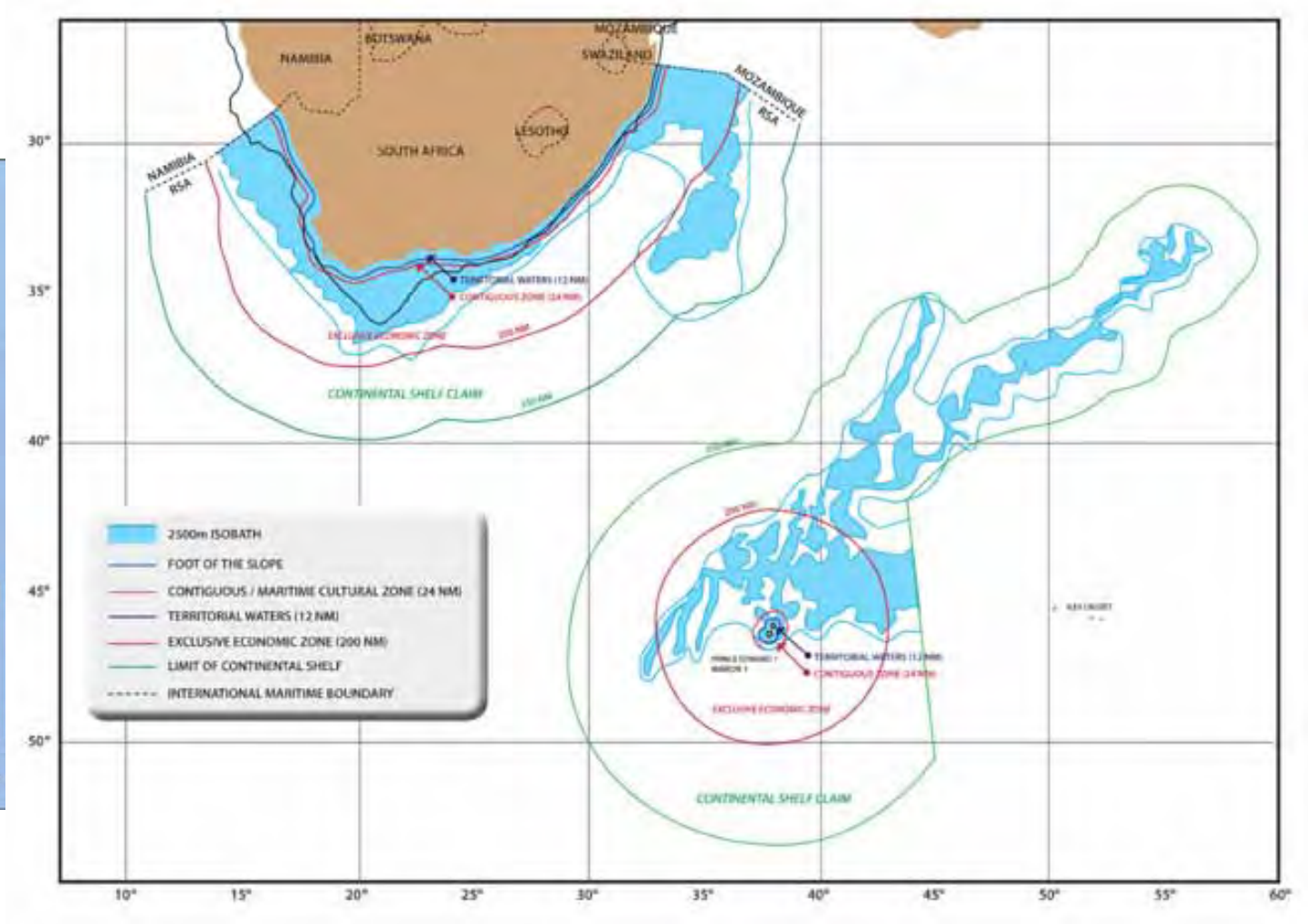




South Africa's sovereignty includes

- the mainland and its Exclusive Economic Zone (EEZ),
- sub-Antarctic territory of Prince Edward Islands (PEI) and its EEZ, and
- The continental shelf claim





Basic Spatial Unit (BSU) in SA

BSU 1 (728 million 100m cells):
South Africa + EEZ + Transboundary basins

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MAPPING OUR NATION

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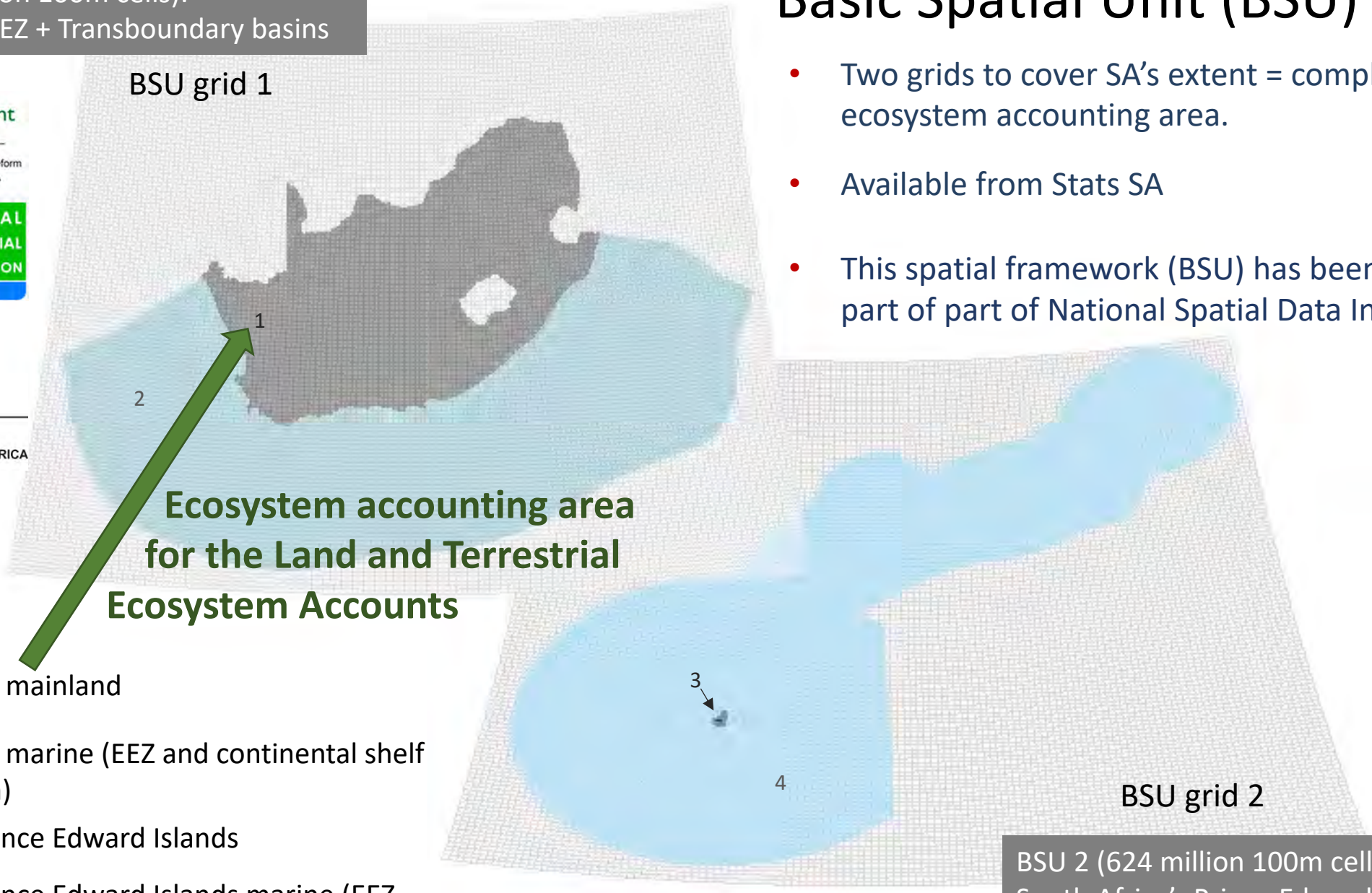
- Two grids to cover SA's extent = complete possible ecosystem accounting area.
- Available from Stats SA
- This spatial framework (BSU) has been adopted as part of part of National Spatial Data Infrastructure



1: SA mainland

2: SA marine (EEZ and continental shelf claim)

3: Prince Edward Islands

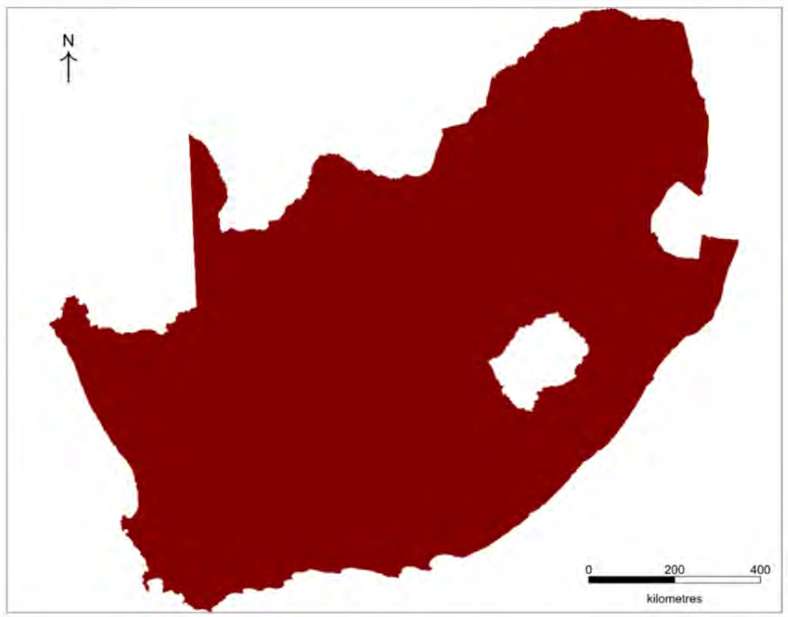
4: Prince Edward Islands marine (EEZ and continental shelf claim)

BSU 2 (624 million 100m cells):
South Africa's Prince Edward Islands + EEZ

Delineating the mainland ecosystem accounting area

- Inland borders:
  - Determined official data from the Demarcation Board.

- Coastline:
  - Defined based on the National Ecosystem Classification System.
  - The dune base separates the backshore and the shore and is considered the ecologically meaningful interface between the terrestrial and marine realm.



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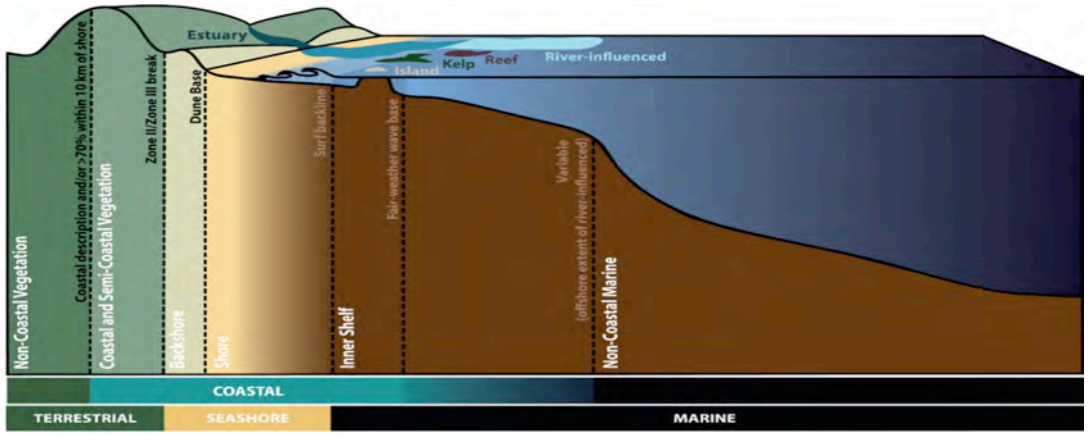
DataNODATA: 0 <single>

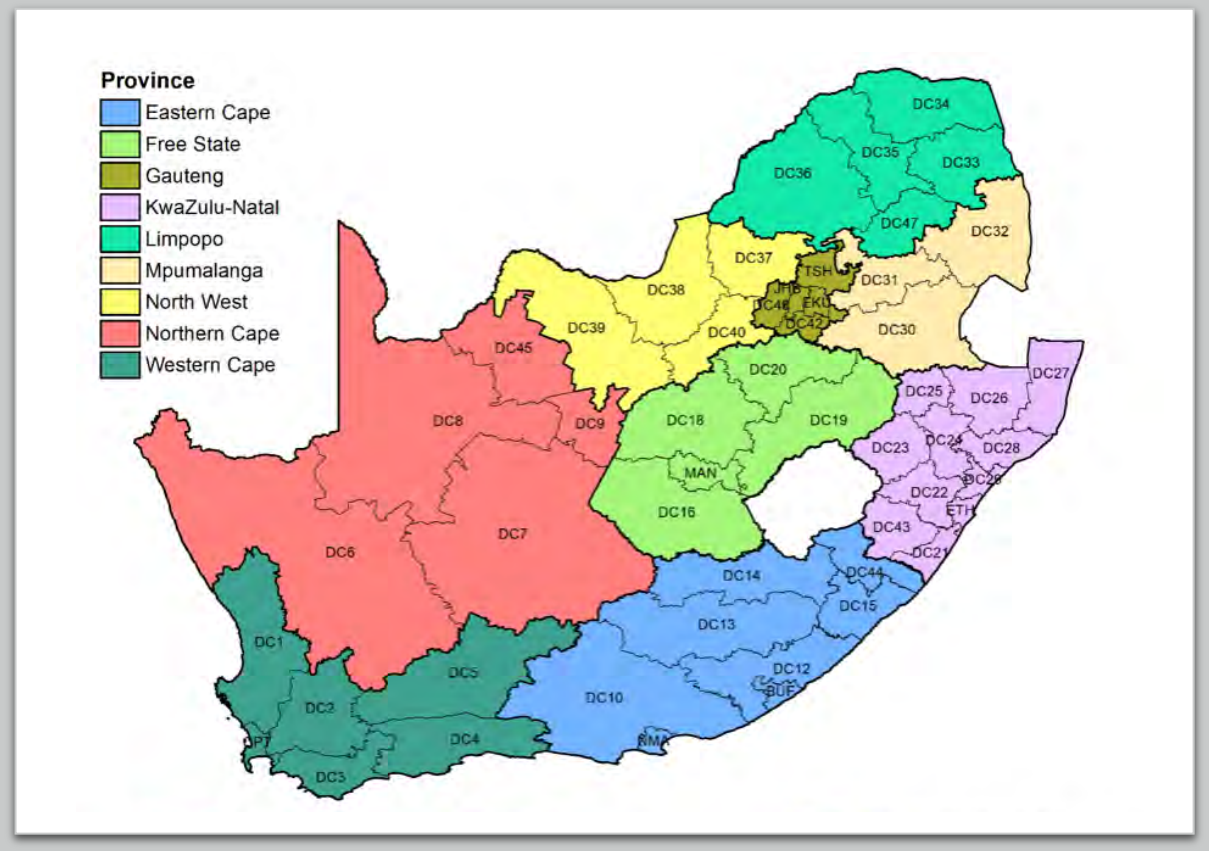
SA mainland

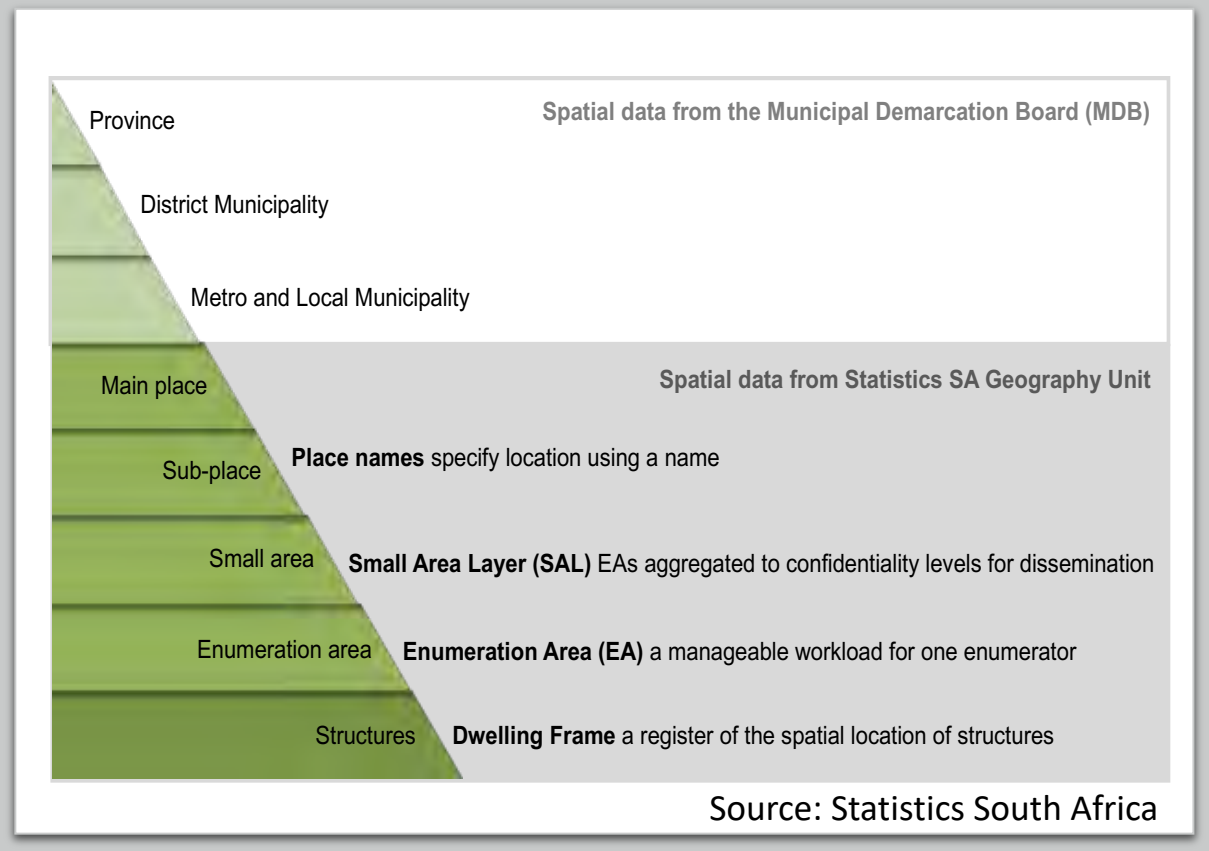


Source: Harris *et al.* 2019

Geospatial information frame for SA

- Refers to a nested hierarchy of administrative units
- Provides sub-accounting areas: Provinces and Municipalities





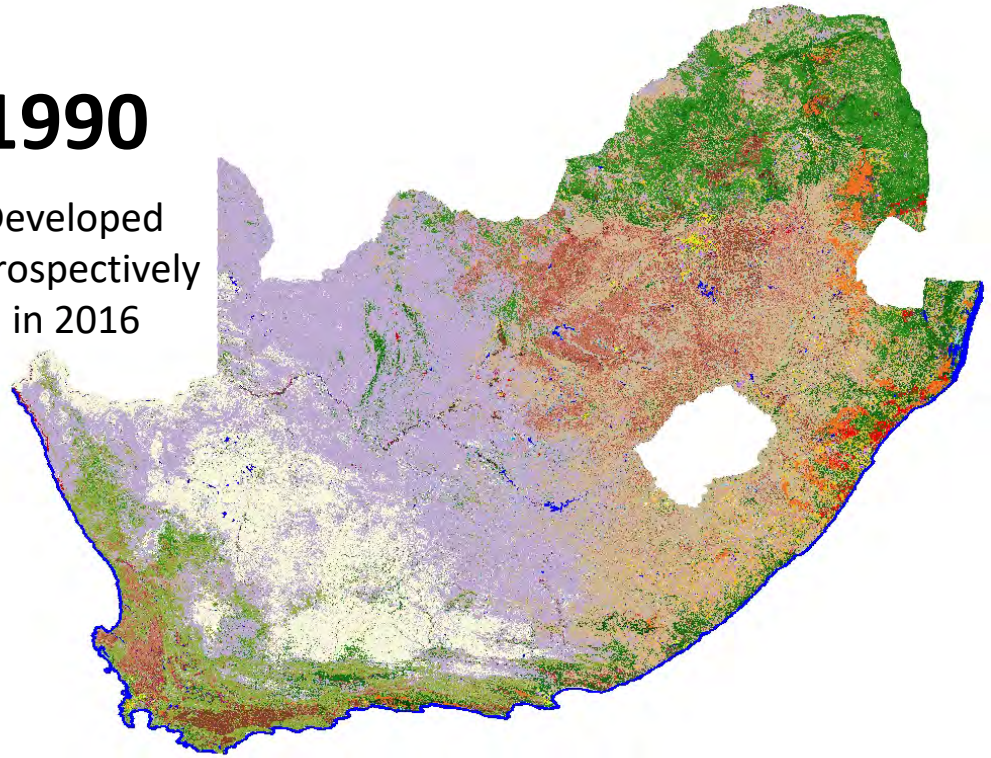
Source: Statistics South Africa

Foundational data layers

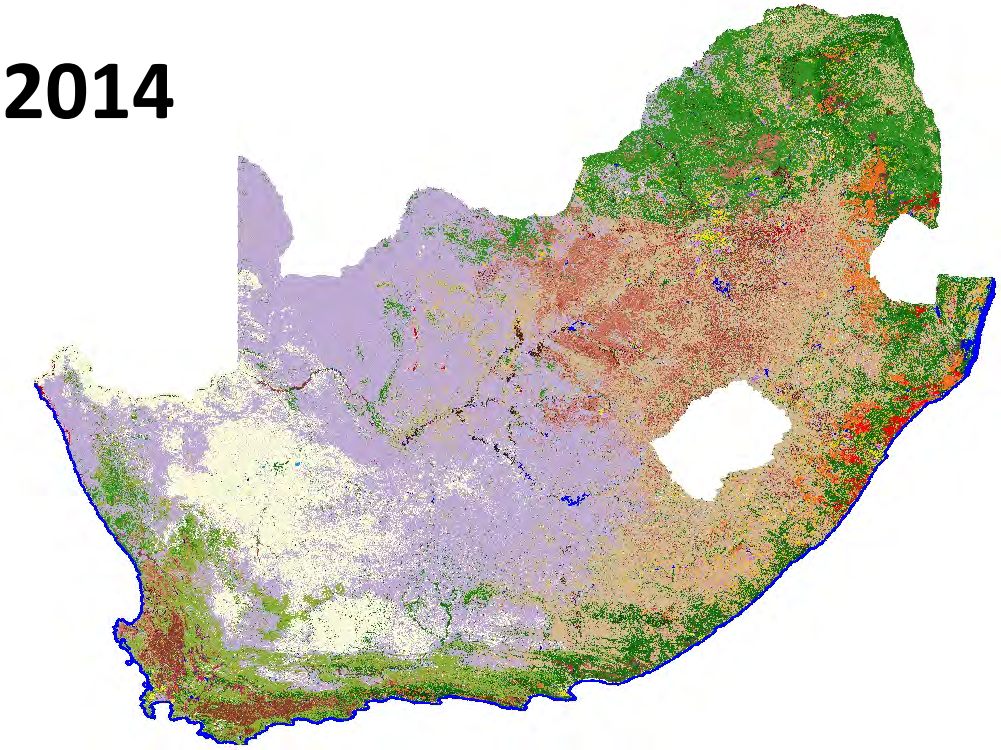
Foundational data layer: **National Land Cover**

1990

Developed retrospectively in 2016



2014



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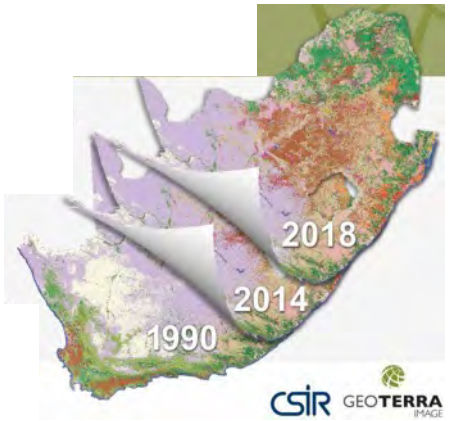
GEOTERRA IMAGE

Recently available for **2018**



Foundational data layer: **National Land Cover** (*cont.*)

National Land Cover datasets for 1990 and 2014:

72 classes

30m, resampled to 100m BSU

Row	Color	Class_Names
0		
1		Water seasonal
2		Water permanent
3		Wetlands
4		Indigenous Forest
5		Thicket /Dense bush
6		Woodlan/Open bush
7		Grassland
8		Shrubland fynbos
9		Low shrubland
10		Cultivated comm fields (high)
11		Cultivated comm fields (med)
12		Cultivated comm fields (low)
13		Cultivated comm pivots (high)
14		Cultivated comm pivots (med)
15		Cultivated comm pivots (low)
16		Cultivated orchards (high)
17		Cultivated orchards (med)
18		Cultivated orchards (low)
19		Cultivated vines (high)
20		Cultivated vines (med)
21		Cultivated vines (low)
22		Cultivated permanent pineapple
23		Cultivated subsistence (high)
24		Cultivated subsistence (med)
25		Cultivated subsistence (low)
26		Cultivated cane pivot - crop
27		Cultivated cane pivot - fallow
28		Cultivated cane commercial - crop
29		Cultivated cane commercial - fallow
30		Cultivated cane emerging - crop
31		Cultivated cane emerging - fallow
32		Plantations / Woodlots mature
33		Plantation / Woodlots young
34		Plantation / Woodlots clearfelled
35		Mines 1 bare
36		Mines 2 semi-bare
37		Mines water seasonal
38		Mines water permanent
39		Mine buildings
40		Erosion (donga)
41		Bare none vegetated
42		Urban commercial
43		Urban industrial
44		Urban informal (dense trees / bush)
45		Urban informal (open trees / bush)
46		Urban informal (low veg / grass)
47		Urban informal (bare)
48		Urban residential (dense trees / bush)
49		Urban residential (open trees / bush)
50		Urban residential (low veg / grass)
51		Urban residential (bare)
52		Urban school and sports ground
53		Urban smallholding (dense trees / bush)
54		Urban smallholding (open trees / bush)
55		Urban smallholding (low veg / grass)
56		Urban smallholding (bare)
57		Urban sports and golf (dense tree / bush)
58		Urban sports and golf (open tree / bush)
59		Urban sports and golf (low veg / grass)
60		Urban sports and golf (bare)
61		Urban township (dense trees / bush)
62		Urban township (open trees / bush)
63		Urban township (low veg / grass)
64		Urban township (bare)
65		Urban village (dense trees / bush)
66		Urban village (open trees / bush)
67		Urban village (low veg / grass)
68		Urban village (bare)
69		Urban built-up (dense trees / bush)
70		Urban built-up (open trees / bush)
71		Urban built-up (low veg / grass)
72		Urban built-up (bare)

Foundational data layer: **National Land Cover** (*cont.*)

Grouping of 72 National Land Cover classes into nested tiers for land accounts

Broad land cover classes *Tier 1: 4 classes*	**Main land cover classes** *Tier 2: 8 classes*	**Detailed land cover classes** *Tier 3: 20 classes*	**National Land Cover (NLC) classes** *Tier 4: 72 classes*
Natural or semi-natural	Natural or semi-natural	Natural or semi-natural	8 land cover classes
Cultivated	Commercial crops	Cultivated commercial fields	4 land cover classes
		Cultivated commercial pivots	3 land cover classes
		Sugarcane	6 land cover classes
	Subsistence crops	Subsistence crops	3 land cover classes
	Orchards and vines	Orchards	3 land cover classes
		Vines	3 land cover classes
	Timber plantations	Timber plantations	3 land cover classes
Built-up	Urban	Urban parkland	4 land cover classes
		Urban industrial	1 land cover class
		Urban commercial	1 land cover class
		Urban built-up	4 land cover classes
		Urban residential	4 land cover classes
		Urban township	4 land cover classes
		Urban informal	4 land cover classes
		Urban smallholding	4 land cover classes
		Urban village	4 land cover classes
		Urban school and sports ground	1 land cover class
	Mines	Mines	5 land cover classes
Waterbodies	Waterbodies	Waterbodies	3 land cover classes

Natural or semi-natural classes grouped as a single class at Tier 1, 2 and 3

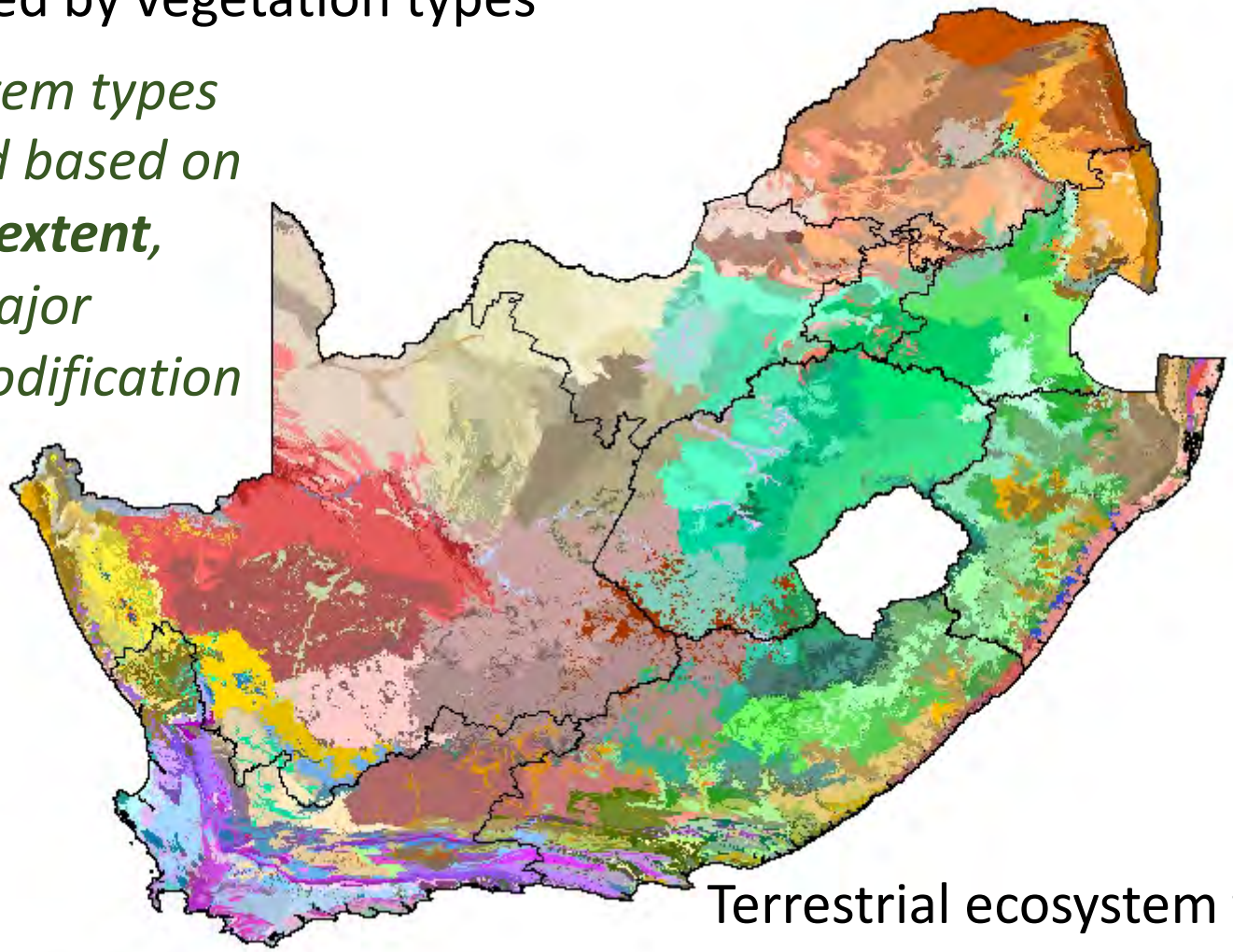
Classes in tiers 1, 2 and 3:

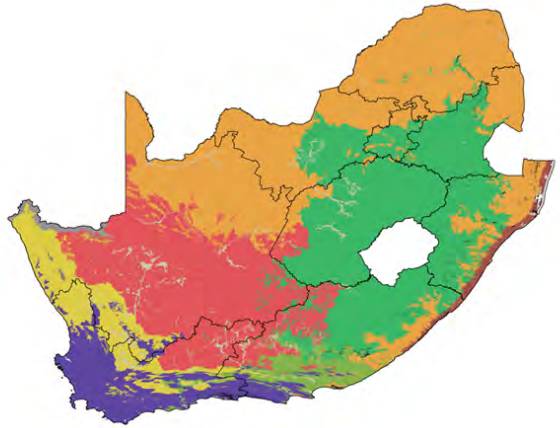
- aligned with **intensity of ecological impact**
- link to **socio-economic drivers** in the landscape as far as possible

Foundational data layer: **National Vegetation Map**

458 terrestrial ecosystem types,
represented by vegetation types

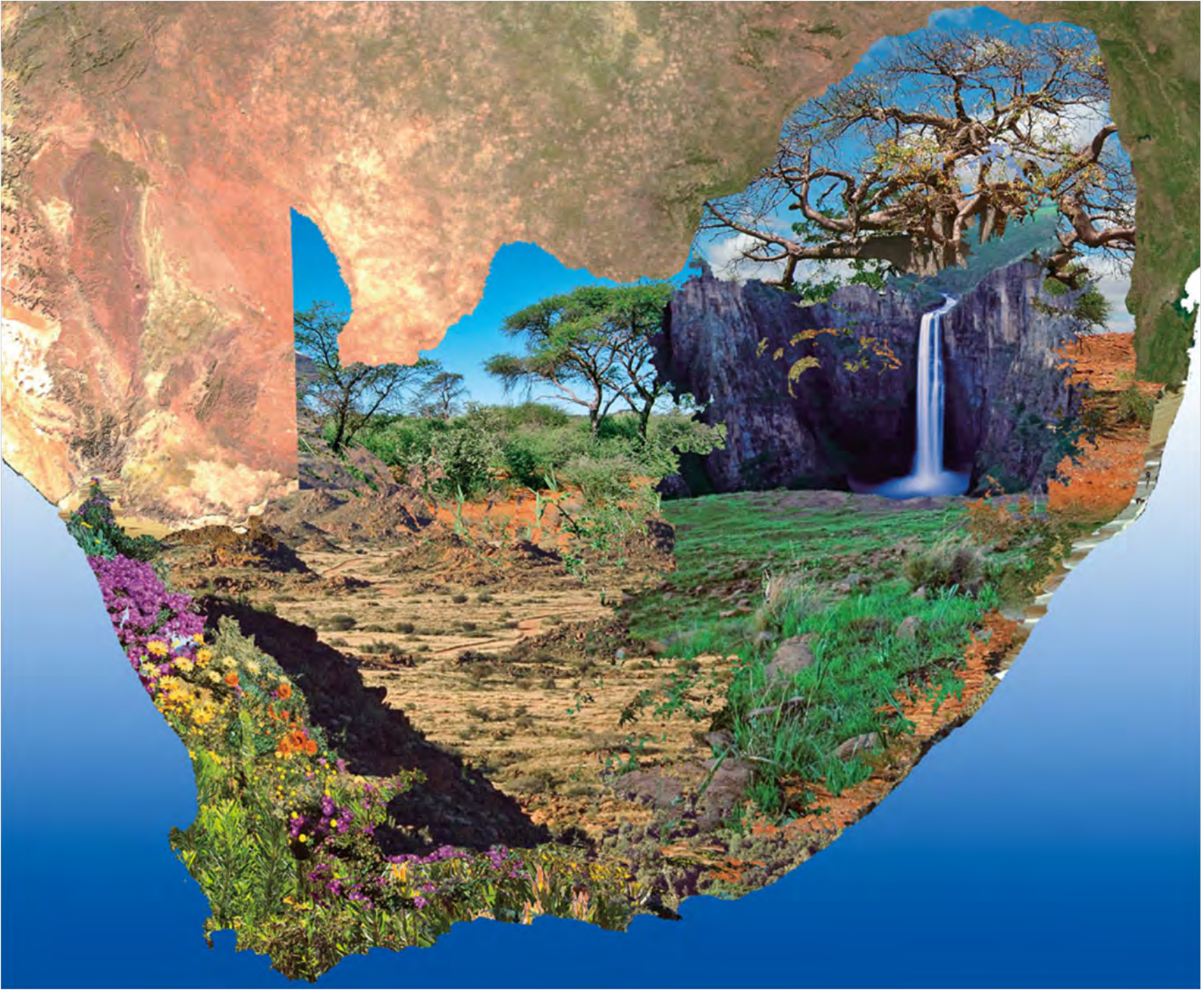
→ *Ecosystem types delineated based on* ***historical extent****, prior to major human modification*

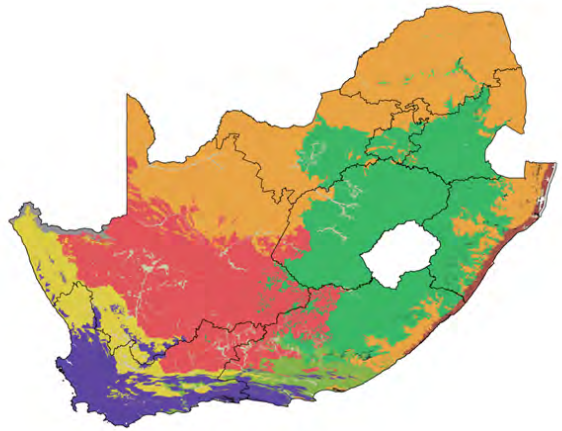




Biomes
- Albany Thicket
- Desert
- Forests
- Fynbos
- Grassland
- Indian Ocean Coastal Belt
- Nama-Karoo
- Savanna
- Succulent Karoo
- Azonal Vegetation
- Provincial boundary

Terrestrial ecosystem types are grouped into 9 biomes →





Biomes

- Albany Thicket
- Desert
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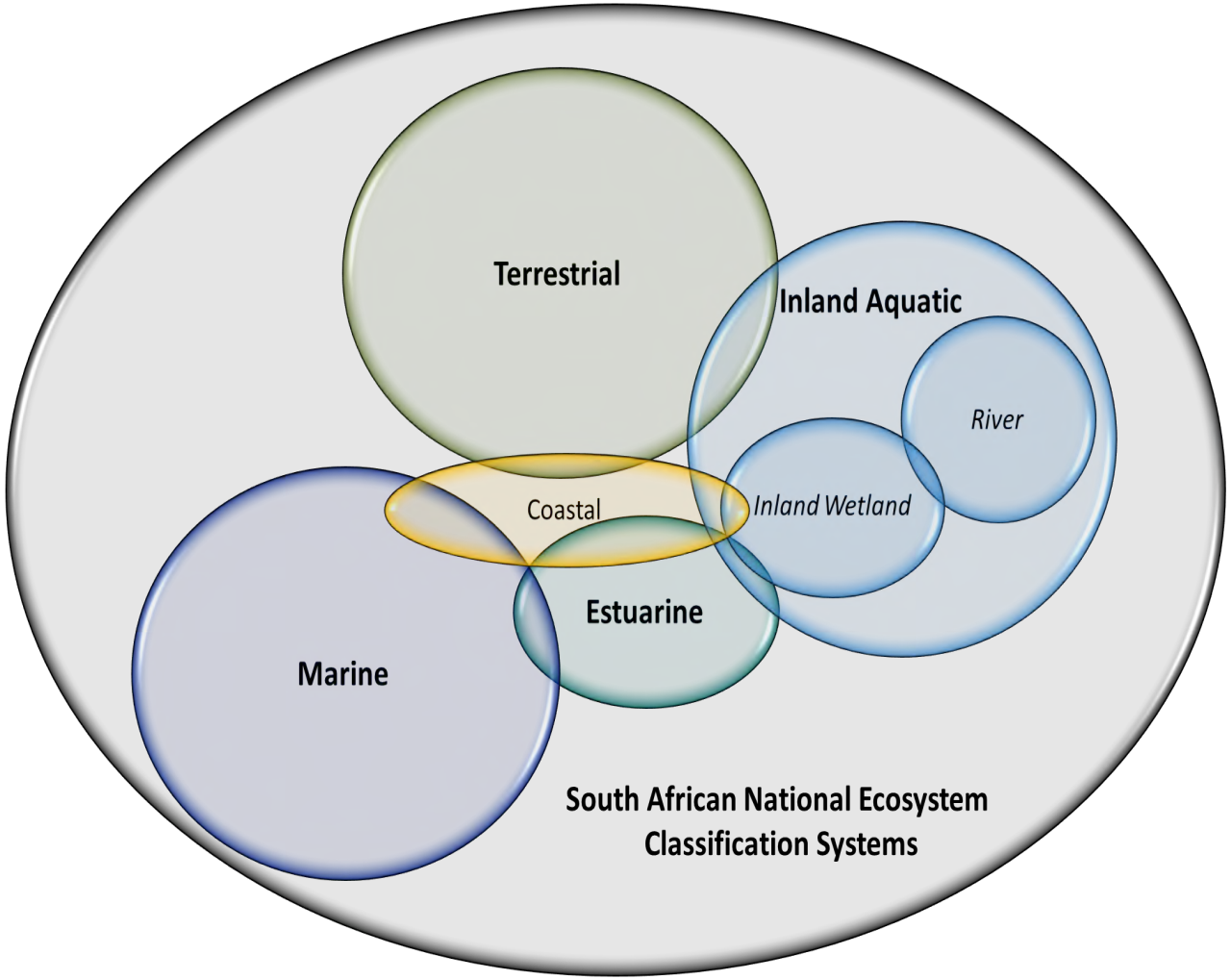
South African National Ecosystem Classification System (SA-NECS) integrates ecosystem classification and mapping across realms

Realm	Classification system name
Terrestrial	National Vegetation Map
Inland aquatic (freshwater)	Classification system for wetlands and rivers
Estuarine	Ecosystem Classification for South African Estuaries
Marine	Marine Ecosystem Classification

The **coast is a cross-realm zone** that includes elements from all four realms



Approach broadly equivalent across all realms

Compiling accounts

Compiling the accounts

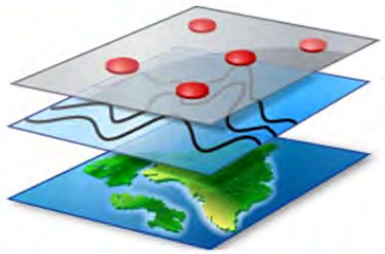
BSU consistent spatial framework for integrating data

*100m x 100m Cells
* Extent
*728 M Cells

Environmental Systems Modelling Platform

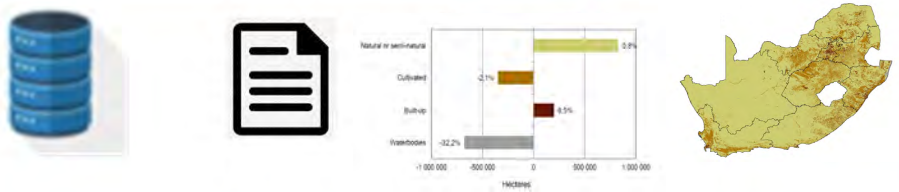
EnSym

IDEEA Group



- **Land cover**
- **Terrestrial ecosystem**
- **Demographic and Economic**

Data Sources



Outputs

Preparing accounts-ready data

- Pre-processing of baseline spatial data (ArcGIS)
- Verification of spatial data (EnSym)
- Conditioning of spatial data (EnSym)

Producing accounts tables

- Production of accounts (EnSym)
- Export accounts tables and change matrices (Excel)

Table formatting & analysis

- Additional formatting and analysis of accounts tables (Excel)

Visual presentation of results

- Produce graphics (Excel)
- Create maps (ArcGIS)

The shifting nature of South Africa's landscape: key indicators and findings from the accounts

Mandy Driver

SANBI Director: Senior Biodiversity Policy Advisor

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More on South Africa’s approach to land and terrestrial ecosystem accounts

Land accounts and terrestrial ecosystem extent accounts are **two separate sets of accounts**

- **Land account**
  - Focuses on changes in extent of **intensively modified land cover classes**, such as cultivated, urban and mined areas
  - Requires only the *National Land Cover* as foundational data layers

- **Terrestrial ecosystem extent account**
  - Focuses primarily mainly on changes in extent of **natural or semi-natural ecosystem types**
  - Mapped based NOT on current land cover but rather on the *National Vegetation Map*

Separating the land account from the terrestrial ecosystem extent account requires…

1. Stable **reference extent** for natural ecosystem types
   - In South Africa this reference extent is provided by **historical extent** (prior to major human modification of the landscape)
   - Delineated in *National Vegetation Map*
   - Historical extent is contrasted with **remaining extent** in 1990 and 2014
   - Remaining extent means the extent that is still in a natural or semi-natural state

2. **Dual perspective** on intensively managed ecosystem types

Dual perspective on intensively modified areas

→ Seen as **land cover classes** in the **land account**

- **Tier 1 land cover classes**
  - Cultivated
  - Built-up
- **Tier 2 land cover classes**
  - Commercial crops
  - Subsistence crops
  - Orchards & vines
  - Timber plantations
  - Urban
  - Mines

→ Seen as **intensively modified ecosystem types** in the **ecosystem extent account**

- **Intensively modified "biomes"**
  - Cultivated
  - Built-up
- **Intensively modified "ecosystem functional groups"**
  - Commercial crops
  - Subsistence crops
  - Orchards & vines
  - Timber plantations
  - Urban

National-level accounting tables

Land account for broad land cover classes (tier 1) at the national level, 1990–2014, in hectares

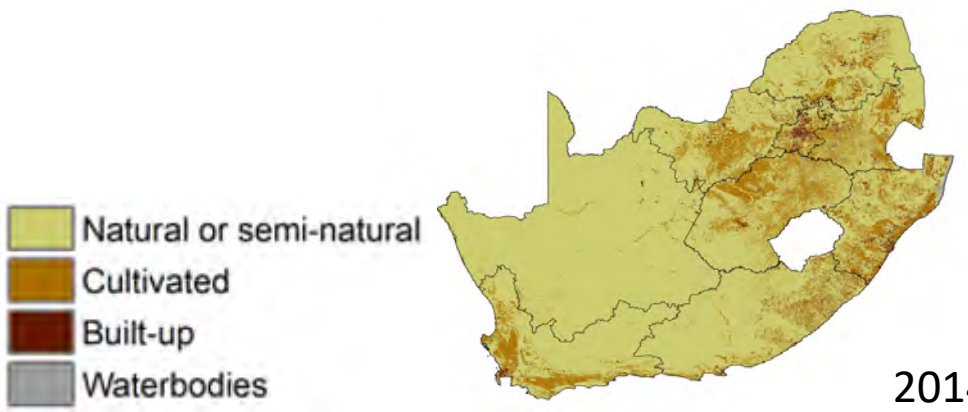
Broad land cover classes (tier 1)	Natural or semi-natural	Cultivated	Built-up	Waterbodies*	TOTAL
Opening stock 1990	**100 710 016**	**16 156 026**	**3 003 883**	**2 096 528**	**121 966 453**
Additions to stock	3 366 559	1 991 959	597 238	288 754	6 244 510
Reductions in stock	2 540 175	2 339 226	400 503	964 606	6 244 510
Net change in stock	826 384	(347 267)	196 735	(675 852)	
Net change as % of opening	**0.8%**	**-2.1%**	**6.5%**	**-32.2%**	
Unchanged (opening - reductions)	98 169 841	13 816 800	2 603 380	1 131 922	
Unchanged as % of opening	97.5%	85.5%	86.7%	54.0%	
Turnover (additions + reductions)	5 906 734	4 331 185	997 741	1 253 360	
Turnover as % of opening	5.9%	26.8%	33.2%	59.8%	
Closing stock 2014	**101 536 400**	**15 808 759**	**3 200 618**	**1 420 676**	**121 966 453**

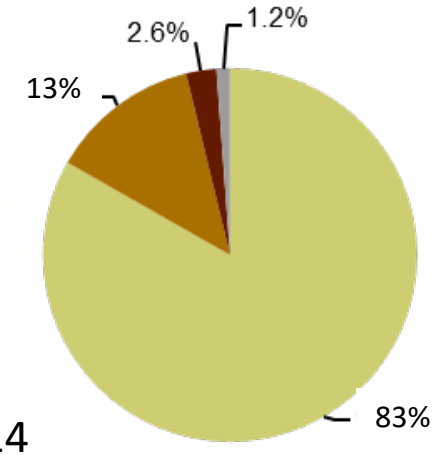
*The large net decrease in the extent of waterbodies reflects primarily that 1990 was a much wetter year than 2014.

This is the most aggregated form of the land account.
It can be broken down by province or municipality.
The broad land cover classes can be disaggregated to tier 2 or tier 3 classes.

By far the majority of South Africa's land area is **natural or semi-natural**

Not much change between 1990 and 2014 at the national level for tier 1 – BUT this hides a lot of sub-national variation and changes at tier 2 and 3





2014

Extent account for terrestrial ecosystems summarised by biome

This is the most aggregated form of the ecosystem extent account.

Natural biomes derived from National Vegetation Map

Intensively modified biomes derived from National Land Cover

Biomes	Albany Thicket	Desert	Forest	Fynbos	Grassland	IOCB	Nama-Karoo	Savanna	Succulent Karoo	Azonal vegetation	Cultivated*	Built-up*	Water-bodies**	TOTAL
Historical extent	**3 531 231**	**626 207**	**462 518**	**8 165 366**	**33 090 325**	**1 171 284**	**24 936 548**	**39 418 522**	**7 821 579**	**2 742 873**	**-**	**-**	**-**	**121 966 453**
Additions to extent	0	0	0	0	0	0	0	0	0	0	16 156 026	3 003 883	2 096 528	21 256 437
Reductions in extent	230 091	8 237	70 673	2 253 375	11 330 606	619 656	420 995	5 396 119	251 373	675 312	-	-	-	21 256 437
Net change in extent	(230 091)	(8 237)	(70 673)	(2 253 375)	(11 330 606)	(619 656)	(420 995)	(5 396 119)	(251 373)	(675 312)	-	-	-	
Net change as % of historical	**-6,5%**	**-1,3%**	**-15,3%**	**-27,6%**	**-34,2%**	**-52,9%**	**-1,7%**	**-13,7%**	**-3,2%**	**-24,6%**	-	-	-	
Closing extent 1990	**3 301 140**	**617 970**	**391 845**	**5 911 991**	**21 759 719**	**551 628**	**24 515 553**	**34 022 403**	**7 570 206**	**2 067 561**	**16 156 026**	**3 003 883**	**2 096 528**	**121 966 453**
Opening extent 1990	**3 301 140**	**617 970**	**391 845**	**5 911 991**	**21 759 719**	**551 628**	**24 515 553**	**34 022 403**	**7 570 206**	**2 067 561**	**16 156 026**	**3 003 883**	**2 096 528**	**121 966 453**
Additions to extent	44 432	1 142	24 900	241 184	1 444 446	75 114	146 910	1 160 055	38 422	189 954	1 991 959	597 238	288 754	6 244 510
Reductions in extent	36 008	1 260	7 689	196 035	1 180 183	63 783	78 038	885 303	33 631	58 021	2 339 226	400 503	964 606	6 244 286
Net change in extent	8 424	(118)	17 211	45 149	264 263	11 331	68 872	274 752	4 791	131 933	(347 267)	196 735	(675 852)	
Net change as % of opening	**0,3%**	**0,0%**	**4,4%**	**0,8%**	**1,2%**	**2,1%**	**0,3%**	**0,8%**	**0,1%**	**6,4%**	**-2,1%**	**6,5%**	**-32,2%**	
Net change in relation to historical extent	(221 667)	(8 355)	(53 462)	(2 208 226)	(11 066 343)	(608 325)	(352 123)	(5 121 367)	(246 582)	(543 379)	-	-	-	
Net change as % of historical	**-6,3%**	**-1,3%**	**-11,6%**	**-27,0%**	**-33,4%**	**-51,9%**	**-1,4%**	**-13,0%**	**-3,2%**	**-19,8%**	-	-	-	
Closing extent 2014	**3 309 564**	**617 852**	**409 056**	**5 957 140**	**22 023 982**	**562 959**	**24 584 425**	**34 297 155**	**7 574 997**	**2 199 270**	**15 808 759**	**3 200 618**	**1 420 676**	**121 966 453**

* Cultivated areas, built-up areas and waterbodies are treated as biomes for the purpose of the ecosystem extent account table. There is no reliable spatial information on the historical extent of waterbodies, subsistence cultivation or habitation.

** The large net decrease in the extent of waterbodies reflects primarily that 1990 was a much wetter year than 2014. Waterbodies include both natural and artificial water bodies (such as dams).

In addition to national-level accounting tables…

- Many additional tables, maps and graphs included in the document, including:
  - Land accounts at provincial level
  - Summary of net change in land cover at the district level
  - Change matrices that show which land cover classes changed to which
  - Ecosystem extent account tables per biome

- Underlying spreadsheets are freely accessible on Stats SA's website for users who want to do additional analyses

Indicators and findings drawn from the accounts

Indicators drawn from the accounts

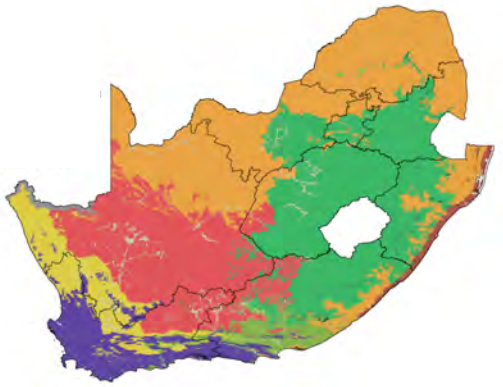
1. **Proportion of accounting area** (SA mainland/province/municipalities) covered by specific ecosystem types or land cover classes
2. **Net change in area** covered by specific ecosystem types or land cover classes (ha and %)
3. Percentage of **area unchanged** for specific land cover classes
4. Percentage **turnover** in specific land cover classes

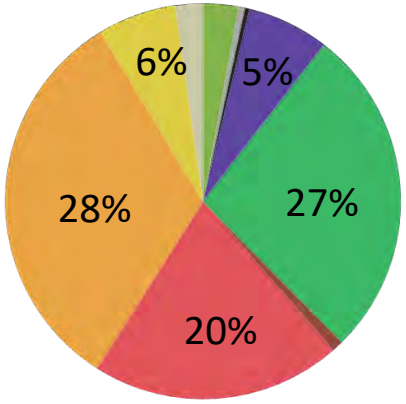
5. **Ecosystem Extent Index** for ecosystem types

Align fully with Chapter 14 of SEEA EA (global consultation version)

Suggested addition to Chapter 14 of SEEA EA (global consultation version)

① **Proportion of accounting area** covered by specific ecosystem types or land cover classes





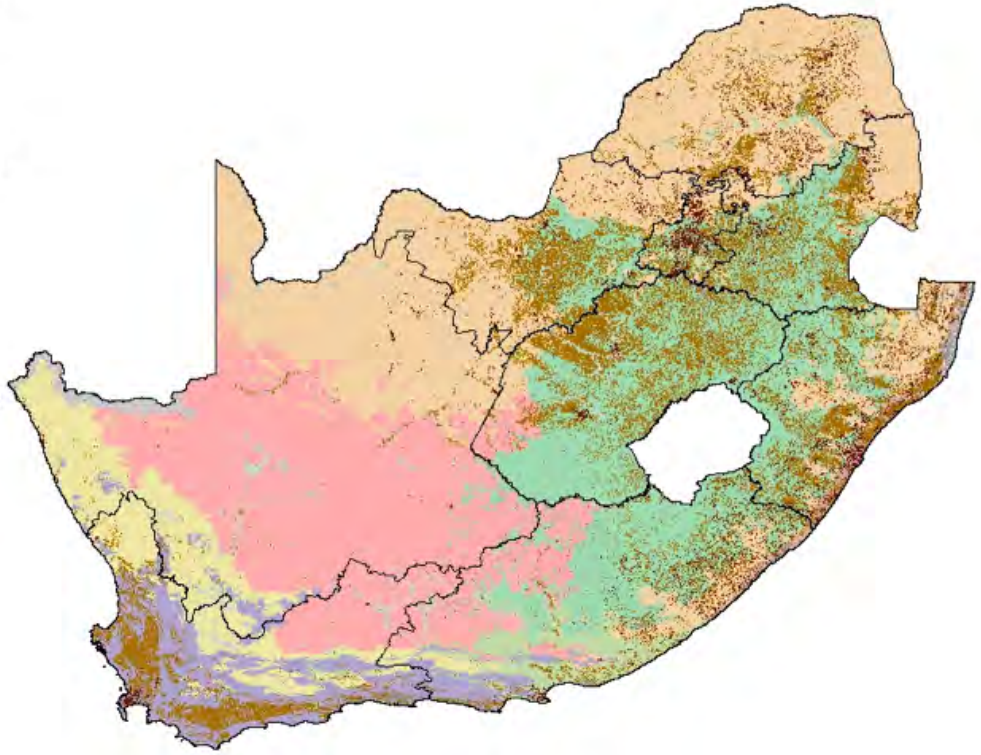
Historical reference
(prior to major human modification of the landscape)

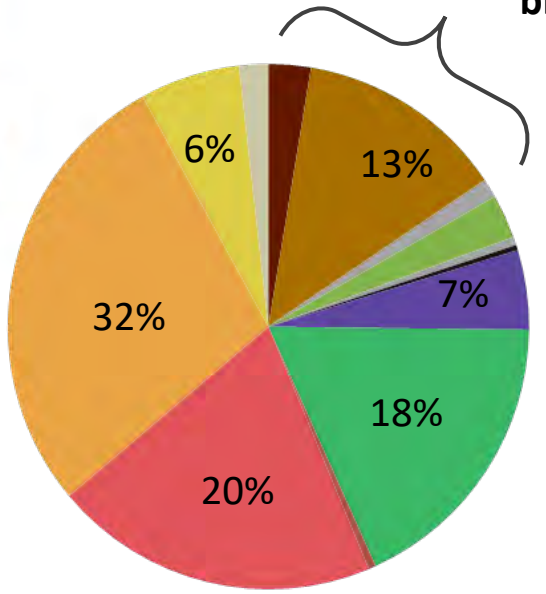
Example for biomes

2014

Intensively modified "biomes"
- Built-up
- Cultivated
- Waterbodies

Natural or semi-natural biomes
- Albany Thicket
- Desert
- Forest
- Fynbos
- Grassland
- Indian Ocena Coastal Belt
- Nama-Karoo
- Savanna
- Succulent Karoo
- Azonal Vegetation
- Provincial boundary





Intensively modified biomes have replaced portions of natural biomes

② **Net change in area** covered by specific ecosystem types or land cover classes (expressed in absolute or percentage terms)

Example

Largest changes in natural biomes 1990 – 2014

- Largest *absolute decrease* in **Grassland** biome, from 33m ha to 22m ha
- Largest *percentage decrease* in **Indian Ocean Coastal Belt**, from 1.2m ha to 0.6m ha

② **Net change in area** covered by specific ecosystem types or land cover classes (expressed in absolute or percentage terms)

Examples: Some remarkable changes in intensively modified land cover classes 1990 – 2014

Centre-pivot irrigated cultivation increased by 220%, from 240 000 ha to 770 000 ha

- Large ecological impacts including on water

Area of **informal urban settlements** almost doubled, from 31 000 ha to 60 000 ha

- Significant challenges for urban planning and service provision

④ **Percentage turnover** in specific land cover classes

- Net change can disguise switches between land cover classes
- *Small net change combined with high turnover indicates* that although the total area of that land cover class remained quite stable, there were probably locational shifts – the spatial distribution of the land cover class may have changed
- This can indicate socio-economic changes in the landscape

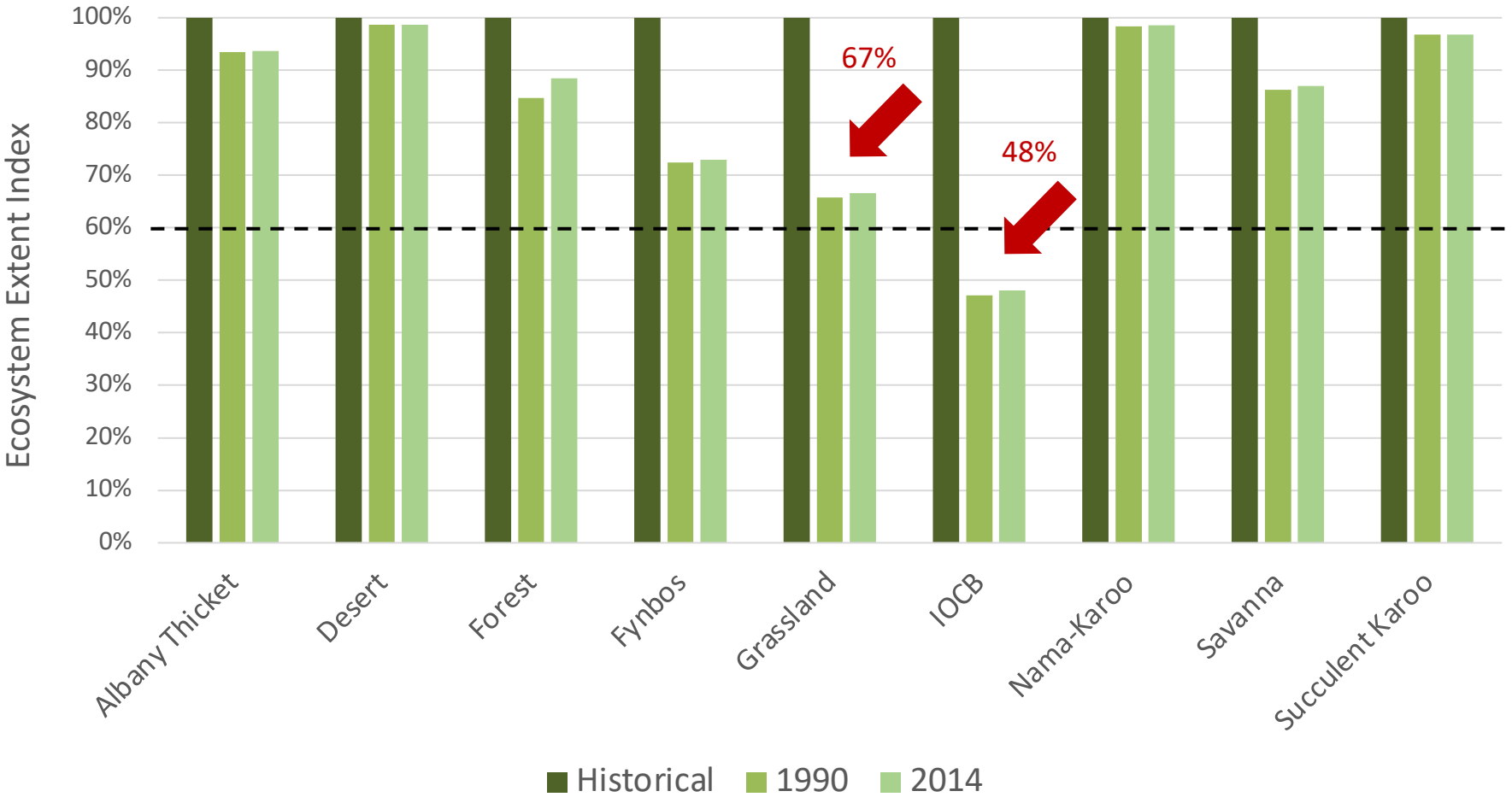
Example: subsistence crops

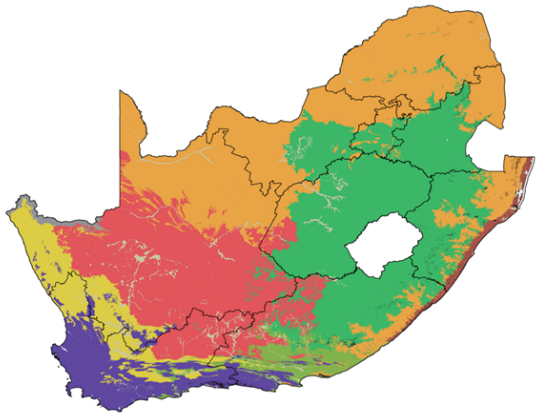
- **Net change** in subsistence crops of **only 1.1%**
  - from 1.95 million ha in 1990 to 1.97 million ha in 2014
- BUT **turnover was 46%** - indicating substantial changes in where cropping took place
  - Change matrix and maps can provide additional info to help interpret these shifts

⑤ Ecosystem Extent Index for ecosystem types

- The percentage of an ecosystem type that remains intact relative to its reference extent
  - In SA the reference extent is the historical distribution of the ecosystem type
- Shows which ecosystem types have most declined in extent
- Tracked over time, shows which ecosystem types are declining in extent most rapidly

Ecosystem Extent Index can be evaluated against thresholds, for example, a threshold for ecological functioning



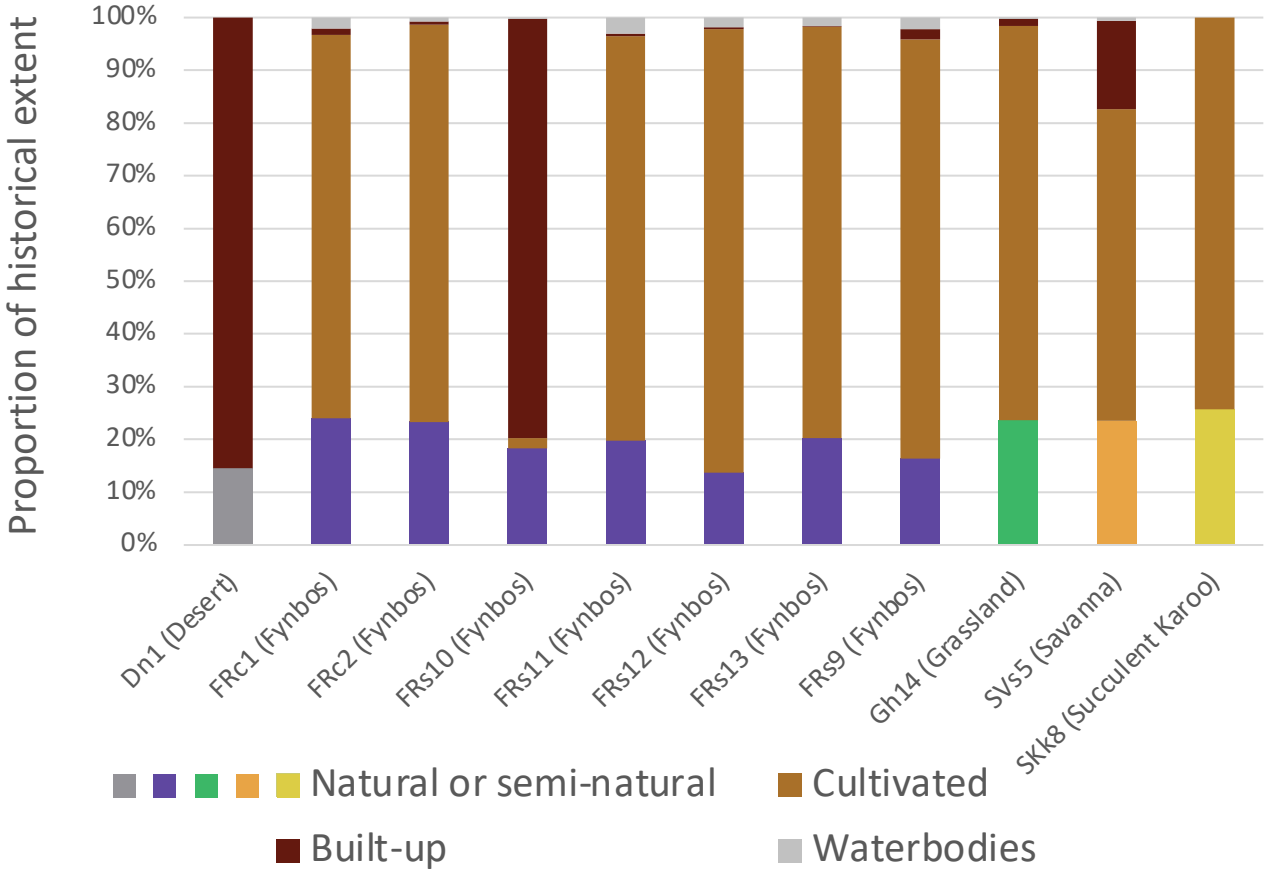


Ecological function threshold

Biomes or ecosystem types that falls below an ecological function threshold have less ability to provide services and benefits to people

Ecosystem Extent Index can be evaluated against biodiversity targets

11 of South Africa's 458 terrestrial ecosystem types have an Ecosystem Extent Index that is less than their **biodiversity target**



Intensively modified ecosystem types have replaced large proportions of the historical extent of these ecosystem types

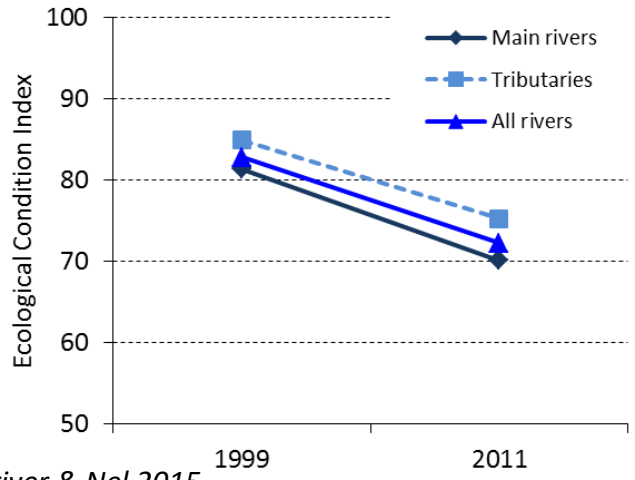
Remaining natural or semi-natural area

Biodiversity target = minimum proportion of the historical extent of an ecosystem type that must remain in natural condition in order to conserve the majority of species associated with that ecosystem type

Ecosystem Condition Index

Ecosystem Condition Index

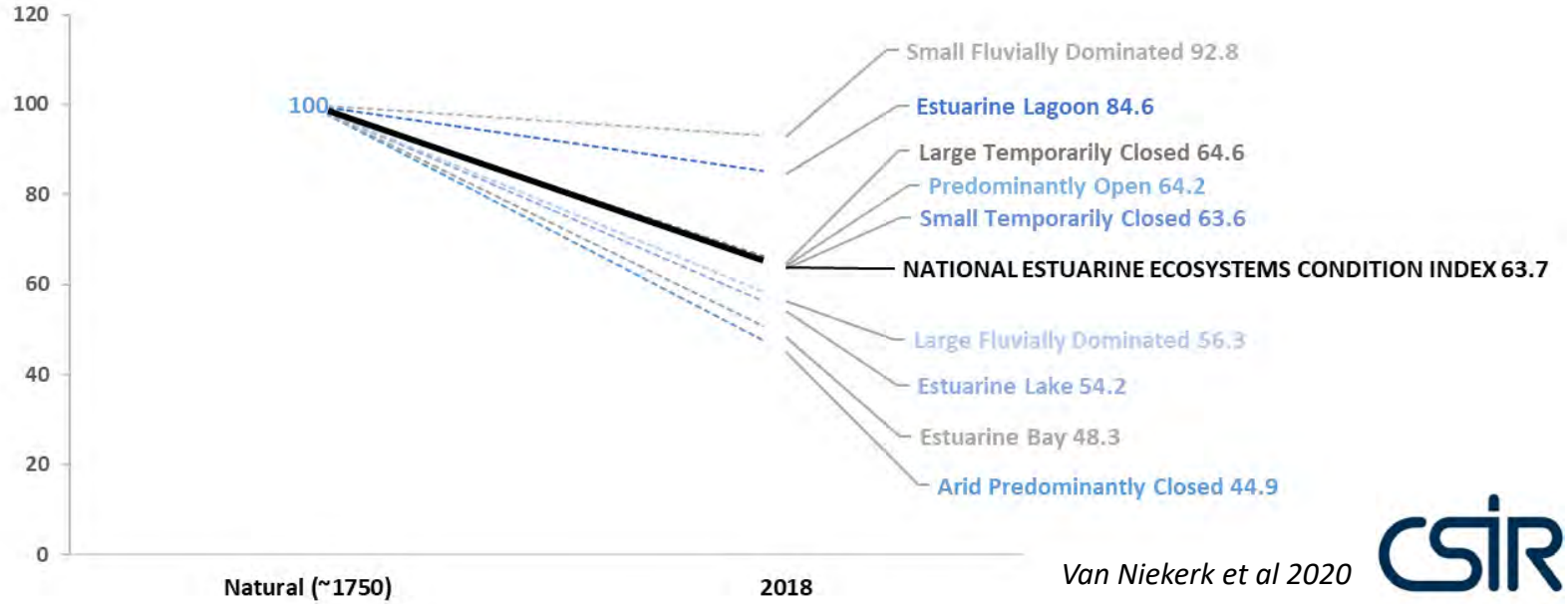
Ecosystem condition account has been compiled for rivers and estuaries in South Africa
Consistent with three stage approach in draft Chapter 5 of revised SEEA EEA
Ecosystem Condition Index based on several ecosystem condition indicators



Driver & Nel 2015

National River Ecosystem Condition Index
Declined from 83% in 1999 to 72% in 2011

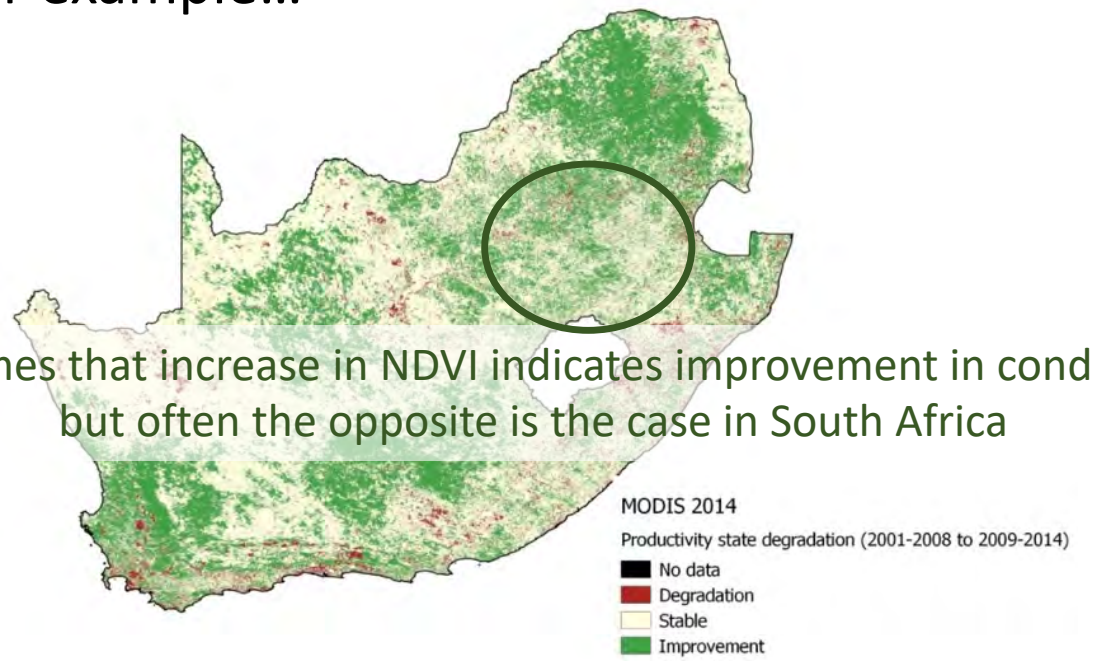
National Estuarine Ecosystem Condition Index: 64% in 2018
Aggregated from nine estuary functional types



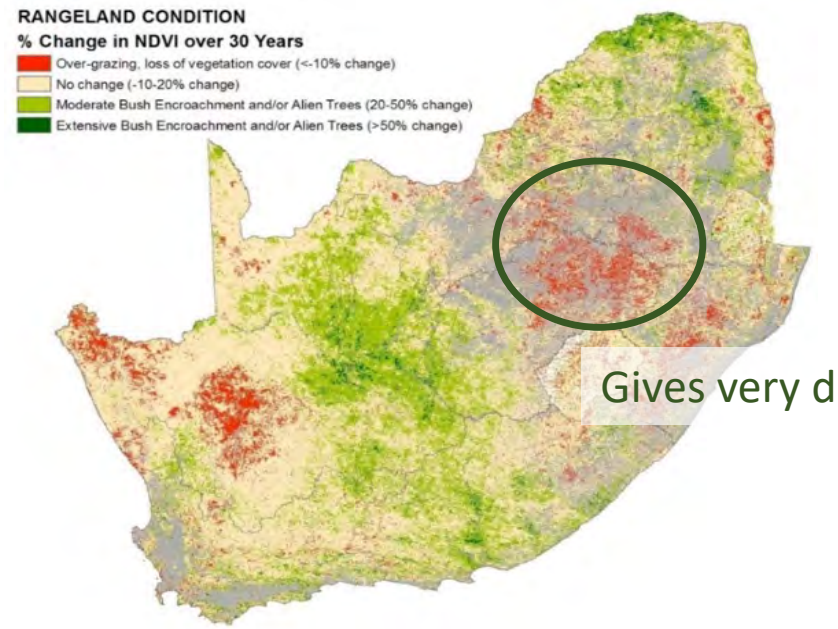
Van Niekerk et al 2020

Ecosystem Condition Index still challenging for terrestrial realm – available data and methods are not consistent or reliable

For example…



Assumes that increase in NDVI indicates improvement in condition but often the opposite is the case in South Africa



Gives very different results

Productivity ‘state’ 2014 using MODIS NDVI data comparing 2001-2008 with 2009-2014, based on Trends.Earth

Best available national estimate of rangeland condition based on percentage change in NDVI over 30 years (Desmet & Venter 2019)

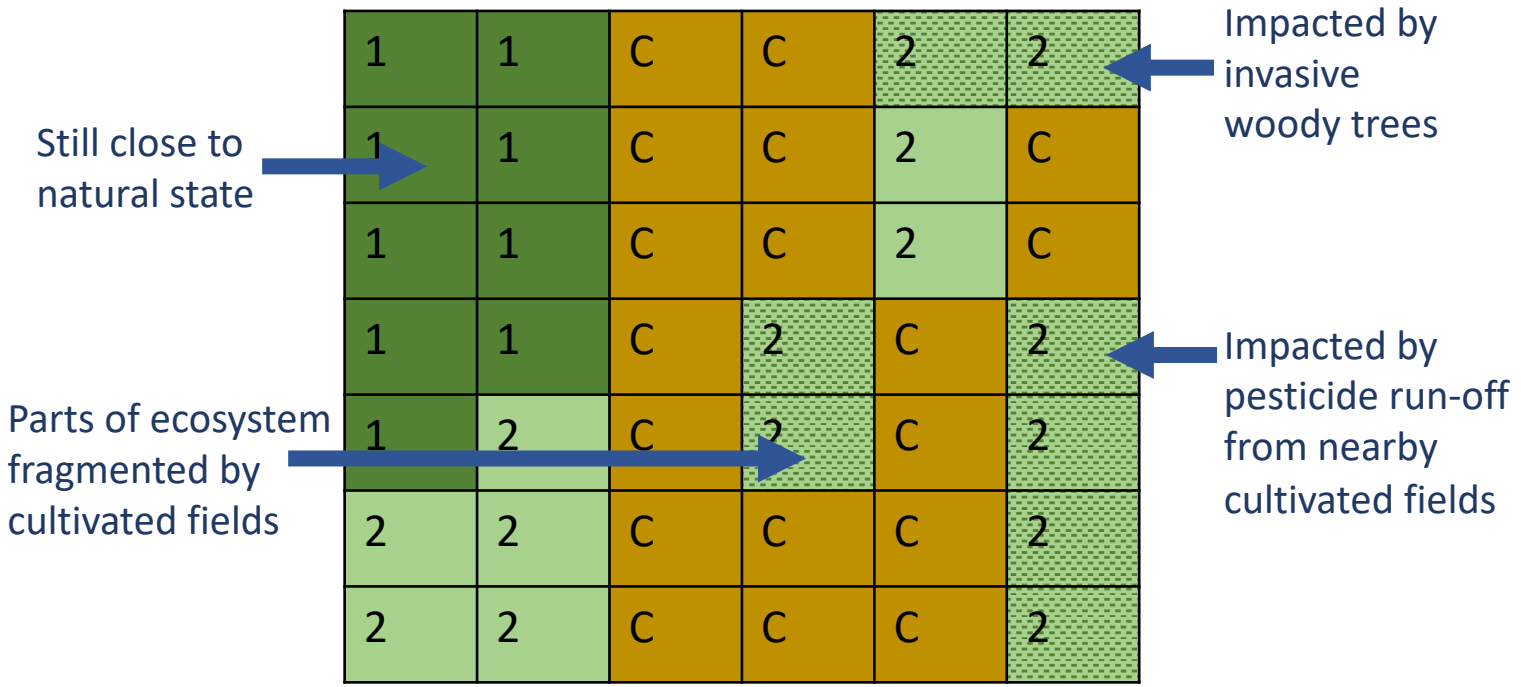
Ecosystem Extent Index and Ecosystem Condition Index complement each other

Reference extent and condition

Ecosystem accounting area (EEA) = 42 ha

1	1	1	1	2	2
1	1	1	1	2	2
1	1	1	2	2	2
1	1	2	2	2	2
1	2	2	2	2	2
2	2	2	2	2	2
2	2	2	2	2	2

Closing extent and condition



Ecosystem types

- 1 — Savannah (ET1)
- 2 — Grassland (ET2)
- C — Cultivated*

Reference extent:
ET1: Historical = 14 ha (EEI = 100%)
ET2: Historical = 28 ha (EEI = 100%)

Reference condition:
ET1: Natural (ECI = 100%)
ET2: Natural (ECI = 100%)

Closing extent:
ET1 = 9 ha
ET2 = 13 ha

Closing condition:
ET1: Still largely natural
ET2: Range of negative impacts

Ecosystem Extent Index (EEI):
ET1: EEI = 9/14 = 64%
ET2: EEI = 13/28 = 46%

Ecosystem Condition Index (ECI):
ET1: ECI = 86% (for example)
ET2: ECI = 50% (for example)

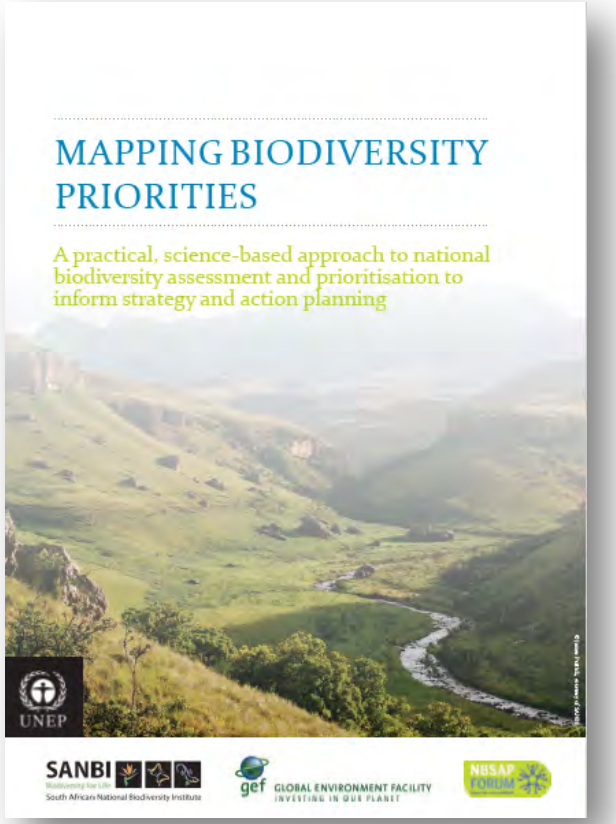
* This diagram doesn't deal with how an Ecosystem Extent Index and Ecosystem Condition index would be established for an intensively managed ecosystem type such as cultivated land

Foundational data layer of ecosystem types…not out of reach

Partnership project between SANBI and UNEP-WCMC, 2017-2019

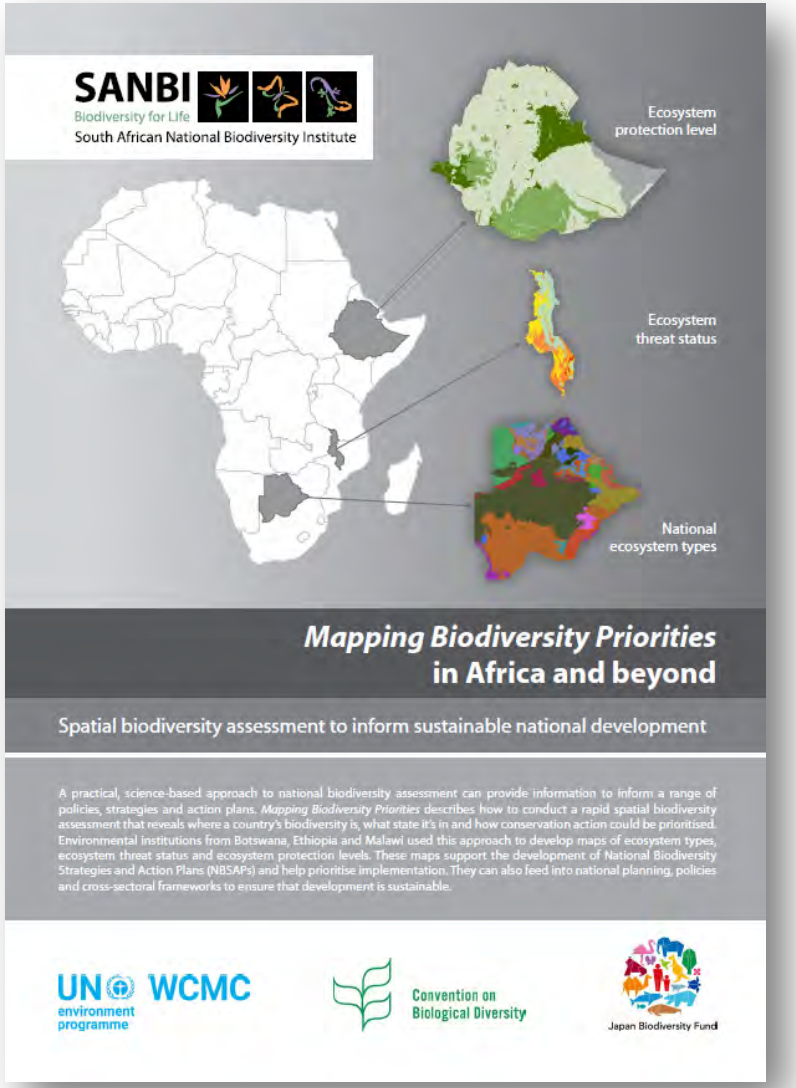
Mapping Biodiversity Priorities in Africa

Guidance book in 2016: includes spatial assessment of ecosystem status – intended for data constrained contexts



Piloted in collaboration with Botswana, Ethiopia, Malawi

Factsheet (recently available)



Maps of ecosystem types developed in all three countries, with modest resources, drawing on the expertise of in-country ecologists

Ecosystem types are spatial units that share broadly similar ecological characteristics. Ecosystem types are a good proxy for ecosystem functioning and ecosystem services, if they are determined based on a range of factors, such as rainfall, altitude and geology, rather than simply remote sensing.

The integrated map of ecosystem types developed in Botswana identified 78 terrestrial, river and wetland ecosystem types. Diverse ecosystem types exist especially in the northeast of the country.

The *Mapping Biodiversity Priorities* approach helped the Ethiopia team to identify and map 78 ecosystem types, including different types of woodlands, grasslands, forests, wetlands and river basins. The classification and maps can now be further refined.

The Malawi team developed the most detailed country-wide map of ecosystem types available to date, identifying 59 terrestrial and freshwater ecosystem types.

A peek at what's in the pipeline

Gerhardt Bouwer

Stats SA Chief Director: Independent Assessment Unit

stats sa
Department:
Statistics South Africa
REPUBLIC OF SOUTH AFRICA

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

SANBI
Biodiversity for Life
South African National Biodiversity Institute

United Nations

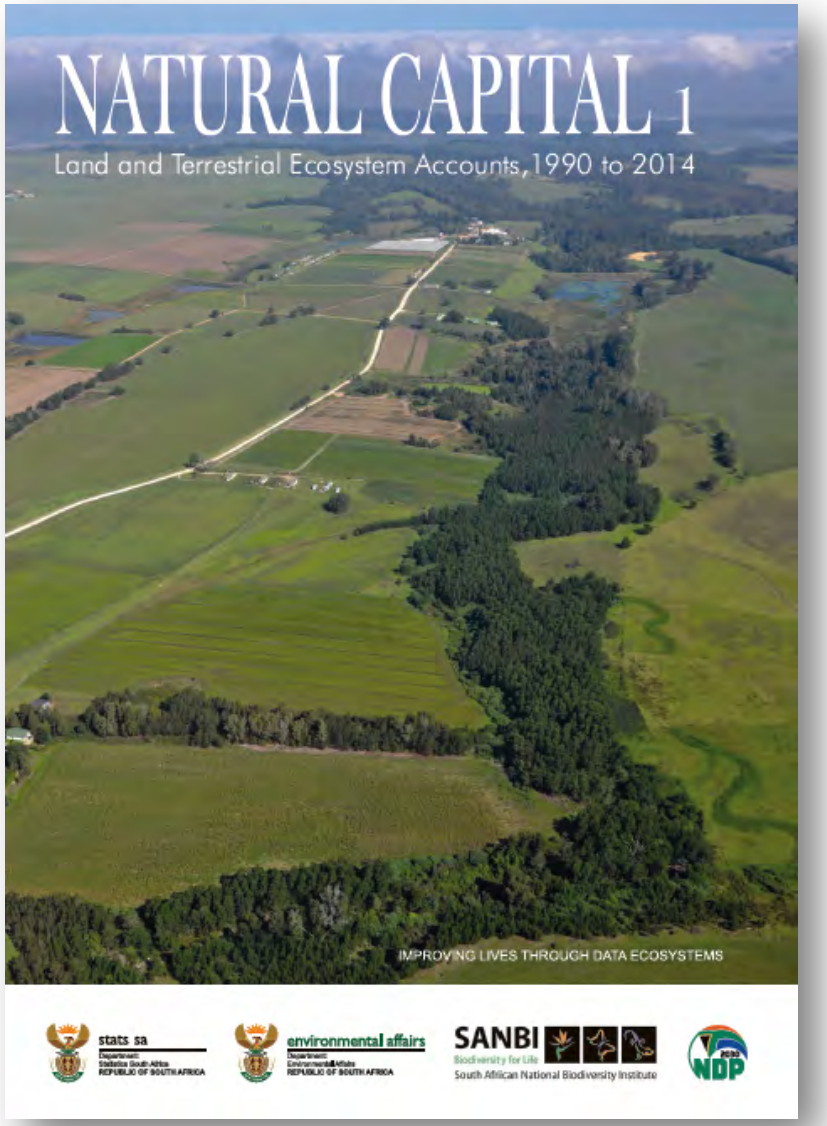
UN environment

System of Environmental Economic Accounting

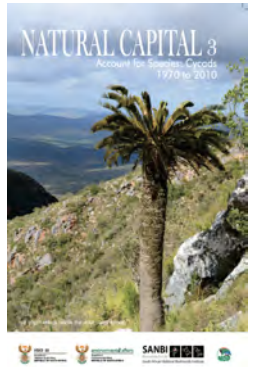
ANCHOR environmental

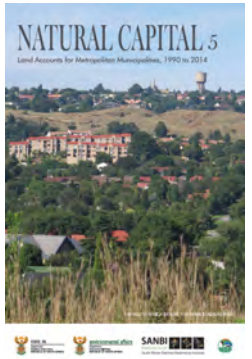
2030 NDP

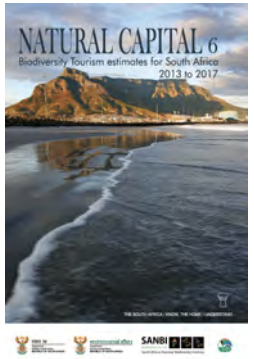
Stats SA's *Natural Capital* series



- First publication in Stats SA's new *Natural Capital* series
- Upcoming publications:
  - Accounts for Protected Areas, 1900 to 2014
  - Accounts for species: Cycads, 1970 to 2010
  - Accounts for species: Rhinos, 1970 to 2017
  - Land accounts for Metropolitan Municipalities, 1990 to 2014
  - Accounts for Strategic Water Source Areas, 1990 to 2018
  - Updated national water accounts







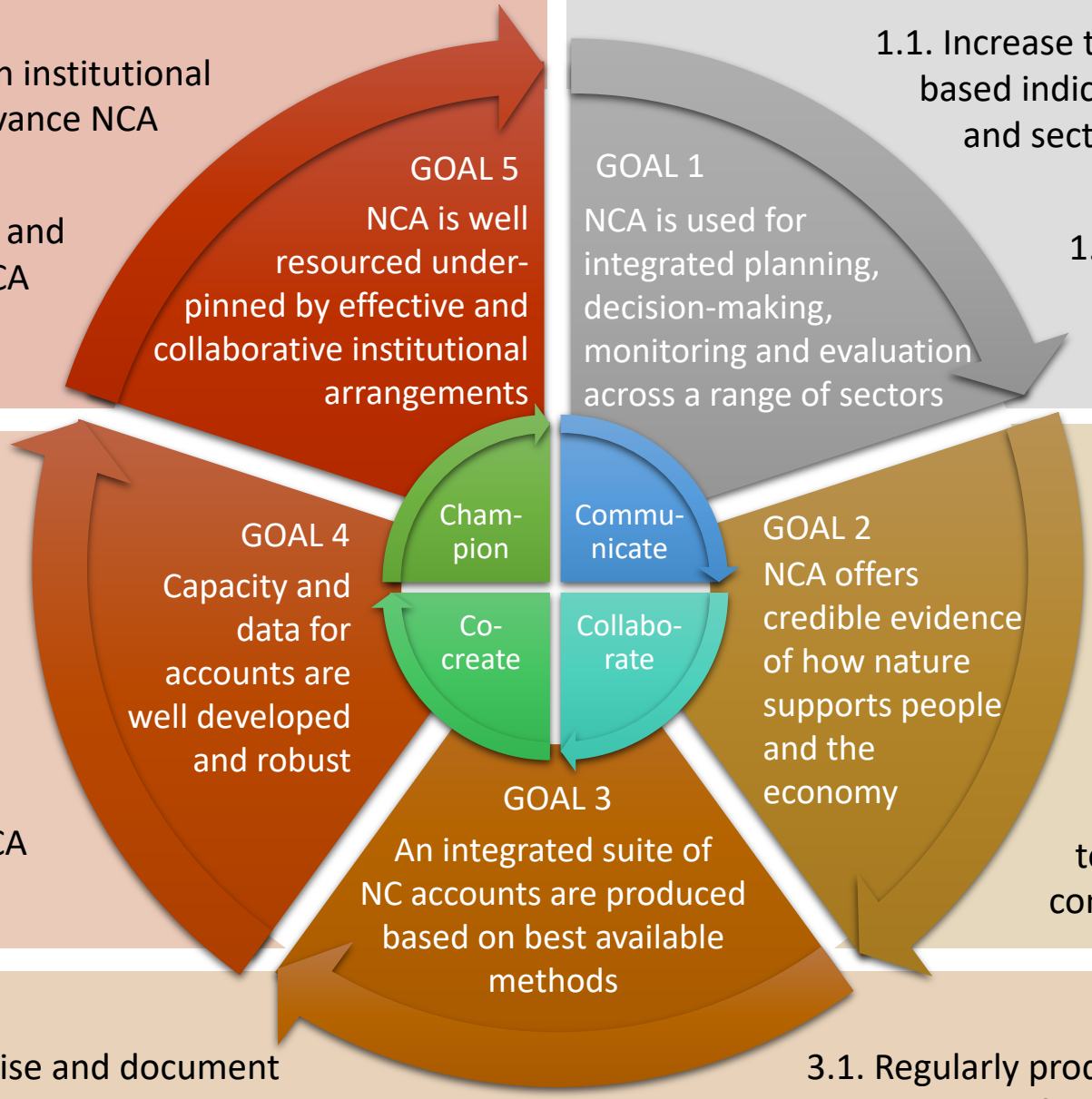
National NCA Strategy

A ten-year strategy for advancing NCA in South Africa

- **Purpose**: to focus the efforts of Stats SA and partners engaged in NCA on
  - developing priority national-level natural capital accounts
  - to inform South Africa's sustainable development policy objectives.

- 10-year time frame with a 5-year review.

VISION: NCA is widely used to provide credible evidence for integrated planning and decision-making in support of the development needs of the country



5.1. Strengthen institutional arrangements to advance NCA

5.2. Collaborate to increase national and donor-funded support for NCA

1.1. Increase the use of natural capital accounts-based indicators and information for high-level and sectoral policies and planning

1.2. Stimulate public discourse with information from NCA

4.1. Gather, synthesize and improve accounts-ready data

4.2. Increase capacity and skills to produce and advance NCA

2.1. Analyse and interpret NC accounts to provide useful stats and info

2.2. Make NC accounts and associated data and information widely available

2.3. Contribute lessons & guidance to national, regional and global community

3.2. Adopt, develop, standardise and document methodologies for producing NC accounts

3.1. Regularly produce and publish an integrated system of NC accounts

Reflections on value and application of the accounts

Department of Environment, Forestry and Fisheries

stats sa
Department:
Statistics South Africa
REPUBLIC OF SOUTH AFRICA

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

SANBI
Biodiversity for Life
South African National Biodiversity Institute

United Nations

UN environment

System of Environmental Economic Accounting

ANCHOR environmental


Thank you for listening!
The shifting nature of South Africa's landscape: a 24 year snapshot of land and ecosystem change
Discussion, reflections and comments welcome