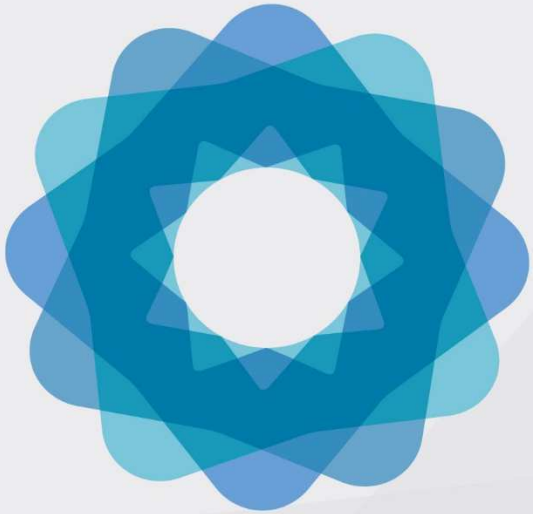


System of Environmental Economic Accounting

Bringing the Future into Focus

System of Environmental Economic Accounting

Classification of land

Issues in Land and Ecosystem extent accounts, example from South Africa

3 November 2015, London Group

United Nations

Outline

1. Land accounting in the SDGs
2. Assumptions, issues and suggestions
3. Relationships between land and ecosystem extent accounts, example from South Africa

Land accounts and SDGs
Target 6, 14, 15

- SDG 6: ***Ensure availability and sustainable management of water and sanitation for all***
  - Target 6.6: *By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes*
- SDG 14: ***Conserve and sustainably use the oceans, seas and marine resources for sustainable development***
  - Target 14.2: *By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans*
- SDG 15: ***Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss***
  - Target 15.9: *By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts*

Assumptions

- The SNA and SEEA can provide measurement support to at least 12 SDGs and 41 targets:
  - > ***The challenge is getting the values of biodiversity and ecosystems right***
  - > Small-area spatial data are essential. ***Land cover is a cross-cutting theme.***
- "***Land cover***" is more than terrestrial surface (+ wetlands, coastal…)
- For countries to monitor their progress towards the SDGs they need to develop ***ongoing statistical processes***:
  - > The GEO community focuses on user needs, data management and ***data-driven approaches*** (*a posteriori)*
  - > The statistical community builds ***statistical frameworks*** for data collection, compilation and dissemination following principles of data quality, consistency, relevance and comparability (*a priori*)

Issues

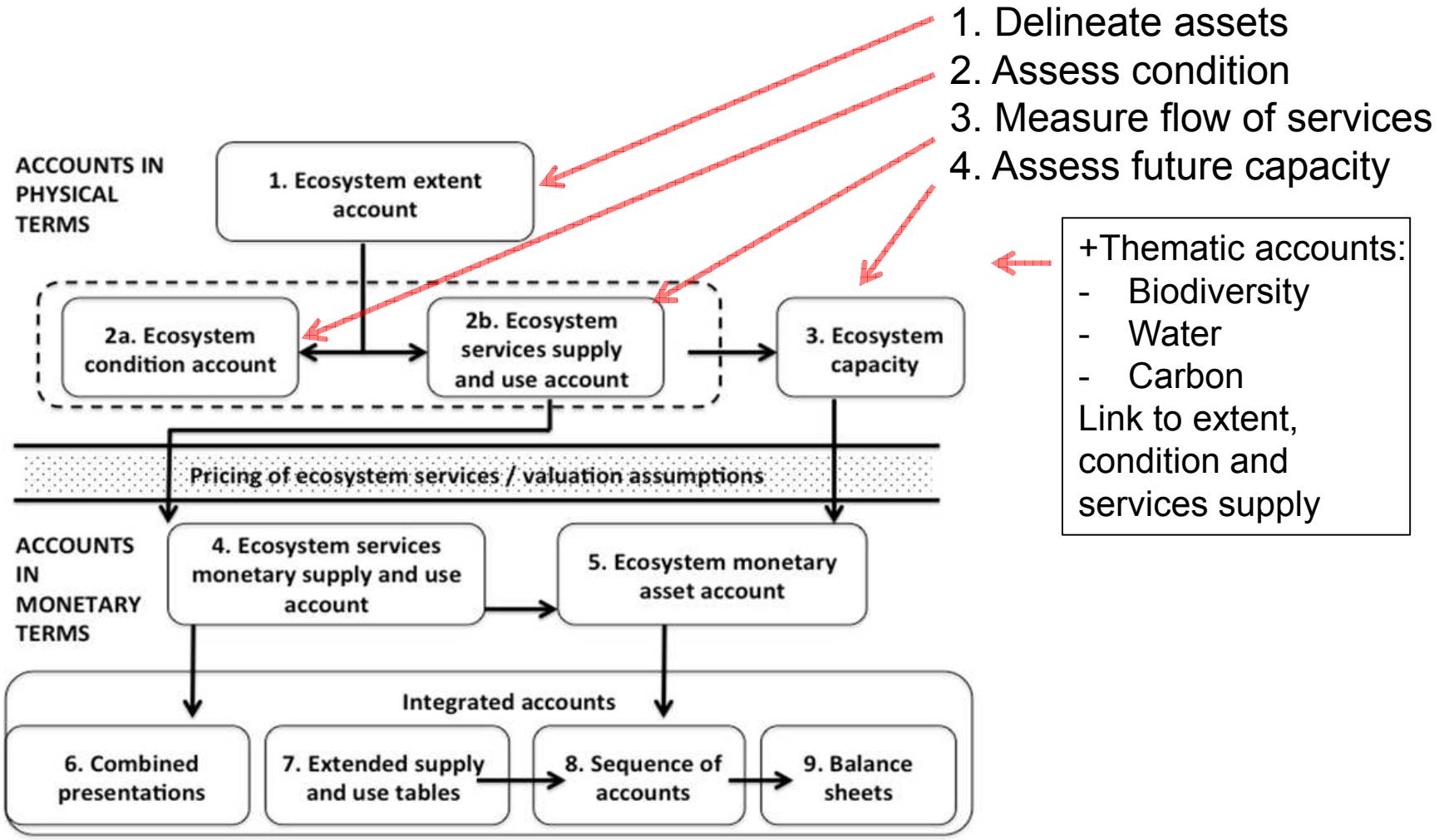
- From the perspective of a **country** addressing SDGs and implementing SEEA:
  - Much spatial data, but
    - No guidance on **which** global datasets to use
    - Existing standard land cover products are **not ideal**
    - No **international standard classification** of land cover
    - No international guidance on **integrating, storing and extracting** social, economic and environmental spatial data
  - And…countries need baseline data for 2016 to track their progress to 2030
- This is an **opportunity** to improve convergence among and between the GEO and statistical communities.

SEEA CF 14+1 Land cover classes

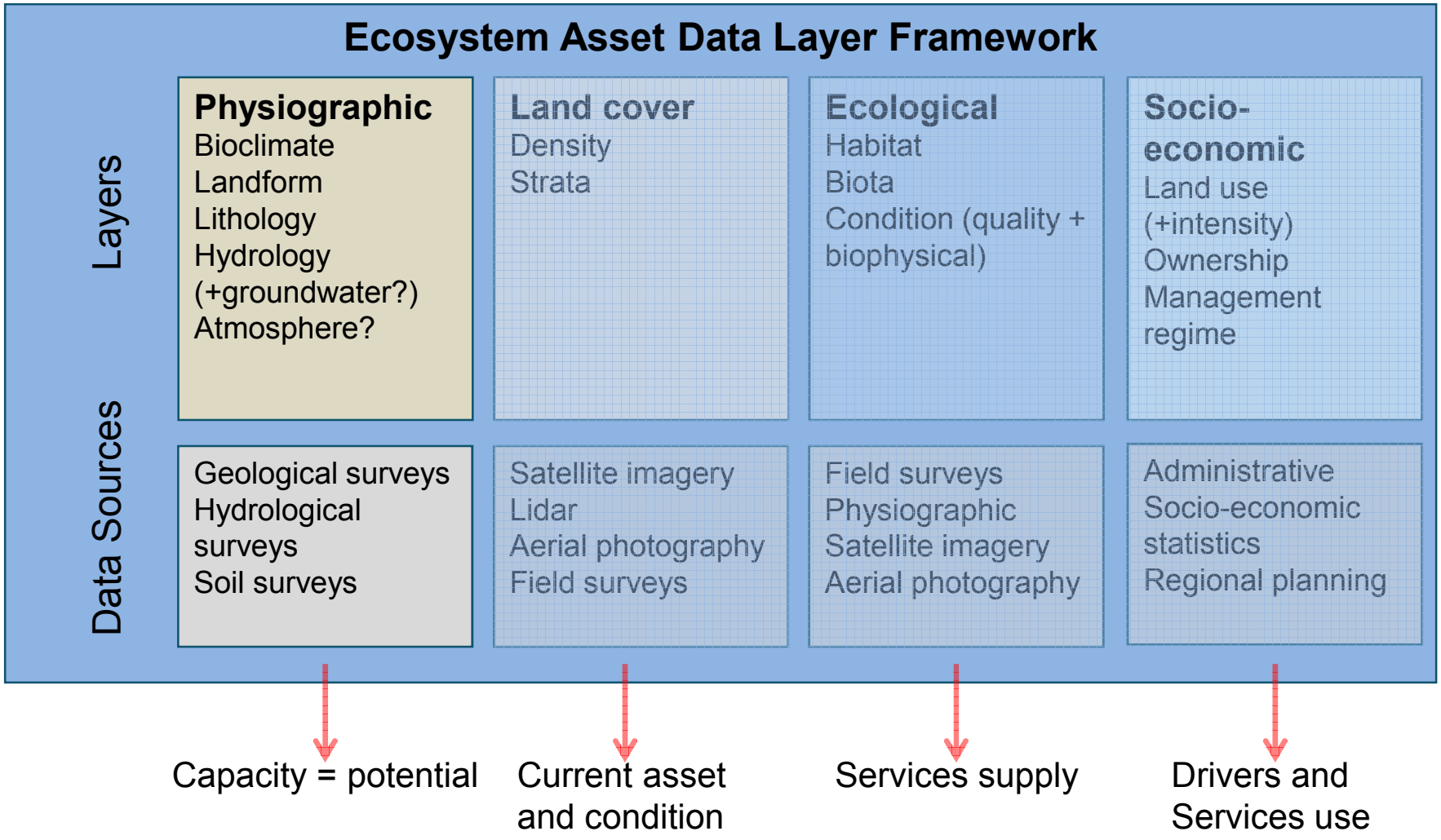
- SEEA Land Cover Classification
  - > 15 classes
- Issues:
  - > What source data to use?
  - > No sub-classes → difficult to cross reference
  - > No agreement that land cover correlates strongly with ecosystem services
  - > Registering BSUs and socio-economic data over time

No.	Description of classes
1	Artificial areas (including urban and associated areas)
2	Herbaceous crops
3	Woody crops
4	Multiple or layered crops
5	Grassland
6	Tree-covered areas
7	Mangroves
8	Shrub-covered areas
9	Shrubs, and/or herbaceous vegetation, aquatic or regularly flooded
10	Sparsely natural vegetated areas
11	Terrestrial barren land
12	Permanent snow and glaciers
13	Inland water bodies
14	Coastal water bodies and intertidal areas
15	Sea and marine areas*

Background on the SEEA



A better ecosystem asset framework?



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Issues to advance:

- Short term:
  1. Assessing current global land cover data (for SDG and SEEA)
     - Advice to countries on which spatial data to use
     - Cheaper, more regular “standard” spatial data

- Longer term:
  3. Developing an international standard land cover classification
     - Provide standard to compare all land cover products
  4. Improving global spatial data
     - Leverage existing technology globally

Some starting points?

1. **International land cover classification:**
   - LCCS3 is a system for creating and comparing map legends; it includes classifiers for landform, lithology/soils, climate, altitude, erosion, water quality, etc.)
   - CORINE/EUNICE crosswalk used to create map of European ecosystems
   - USGS/ESRI Ecological Land Units (ELUs) classify bioclimate, landform, lithology and land cover
2. **Improving global spatial data for SDGs and SEEA:**
   - Sensors are available to detect wetlands, condition, specific species, services for custom products

Some questions

1. Is a **global assessment of land cover products** available or can we suggest a small number of global datasets to assess? Can we agree on criteria to be used and a process to produce a joint assessment?
2. Would it be feasible to establish a common **global reference grid** for integrating, storing and extracting social, economic and environmental data?
3. What is the most appropriate starting point for an **international land cover classification**? Who needs to be involved?
4. What would be required to focus existing technology on providing **spatial ecosystem asset data globally** and frequently?

Land and ecosystem extent

Important conceptual issues:

- More detail (than Land Cover and use) may be needed

Understanding the data options and sources

- In relation to scale of analysis, pilot project objectives, available resources

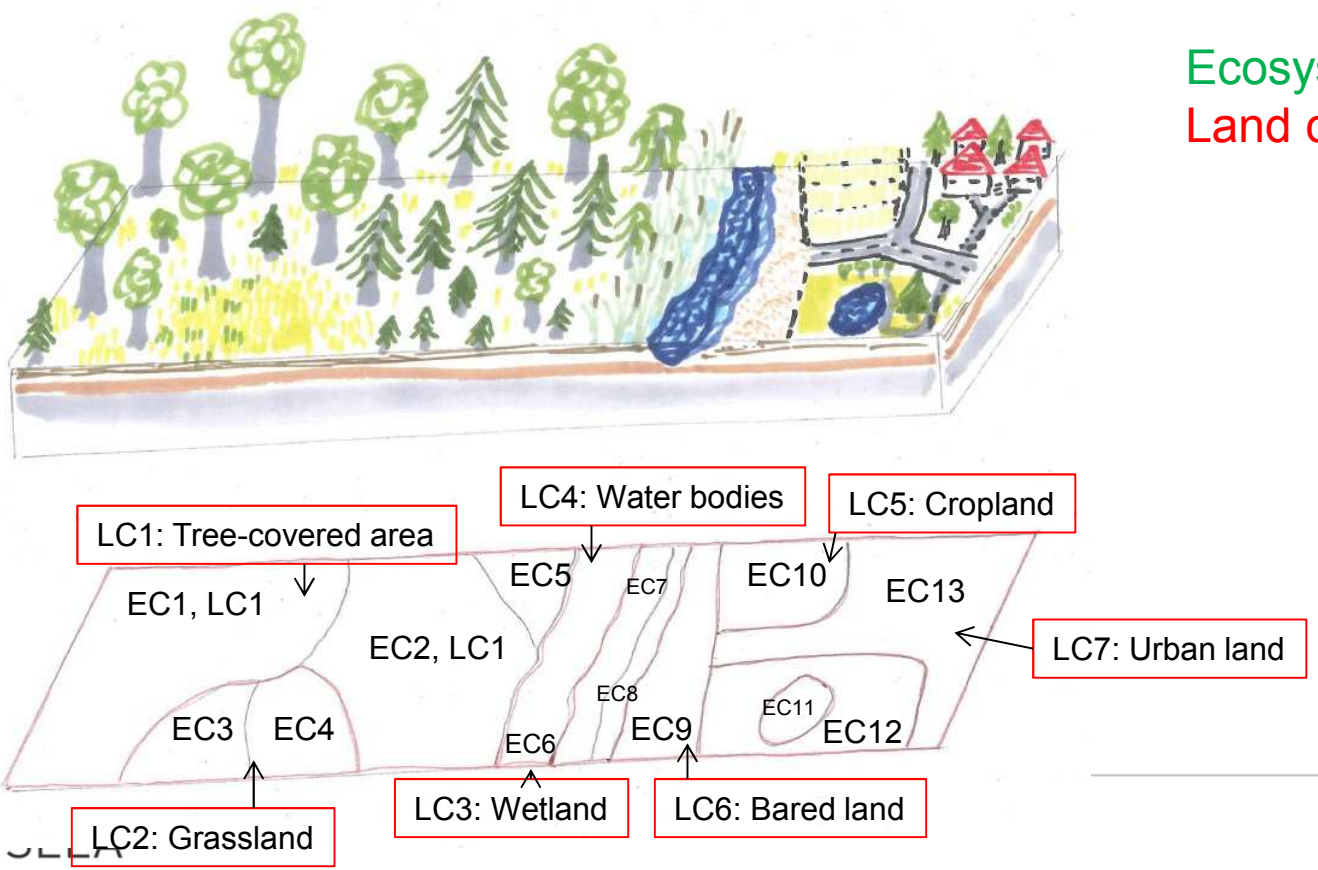
Ecosystem units, EU

- Are defined and mapped by the distinguishable structural elements of terrestrial and aquatic ecosystems
    a) Terrestrial – plant community associations / or vegetation complexes
    b) Aquatic – habitat or biotic communities (such as corals, mussel banks, kelp, reefs etc.)

EUs can be ‘translated’ or aggregation/disagregated into Land Cover classes in a nested hierarchy

Land and ecosystem extent

- Typology of ecosystems and their coverage



Ecosystem = EC
Land cover = LC

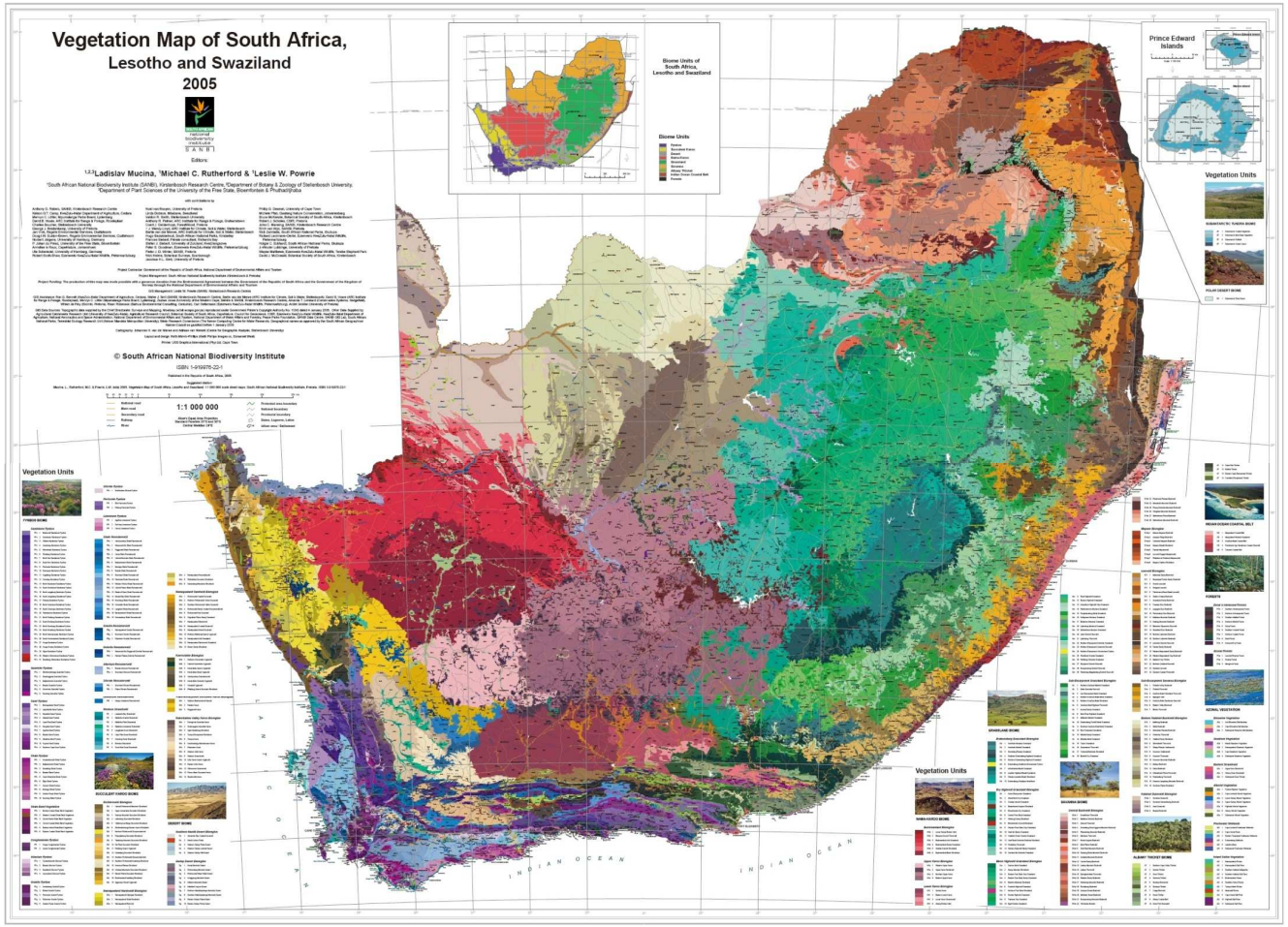
Ecosystem Extent

- Data Options for EU mapping
  - Detailed mapping of habitats and vegetation complexes would be best completed through in-situ inventories (once a base map is completed, remote sensing can be easily applied to update it)
  - Very-high resolution remote sensing imagery (such as QuickBird and Ikonos) and aerial imagery can be applied to facilitate the process.
  - Intermediate solutions may be to produce detailed land cover and use maps, which are able to distinguish vegetation types at the level of community (e.g. with dominant species)
  - High- and medium- resolution imagery such as Landsat, SPOT, etc. would be suitable for the purpose

South African example on applying land accounts in Ecosystem extent estimation

Ecosystem Units were derived from a national map of Vegetation types (potential distribution)

Land cover/use and changes are mapped independently, for one province (also nationally but not yet applied in these example)



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South African example

Land cover/use and changes for QwaZulu–Natal (QZN),
47 detailed classes (summarised in 26 below) and 20m resolution

- Water- natural
- Plantations
- Wetlands
- Permanent orchards
- Sugarcane farms
- Mines and quaries
- Urban/ built-up areas
- Golf couses
- Low density settlement
- Subsistence (rural)
- Annual commercial crops
- Dense bush
- Bushland
- Woodland
- Grassland
- Degraded vegetation
- Old culitvated fields
- Erosion
- Apline grass-heath
- Urban/ built-up areas
- Water- dams
- Water- estuarine
- Bare sand/ rock
- Forest
- Old plantations
- Rehabilitated mines

South African example

Land accounts were extracted in 2 forms:

- According to the SEEA-CF structure shown in the table below
- Alternative structure more linked to processes with ecological impacts, shown on next s

Table 4: Physical account for land cover in KZN, using land cover classes and account structure from the SEEA Central Framework

hectares	Artificial surfaces	Crops	Grassland	Tree covered area	Mangroves	Shrub covered area	Regularly flooded areas	Sparse natural vegetated areas	Terrestrial barren land	Inland water bodies	Coastal water and inter-tidal areas	No Data
Opening stock 2005	**276044.7**	**1808759.6**	**3975937.3**	**1319390.6**	**1197.9**	**1352795.1**	**126222.2**	**258713.6**	**117488.9**	**52466.8**	**142425.6**	**6833.6**
Additions to stock												
Managed expansion	68644.5	521076.6	9630.2	404822.6	204.1	142485.9	28906.1	51400.6	29440.6	9382.6	1758.8	
Natural expansion												
Upward reappraisal												98888.7
Total additions to stock	68644.5	521076.6	9630.2	404822.6	204.1	142485.9	28906.1	51400.6	29440.6	9382.6	1758.8	98888.7
Reductions in stock												
Managed regression	20427.8	139685.6	498937.3	183607.3	129.3	377897.4	12894.4	17984.0	15534.8	1501.1	97789.9	126.2
Natural regression												
Downward reappraisal	0.4	0.9	52.9	13.3		27.1	16.2	0.4	4.3	1.6	1.1	
Total reductions in stock	20428.2	139694.4	498990.2	183620.6	129.3	377924.5	12910.6	17984.4	15539.1	1502.7	97791.0	126.2
Opening stock 2008	**324260.9**	**2190141.8**	**3486577.3**	**1540592.6**	**1272.7**	**1117356.5**	**142217.7**	**292129.7**	**131390.4**	**60346.8**	**46393.4**	**105596.1**
Additions to stock												
Managed expansion	17177.4	101110.5	3234.2	26295.7	1224.0	72166.5	32228.1	46949.8	8217.0	5552.2	805.5	16.9
Natural expansion												
Upward reappraisal	6.4		1.0	0.2		0.2	0.2				8.9	
Total additions to stock	17183.8	101110.5	3235.2	26295.8	1224.0	72166.8	32228.3	46949.8	8217.0	5552.2	814.4	16.9
Reductions in stock												
Managed regression	29.4	11590.7	206896.8	28637.1	0.3	52206.6	6708.4	6142.2	2042.4	541.1	199.6	
Natural regression												
Downward reappraisal												
Total reductions in stock	29.4	11590.7	206896.8	28637.1	0.3	52206.6	6708.4	6142.2	2042.4	541.1	199.6	
Opening stock 2011	**341415.3**	**2279661.7**	**3282915.7**	**1538251.3**	**2496.4**	**1137316.7**	**167737.6**	**332937.3**	**137565.0**	**65357.8**	**47008.2**	**105613.0**

Table notes:

- Timber plantations are included in crops. From an ecological point of view in the South African context they are similar to woody crops, and are very different to natural tree-covered areas. In the SEEA Central Framework, "forest plantations" are included in tree covered areas, while other forms of plantations (such as coffee, rubber) are included in woody crops.
- [No Data column to be resolved – see technical note in Box 2]

Physical land account for KZN with classes grouped to show changes in condition, including degradation

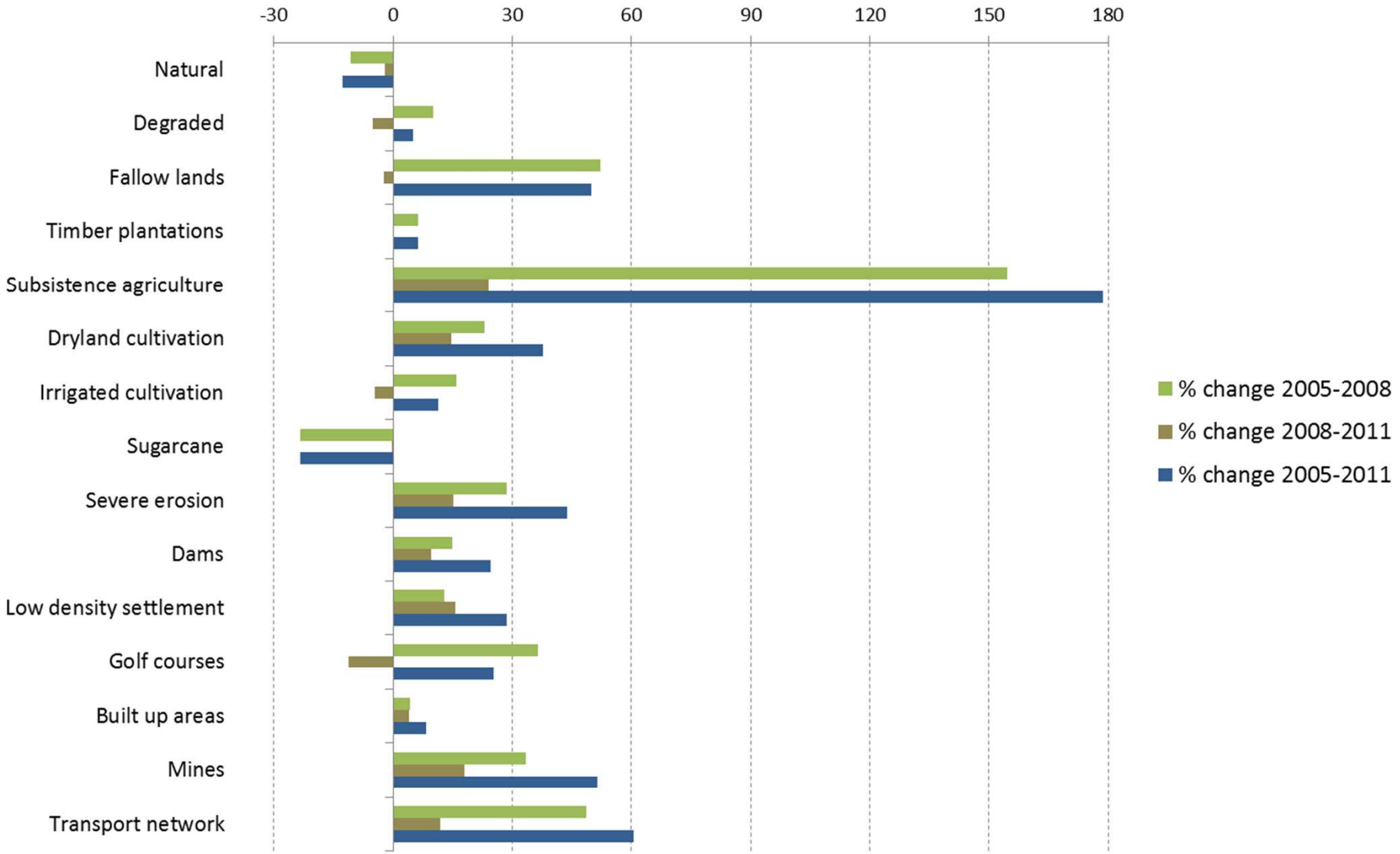
hectares	Natural	Degraded	Fallow lands
Land cover 2005	6284888.4	641270.5	43114.2
Total additions to stock	0.0	176067.0	26288.9
Total reductions in stock	672172.8	110937.4	3742.8
Net additions (additions - reductions)	-672172.8	65129.6	22546.1
Net additions as % of opening land cover	-10.7	10.2	52.3
Total turnover (reductions + additions)	672172.8	287004.5	30031.7
Total turnover as a % of opening land cover	10.7	44.8	69.7
No land cover change	5612715.6	530333.0	39371.4
No land cover change as a % of opening LC	89.3	82.7	91.3
Land cover 2008	5612715.6	706400.1	65660.3
Total additions to stock	105.0	8002.8	2381.6
Total reductions in stock	126981.4	41473.8	3386.8
Net additions (additions - reductions)	-126876.4	-33471.1	-1005.2
Net additions as % of opening land cover	-2.3	-4.7	-1.5
Total turnover (reductions + additions)	127086.4	49476.6	5768.4
Total turnover as a % of opening land cover	2.3	7.0	8.8
No land cover change	5485734.2	664926.2	62273.5
No land cover change as a % of opening LC	97.7	94.1	94.8
Land cover 2011	5485839.2	672929.0	64655.2

Land cover classes

1. Natural
2. Degraded
3. Fallow lands
4. Timber plantations
5. Subsistence agriculture
6. Dryland cultivation
7. Irrigated cultivation
8. Sugarcane
9. Rehabilitated mines
10. Severe erosion
11. Dams
12. Low density settlement
13. Golf courses & sports fields
14. Built-up areas
15. Mines
16. Transport network

- Biggest additions: subsistence agriculture, then dryland and degraded
- Big % additions: transport network, mines
- Biggest reduction: natural areas

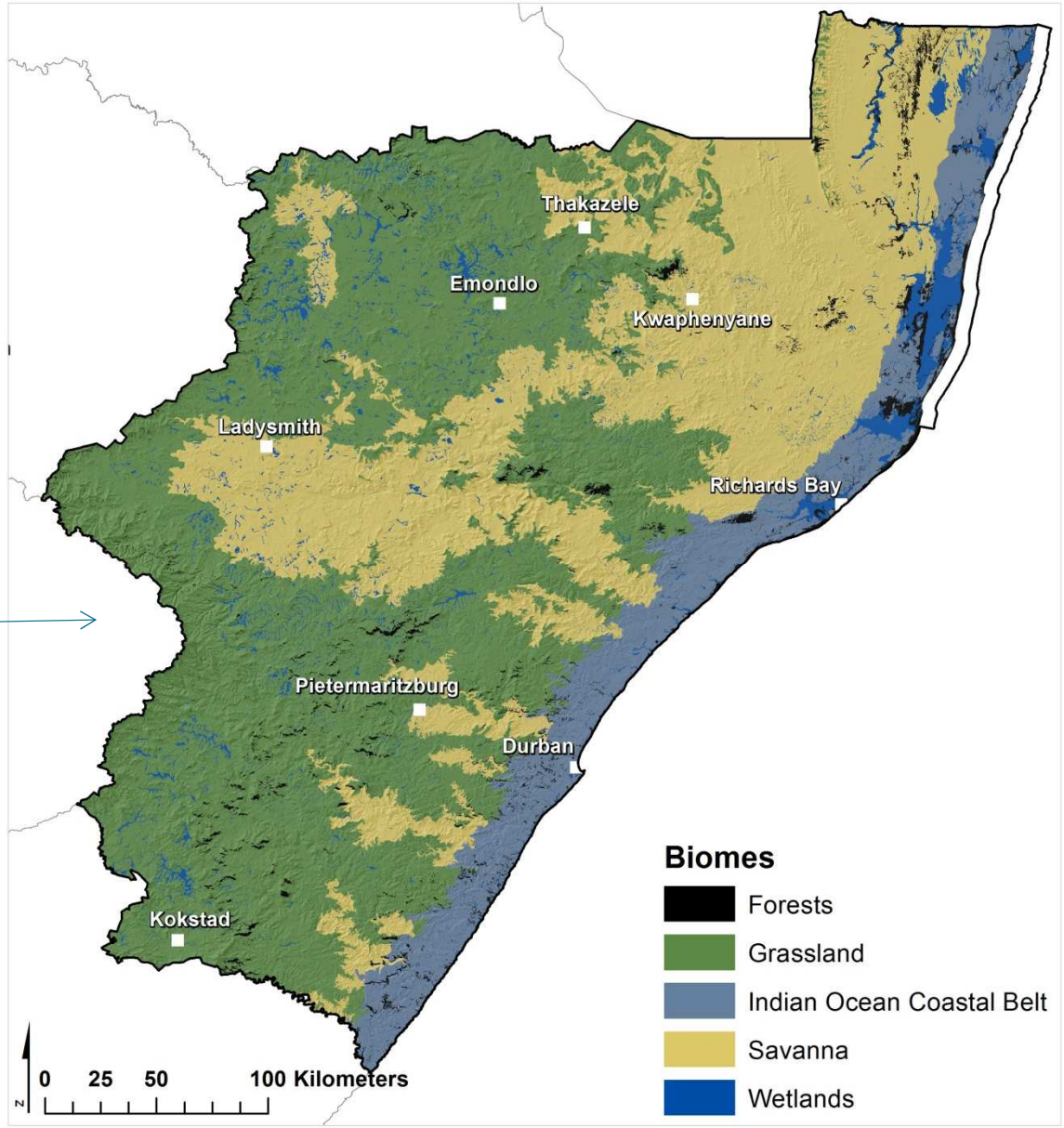
% change in land cover classes



Ecosystem extent accounts for KZN

Changes in the Ecosystem units (or vegetation types) extent were estimated from the land cover/land use change accounts

Five biomes were applied for aggregating/reporting the Ecosystem Units (vegetation types shown earlier)



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Ecosystem extent accounts by biome

Hectares	1840	2005	2008	2011
Grassland	4581933	2930197	2653090	2584998
Savanna	3259059	2418679	2210072	2175315
Indian Ocean Coastal Belt	893967	365213	305490	293708
Wetland	393718	286151	267875	258793
Forest	202822	184614	174822	171694
% of original extent	1840	2005	2008	2011
Grassland	100	64	58	56
Savanna	100	74	68	67
Indian Ocean Coastal Belt	100	41	34	33
Wetland	100	73	68	66
Forest	100	91	86	85
All biomes	**100**	**66**	**60**	**59**

Integrated land and ecosystem account – for biomes

biomes

land cover classes

hectares	Increases (positive numbers) and decreases (negative numbers) in land cover classes within each biome																
Biome	Natural	Degraded	Fallow lands	Timber plantations	Subsistence agricultur	Dryland cultivation	Irrigated cultivation	Sugarcane	Rehabilitated mines	Severe erosion	Dams	Low density settleme	Golf courses	Built up areas	Mines	Transport network	No Data
Forest	-12920.0	9317.2	499.8	1006.3	3278.4	30.8	16.8	-3125.0	871.9	0.8	53.1	306.0	-5.5	-31.9	269.1	394.3	37.7
Grassland	-345199.7	34046.9	9742.9	35482.4	130480.3	73076.6	8570.9	-27924.4	24.4	11904.9	6865.5	30267.2	459.9	7776.8	966.6	23475.6	-16.7
IOCB	-71505.3	14166.3	8819.4	5029.0	59964.5	344.2	3498.5	-50101.1	841.1	11.4	356.2	14153.7	215.1	6576.4	174.6	7406.1	49.9
Savanna	-243363.8	-26696.7	1113.6	1975.4	222088.7	13612.0	205.1	-32508.0	0.0	15857.9	2925.9	28586.8	69.7	1478.0	746.3	13924.5	-15.4
Wetland	-27357.6	819.5	1365.4	610.7	13858.6	7352.0	1226.4	-4158.6	2.5	1181.2	2689.2	882.1	46.8	169.8	168.9	1085.6	57.4

%	Increases (positive numbers) and decreases (negative numbers) in land cover classes within each biome																
Biome	Natural	Degraded	Fallow lands	Timber plantations	Subsistence agriculture	Dryland cultivation	Irrigated cultivation	Sugarcane	Rehabilitated mines	Severe erosion	Dams	Low density settlement	Golf courses	Built up areas	Mines	Transport network	No Data
Forest	-16.9	9.4	0.5	0.5	8.3	0.0	0.0	-3.2	0.5	0.0	0.0	0.3	0.0	-0.1	0.1	0.3	0.2
Grassland	-7.5	0.7	0.2	0.8	2.8	1.6	0.2	-0.6	0.0	0.3	0.1	0.7	0.0	0.2	0.0	0.5	0.0
IOCB	-8.0	1.6	1.0	0.6	6.7	0.0	0.4	-5.6	0.1	0.0	0.0	1.6	0.0	0.7	0.0	0.8	0.0
Savanna	-7.5	-0.8	0.0	0.1	6.8	0.4	0.0	-1.0	0.0	0.5	0.1	0.9	0.0	0.0	0.0	0.4	0.0
Wetland	-6.9	0.2	0.3	0.2	3.5	1.9	0.3	-1.1	0.0	0.3	0.7	0.2	0.0	0.0	0.0	0.3	0.0

- Subsistence agriculture is the dominant cause of decline in every biome except Forest
- Indian Ocean Coastal Belt – built-up areas also play a significant role

Integrated land and ecosystem account – for selected vegetation types

		Increases (positive numbers) and decreases (negative numbers) in land cover classes within each vegetation type or wetland type																
	hectares	Natural	Degraded	Fallow lands	Timber plantations	Subsistence agricultur	Dryland cultivation	Irrigated cultivation	Sugarcane	Rehabilitated mines	Severe erosion	Dams	Low density settleme	Golf courses	Built up areas	Mines	Transport network	No Data
	Vegetation type																	
	Freshwater Wetlands (all)	-8,335	1,039	563	365	3,104	2,331	548	-1,102	-193	-1,872	2,500	521	-596	594	-206	731	8
	Alluvial Wetlands (all)	-18,363	-344	775	209	10,066	5,045	680	-2,710	-1,961	-7,854	11,512	1,967	-683	864	-828	1,589	37
76	Subtropical Dune Thicket	-285	293	0	1	0	0	0	-11	0	0	-2	3	-7	8	0	0	0
87	Mangrove Forests	-245	233	0	-3	39	0	0	-2	0	0	-3	0	-46	25	-1	2	0
49	Midlands Mistbelt Grassland	-53666	8033	334	13143	12296	11508	1619	-2785	-124	-805	-16207	21007	-9155	10857	-5947	9891	3
31	Mabela Sandy Grassland	-144	-98	0	-1	0	215	16	0	0	0	-3	7	-2	0	-9	18	0

- 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?
- Midlands Mistbelt Grassland – low density settlement, plantations, subsistence agric

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Recommendations for enabling integrated land and ecosystem accounts

- Land cover classes and ecosystem units should be distinct
- Land cover classes should link to socio-economic drivers in the landscape
- As far as possible, land cover classes should link to ecological impact
  - Don’t intentionally mix natural, semi-natural and substantially modified in one land cover class
  - This also helps to lay the basis for ecosystem condition accounts

THANK YOU

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