SDG 15.3 Measuring Land Degradation (Neutrality)

A/Prof Neville D. Crossman
UNCCD Consultant

University of Adelaide

neville.crossman@gmail.com
www.nevillecrossman.com

Why land degradation?

- Degraded lands costs $100s billion annually (lost opportunities and restoration costs)
- Degradation of land (ecosystems) is a core concern within SDG 15 Life on Land
- Measuring land degradation is essential to understanding and measuring ecosystem capacity to supply ecosystem services
- Degraded land compromises the capacity of ecosystems to supply services

Bad degradation = few services

SDG Target 15.3: Land Degradation Neutrality

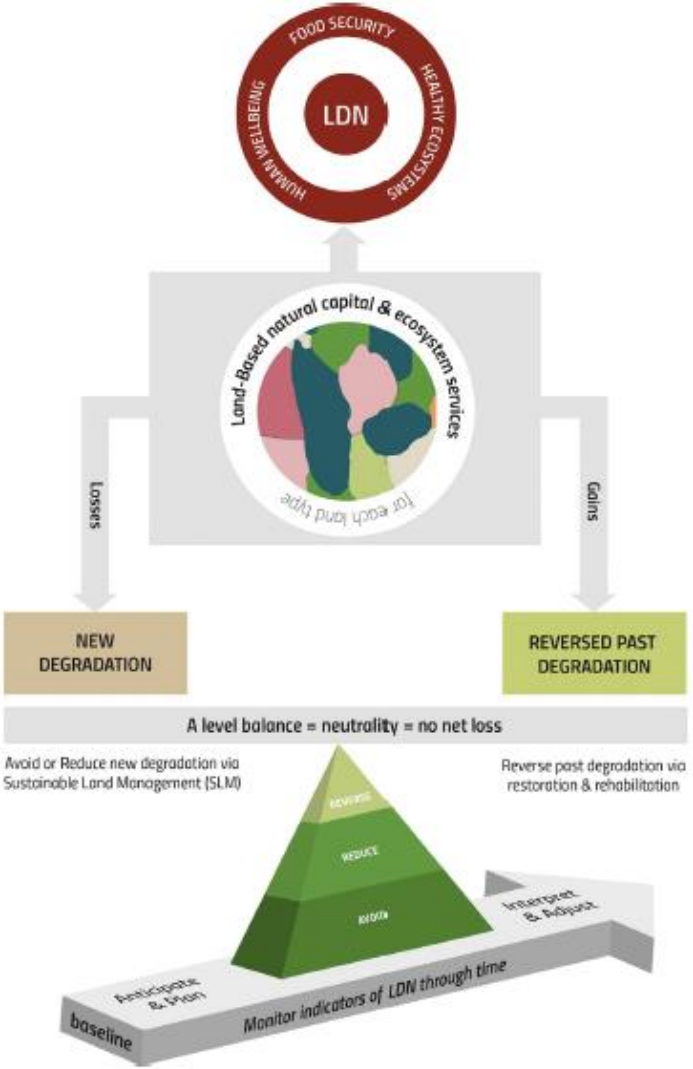
SDG Target 15.3:

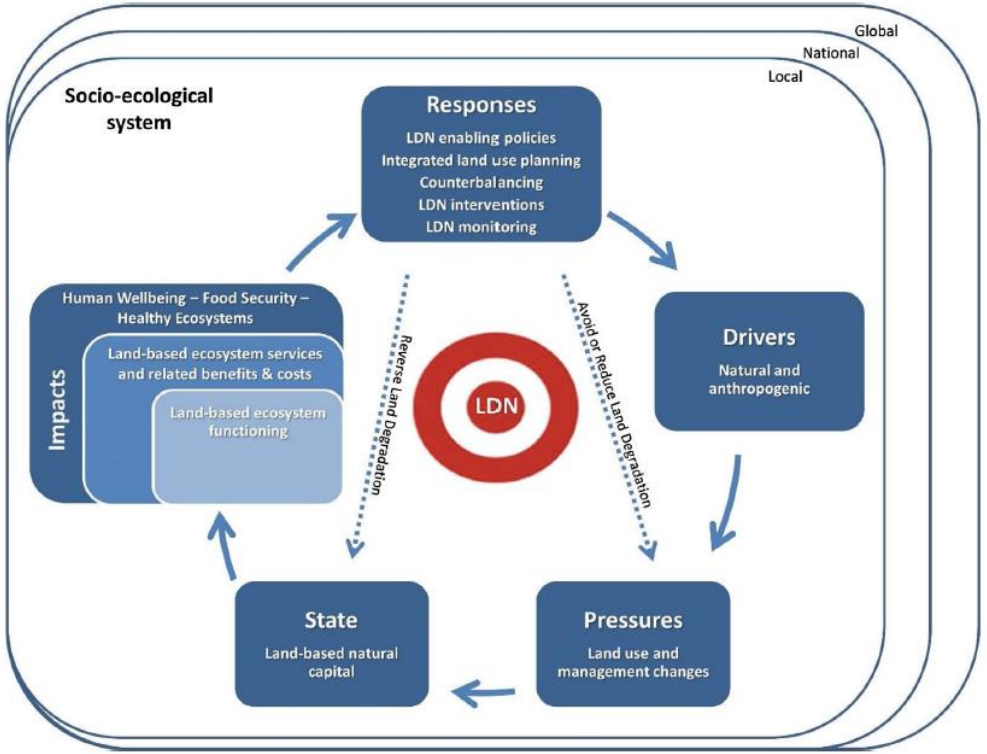
"By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation neutral world"

SDG Indicator 15.3.1:

Proportion of land that is degraded over total land area.

Conceptual framework





Source: Cowie, B. J. Orr, V. M. Castillo Sanchez, P. Chasek, N. D. Crossman, A. Erlewein, G. Louwagie, M. Maron, G. I. Metternicht, S. Minelli, A. E. Tengberg, S. Walter, and S. Welton. 2018. Land in balance: The scientific conceptual framework for Land Degradation Neutrality.Environmental Science & Policy **79**:25-35.

Key principles of LDN – most relevant to SEEA-EEA

Table 1
Principles underpinning the implementation of LDN.

1	Maintain or enhance land-based natural capital.
2	Protect the rights of vulnerable and marginalised land users.
3	Set national LDN targets based on national circumstances.
4	For neutrality, the LDN target equals (is the same as) the baseline.
5	Neutrality is the minimum objective: countries may elect to set a more ambitious target.
6	Integrate planning and implementation of LDN into existing land use planning processes.
7	Counterbalance anticipated losses in land-based natural capital with interventions to reverse degradation, to achieve neutrality.
8	Manage counterbalancing at the same scale as land use planning.
9	Counterbalance "like for like" (within the same land type).
10	Seek solutions that provide multiple environmental, economic and social benefits, and minimise trade-offs.
11	Base land use decisions on multi-variable assessments, considering land potential, land condition, resilience, social, cultural and economic factors.
12	Apply the response hierarchy in devising interventions for LDN: Avoid > Reduce > Reverse land degradation.
13	Apply a participatory process: include stakeholders, especially land users, in designing, implementing and monitoring interventions to achieve LDN.
14	Reinforce responsible governance: protect human rights, including tenure rights; develop a review mechanism; and ensure accountability and transparency.
15	Monitor using the three UNCCD land-based global indicators: land cover, land productivity (net primary productivity, NPP) and carbon stocks (soil organic carbon, SOC).
16	Use the "one-out, all-out" approach to interpret the result of these three global indicators.
17	Use additional national and sub-national indicators to aid interpretation and to fill gaps for ecosystem services not covered by the three global indicators
18	Apply local knowledge and data to validate and interpret monitoring data.
19	Apply a continuous learning approach: anticipate, plan, track, interpret, review, adjust, create the next plan

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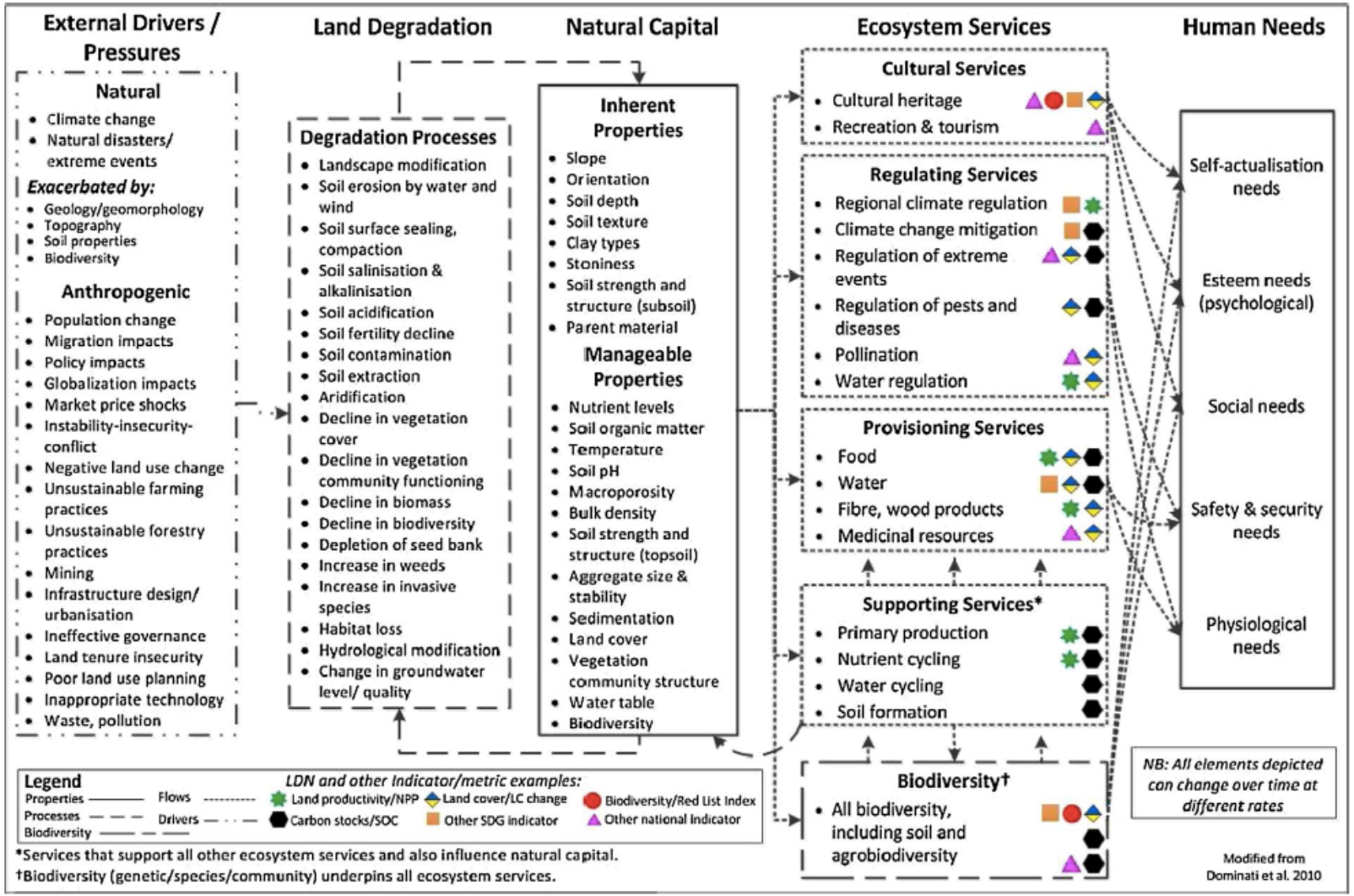

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Three sub-indicators for degraded land

Proportion of degraded land is derived from the three indicators:

1. Land Cover change (LC change) – 2000-15
2. Land Productivity Dynamics (LPD) – 2000-13
3. Change in Soil Organic Carbon stocks (SOC change) – 2000-15

State of each indicator is classified as degradation (or not).

UNCCD has just completed delivery of data to countries using global datasets

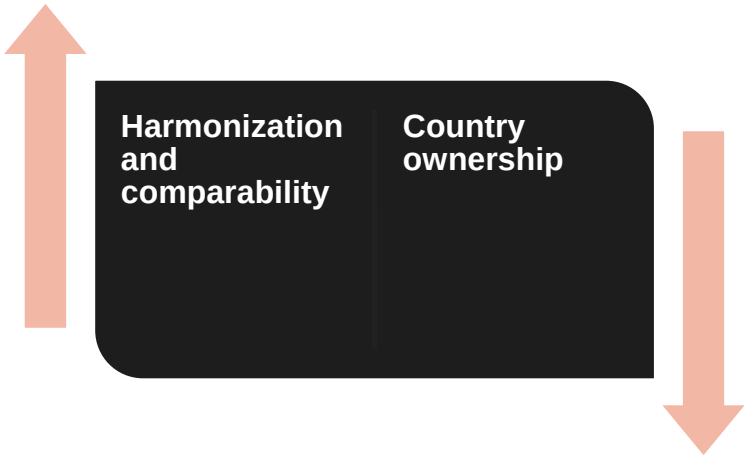
The indicators report for 2000-2015 = baseline land degradation

One out all out rule

- A location is considered degraded if at least one of the three indicators shows a negative change (i.e. is degraded).
- This is the ‘one out, all out’ rule (Cowie et al 2018).
- A precautionary measure - stability or improvements in land condition in any one indicator cannot compensate for degradation in the others.
- Applied because the indicators are complementary – not additive.

Why use global data?

- UNCCD has mandate to provide countries with national ‘default’ data
- Requirements for default data
  - Temporal coverage
    - i.e. availability of reasonably long time series, at least two or more epochs, regular intervals
  - Timeliness
    - i.e. availability of future updates at regular intervals
  - Global coverage
  - Sufficient resolution
  - Clear methods (supported in scientific literature)
  - Accessible & available



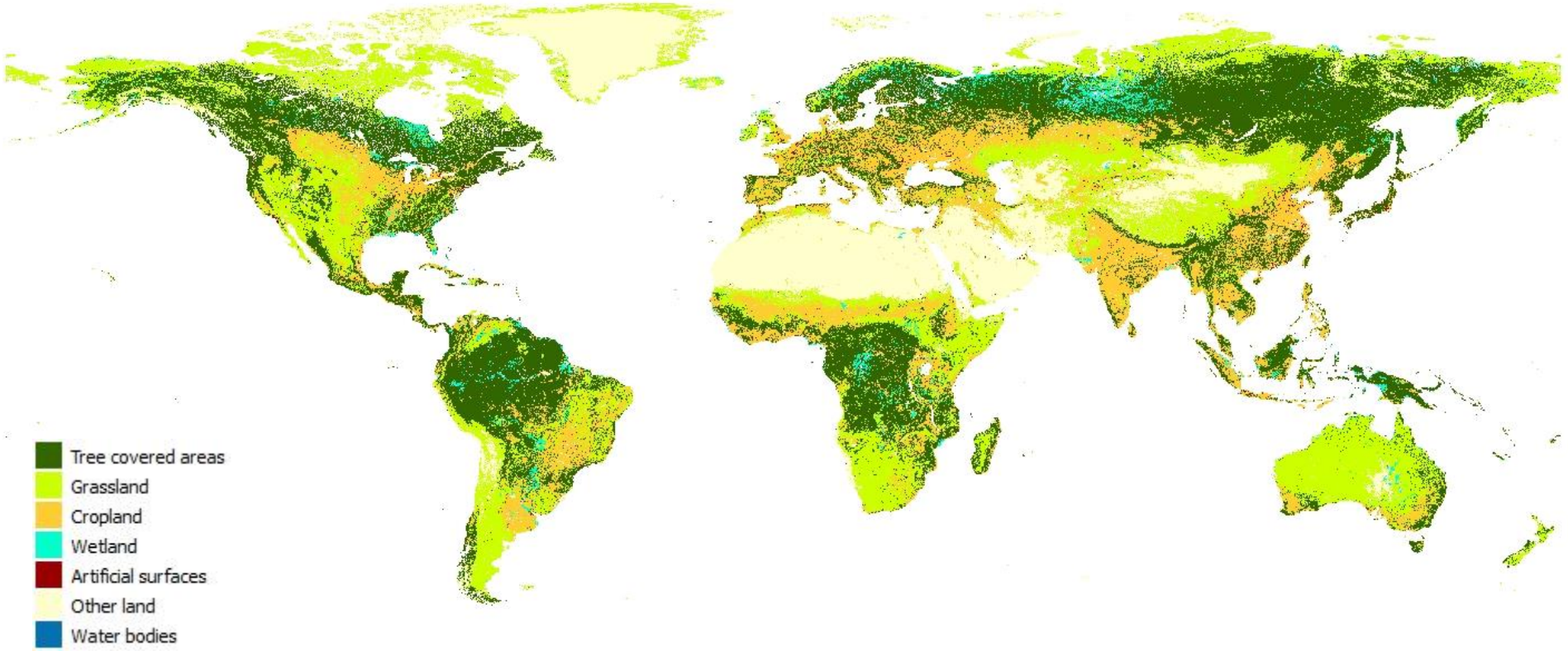
Default global data sources

Indicator	Metrics	Data sources

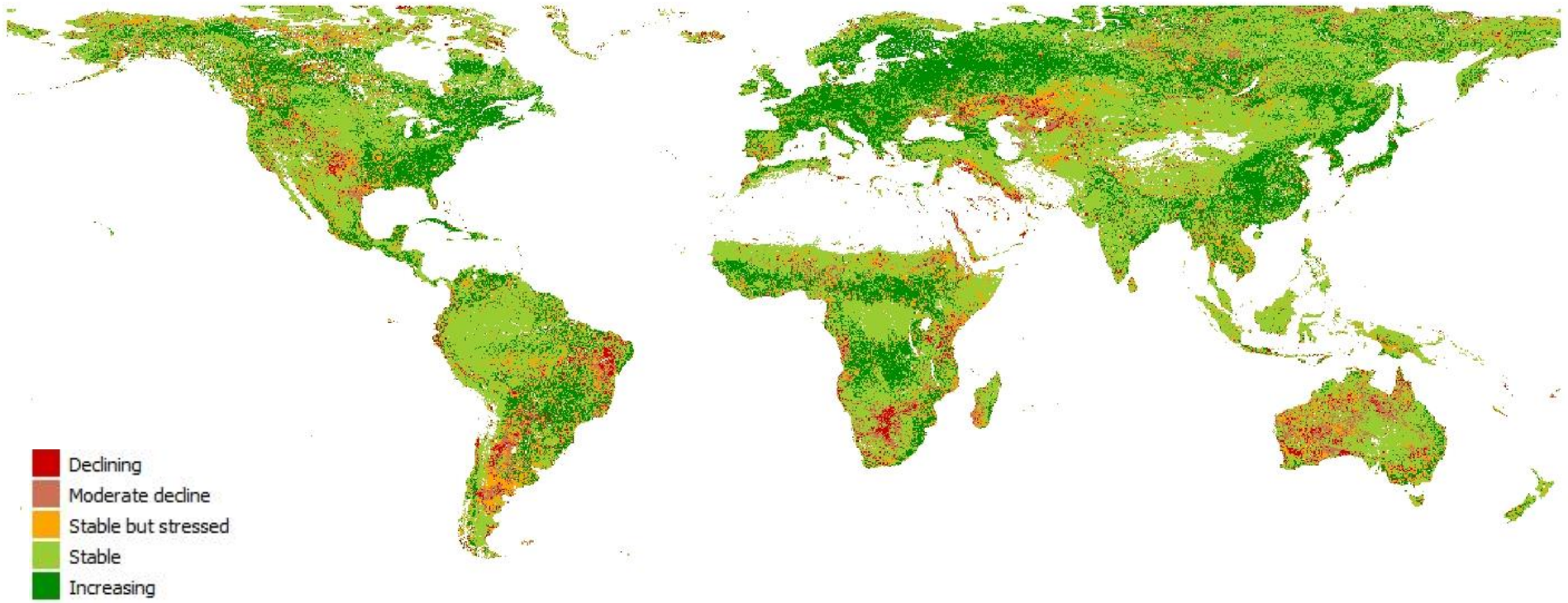
Trends in land cover	Land cover change	ESA Climate Change Initiative Land Cover dataset (http://maps.elie.ucl.ac.be/CCI/viewer/)
		• 300m resolution
		• Temporal coverage:
		  • annual maps from 2000-2015, released in April 2017 (v 2.0.7)
		  22 classes → aggregated to 6 classes for UNCCD reporting

Trends in land productivity or functioning of the land	Land productivity dynamics (LPD)	JRC LPD (http://wad.jrc.ec.europa.eu/) • 1 km resolution • Temporal coverage: 1999-2013 • 5 classes
Trends in carbon stocks above and below ground	Soil organic carbon (SOC) stocks	ISRIC SoilGrids250 (https://soilgrids.org/#!/?layer=TAXNWRB_250m&vector=1) • 250 m resolution • Temporal coverage: Based on legacy soil data points. Change estimates based on land cover data • Continuous data

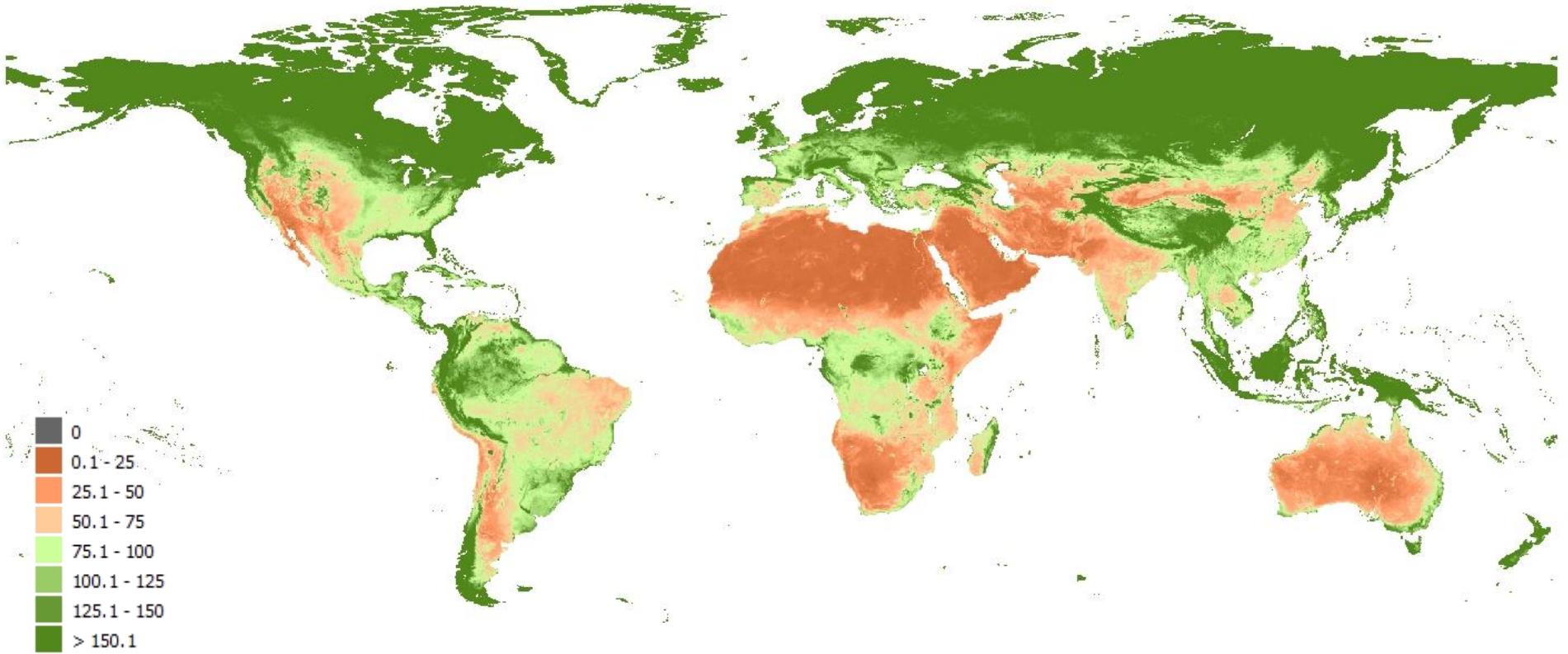
Global Land Cover data



Global LPD data



Global SOC stock data



Description of degradation in each indicator

LC change (red = degrading process):

ORIGINAL CLASS \ FINAL CLASS	Tree-covered areas	Grassland	Cropland	Wetland	Artificial surfaces	Other land
Tree-covered areas	Stable	Vegetation loss	Deforestation	Inundation	Deforestation	Vegetation loss
Grassland	Afforestation	Stable	Agricultural expansion	Inundation	Urban expansion	Vegetation loss
Cropland	Afforestation	Withdrawal of agriculture	Stable	Inundation	Urban expansion	Vegetation loss
Wetland	Woody Encroachment	Wetland drainage	Wetland drainage	Stable	Wetland drainage	Wetland drainage
Artificial surfaces	Afforestation	Vegetation establishment	Agricultural expansion	Wetland establishment	Stable	Withdrawal of settlements
Other Land	Afforestation	Vegetation establishment	Agricultural expansion	Wetland establishment	Urban expansion	Stable

Description of degradation in each indicator

LPD:

LPD Values	LPD Classes	Degradation Status for calculation of SDG 15.3.1
1	Decline	Degraded
2	Moderate Decline	
3	Stressed	
4	Stable	Non Degraded
5	Increasing	

Description of degradation in each indicator

SOC change:

- Locations experiencing a decline in SOC stock over the period 2000-2015 (red = degrading process)

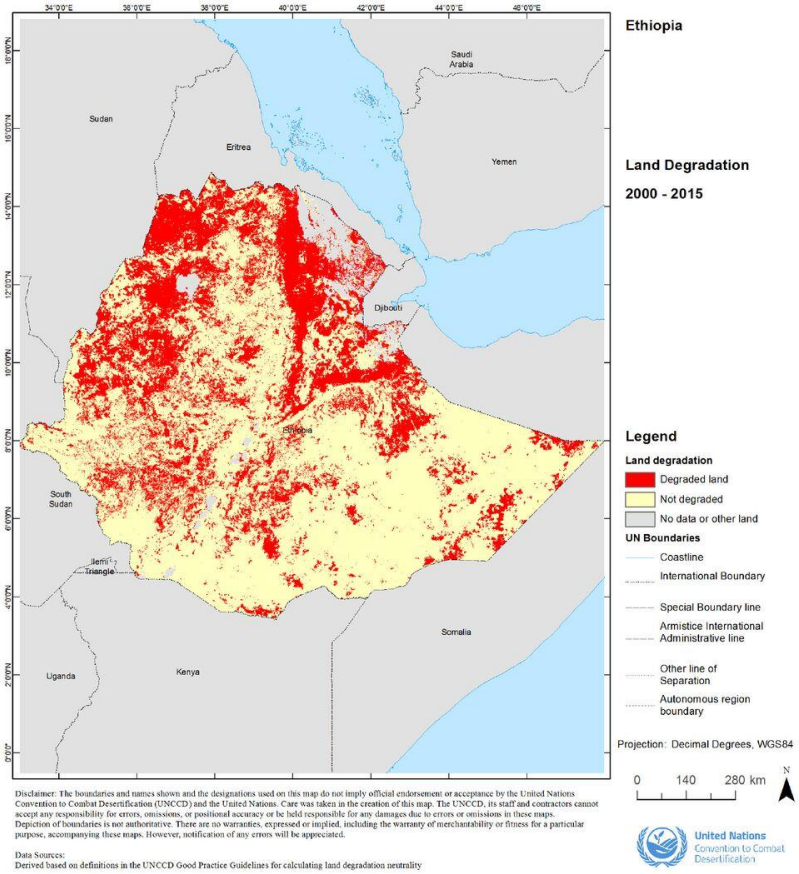
To (2015)

From (2000)

LC class	Tree-covered areas	Grassland	Cropland	Wetland	Artificial surfaces	Other Land
Tree-covered areas	Stable	Tree cover loss	Deforestation	Wetland establisment	Deforestation	Deforestation
Grassland	Woody encroachment	Stable	Vegetation loss	Wetland establisment	Urban expansion	Vegetation loss
Cropland	Withdrawal of agriculture	Withdrawal of agriculture	Stable	Wetland establisment	Urban expansion	Vegetation loss
Wetlands	Wetland drainage	Wetland drainage	Wetland drainage	Stable	Wetland drainage	Wetland drainage
Artificial surfaces	Urban greening	Urban greening	Urban agriculture	Water sensitive urban design	Stable	Withdrawal of settlements
Other Land	Afforestation	Vegetation establishment	Vegetation establishment	Wetland establisment	Urban expansion	Stable

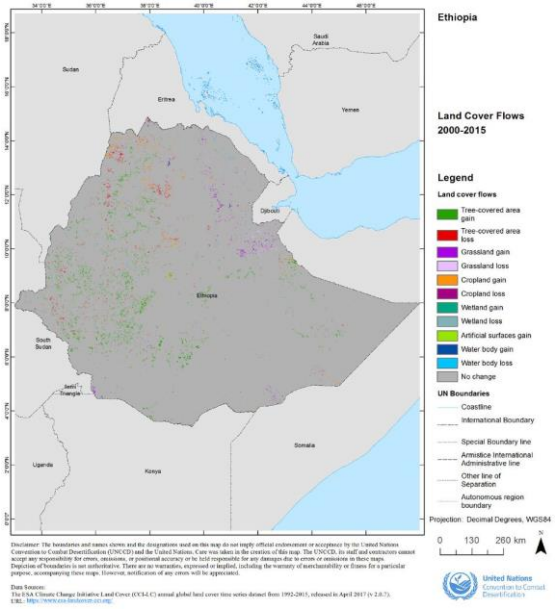
Map of degraded land – delivered to each country

- Land degradation map
- Locations where there is degradation in LC change (2000-2015), or LPD (2000-2013), or SOC change (2000-2015).
- Rasters of land degradation for the period are provided in geotiff format.
- Cells are classified as‘1’ (degraded) or ‘0’ (not degraded).

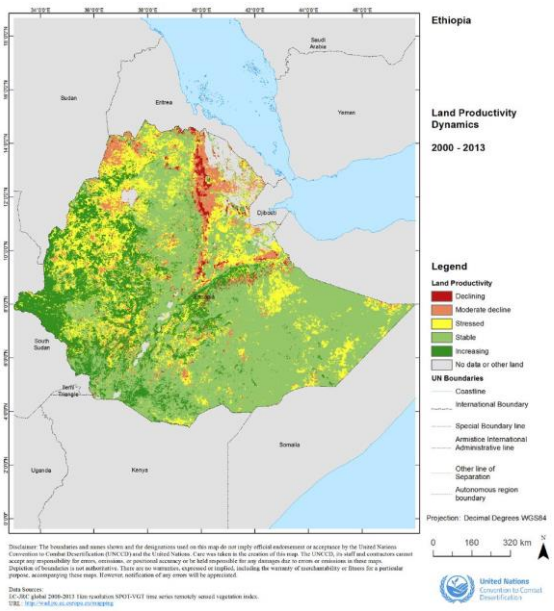


Ethiopia sub-indicators

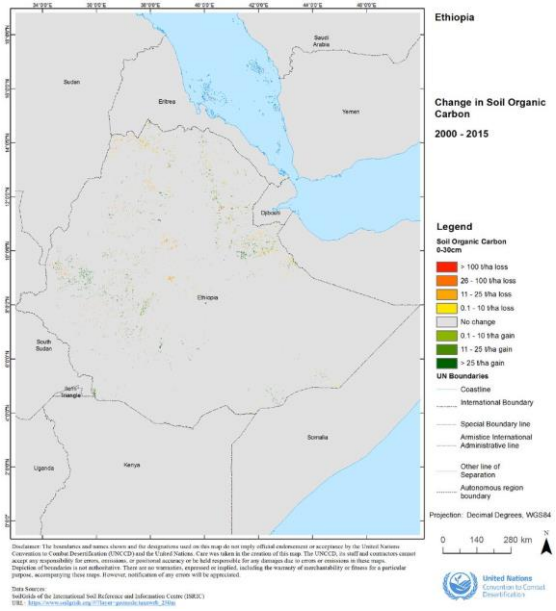
LC Change



LPD



SOC Change



Example data tables – LC change, Brazil

Year	Land cover (km2)					
	Tree-covered areas	Grassland	Cropland	Wetland	Artificial surfaces	Other land
2000	4374903	1723766	1995446	247298	16454	4344
2001	4363481	1723456	2006245	247143	17387	3806
2002	4353993	1722739	2014768	247129	18214	3675
2003	4339046	1724810	2026934	247424	18759	3658
2004	4237417	1728093	2117185	249071	19629	3662
2005	4236496	1727624	2117820	249330	20321	3675
2006	4234617	1728587	2118074	249572	20947	3677
2007	4237073	1727392	2116114	249865	21458	3676
2008	4237134	1727469	2115341	250115	21886	3685
2009	4237411	1726870	2115045	250275	22302	3685
2010	4238185	1727411	2113489	250174	22719	3685
2011	4234617	1730116	2113634	250127	23126	3685
2012	4234452	1729974	2113304	250118	23712	3685
2013	4232944	1731051	2112780	250109	24639	3682
2014	4235058	1730156	2110758	249944	25334	3672
2015	4235035	1730105	2110536	249941	25638	3669
Net area change	-139868	6339	115090	2643	9184	-675

National level annual area estimates (km^2) and net area changes from 2000 to 2015 for 6 LC class.

The *net area change* is calculated as the difference between the initial (2000) and the final monitoring year (2015) for each of the 7 classes.

Conclusion

- Proportion of degraded land is composite indicator establishing degradation baseline:
  - LC change, LPD and SOC change
- One out all out rule means location is degraded if any one indicator is degraded
- The sub-indicators (LC change, LPD and SOC change) provide proxies for ecosystem services (in absence of global ES data)
- Local data and expertise should replace/complement the input indicators
- Significant scope to add depth to sub-indicators with better ES measurements
- But no common standard (yet) available for local-national ES measures