DLR

esa

living planet symposium | BONN 23–27 May 2022

TAKING THE PULSE OF OUR PLANET FROM SPACE

EUMETSAT ECMWF EUSPA

The UNCCD puts Earth observation in action for LDN monitoring and reporting

Barron Joseph Orr, Sara Minelli, Brian O'Conner (UNCCD) and Neil Sims (CSIRO)

GEO LAND DEGRADATION NEUTRALITY

United Nations Convention to Combat Desertification | United for land

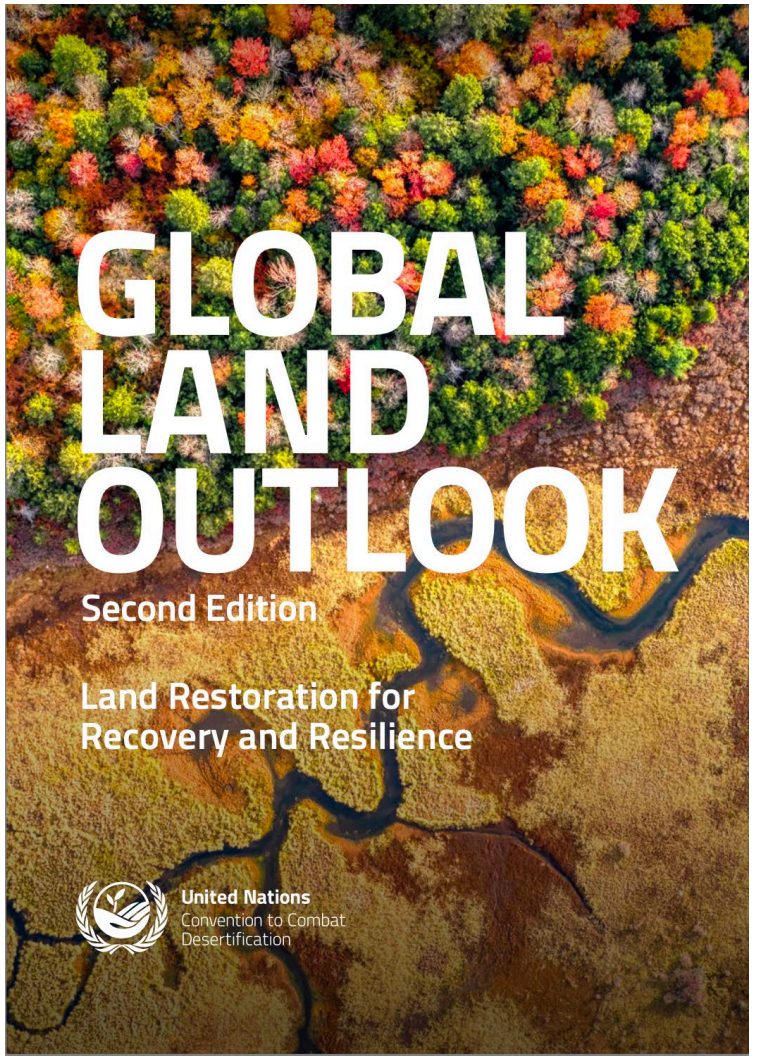
CSIRO

24 May 2022

ESA UNCLASSIFIED – For ESA Official Use Only

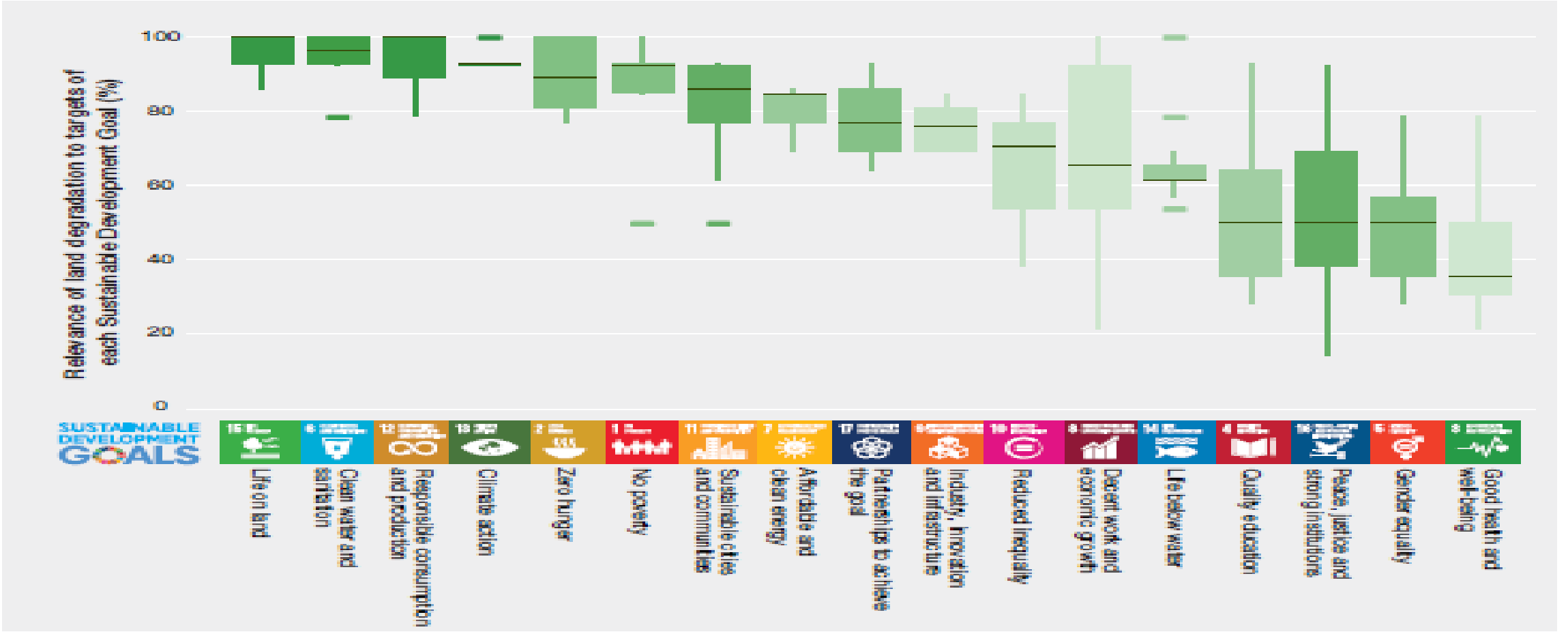
How significant is land degradation?

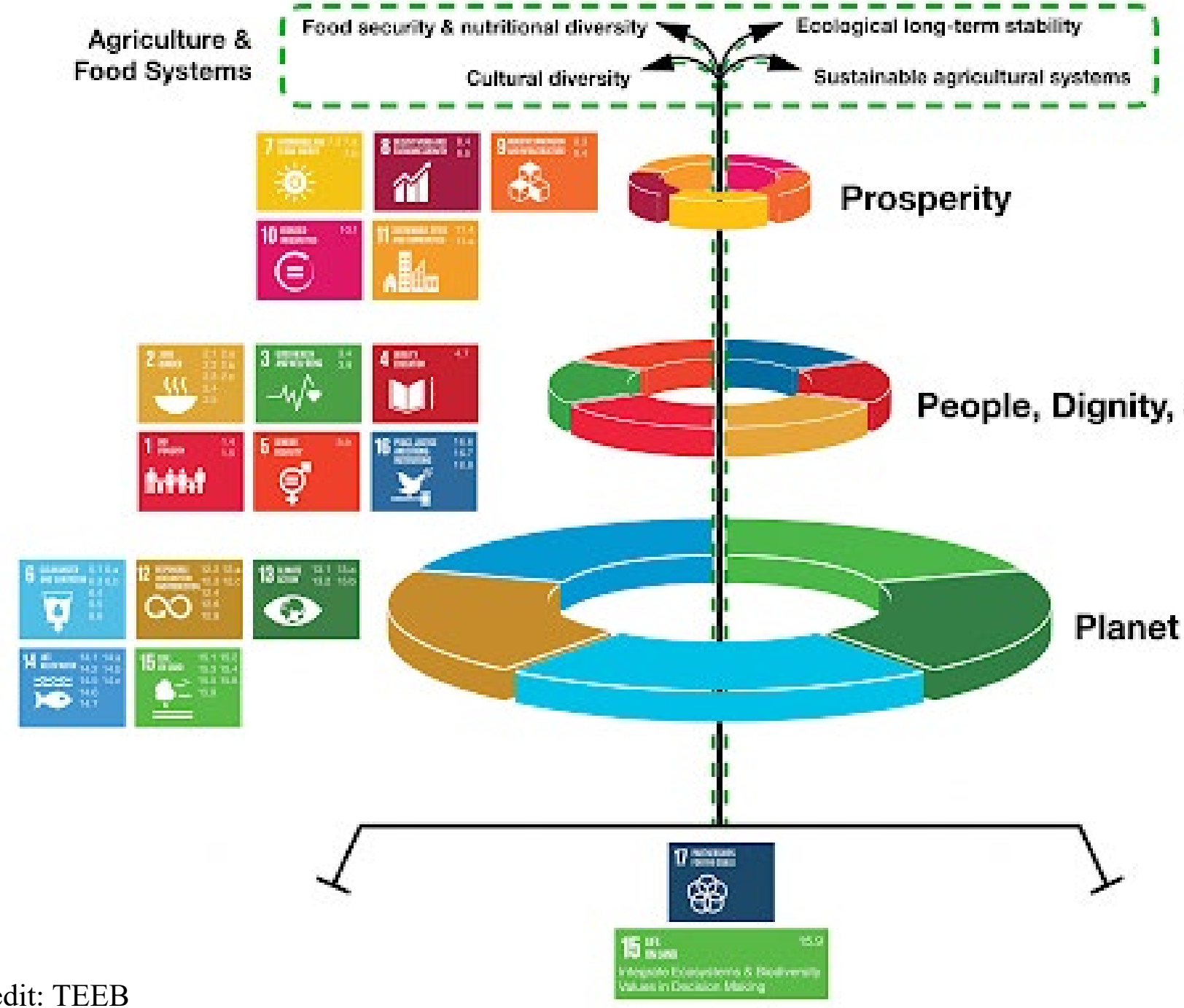
- Over **70%** of ice-free **terrestrial ecosystems** have been **transformed from their natural state for human use**.
- Governments have reported that **1 in 5 of those hectares** is no longer productive, undermining the well-being of **3.2 billion people**
- If business as usual continues through 2050, GLO2 **projects the further degradation of 16 million square km** – an area the size of South America.
- **Land is limited**, and will be needed for many necessary, but competing demands: food, water, energy, climate, biodiversity and much more



https://www.unccd.int/resources/global-land-outlook/glo2

Successfully addressing the Sustainable Development Goals requires simultaneously halting and reversing land degradation.



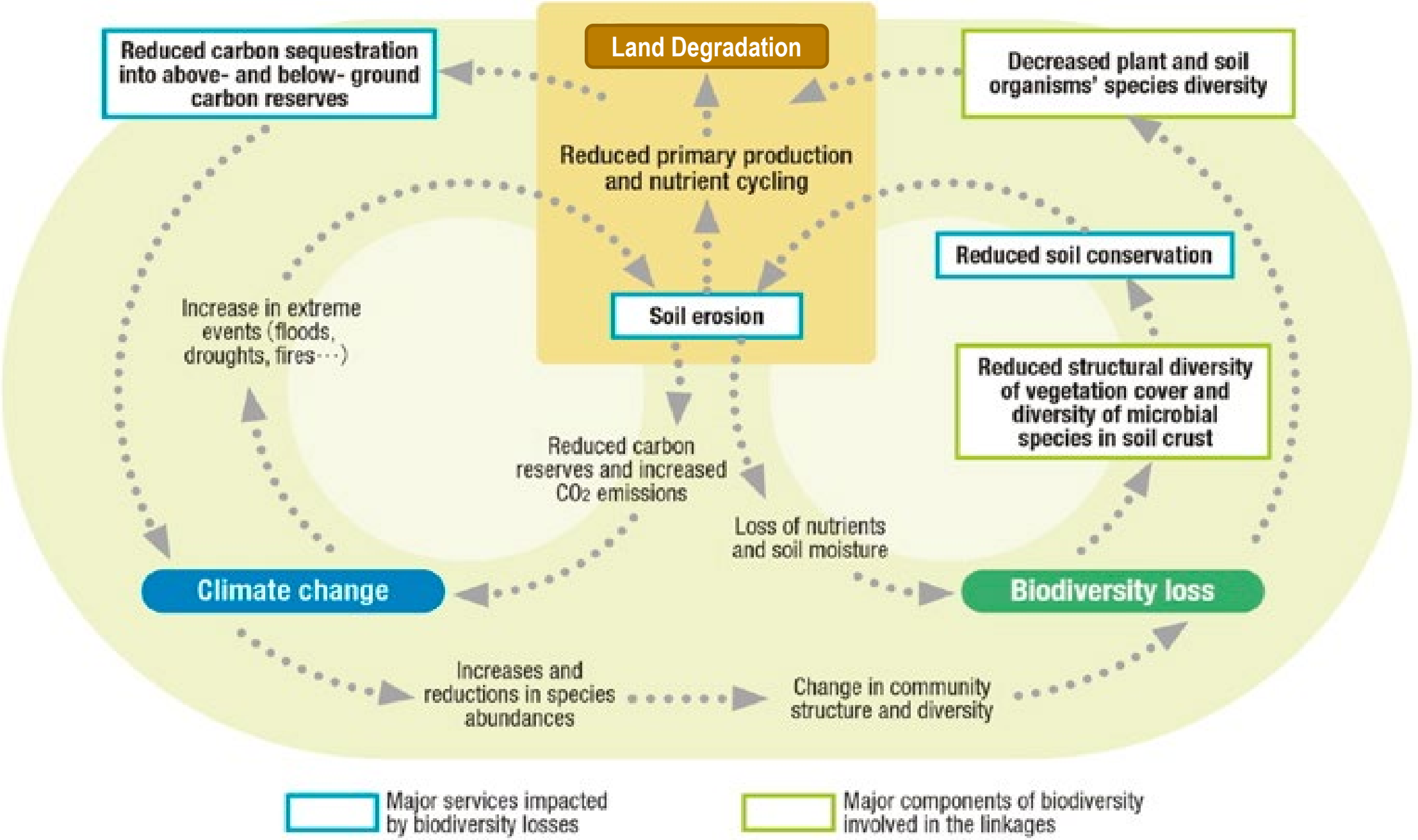


United Nations
Convention to Combat Desertification

The good news is land can accelerate the other SDGs

Credit: TEEB

Example of SDG Synergies



Source: Millennium Ecosystem Assessment 2005 *Ecosystems and Human Well-being: Desertification Synthesis.* Redrawn by Ministry of the Environment, Japan

Synergies are good. But the bad news is…

...SDGs *also* compete for the same land resources.

Synergies and trade-offs

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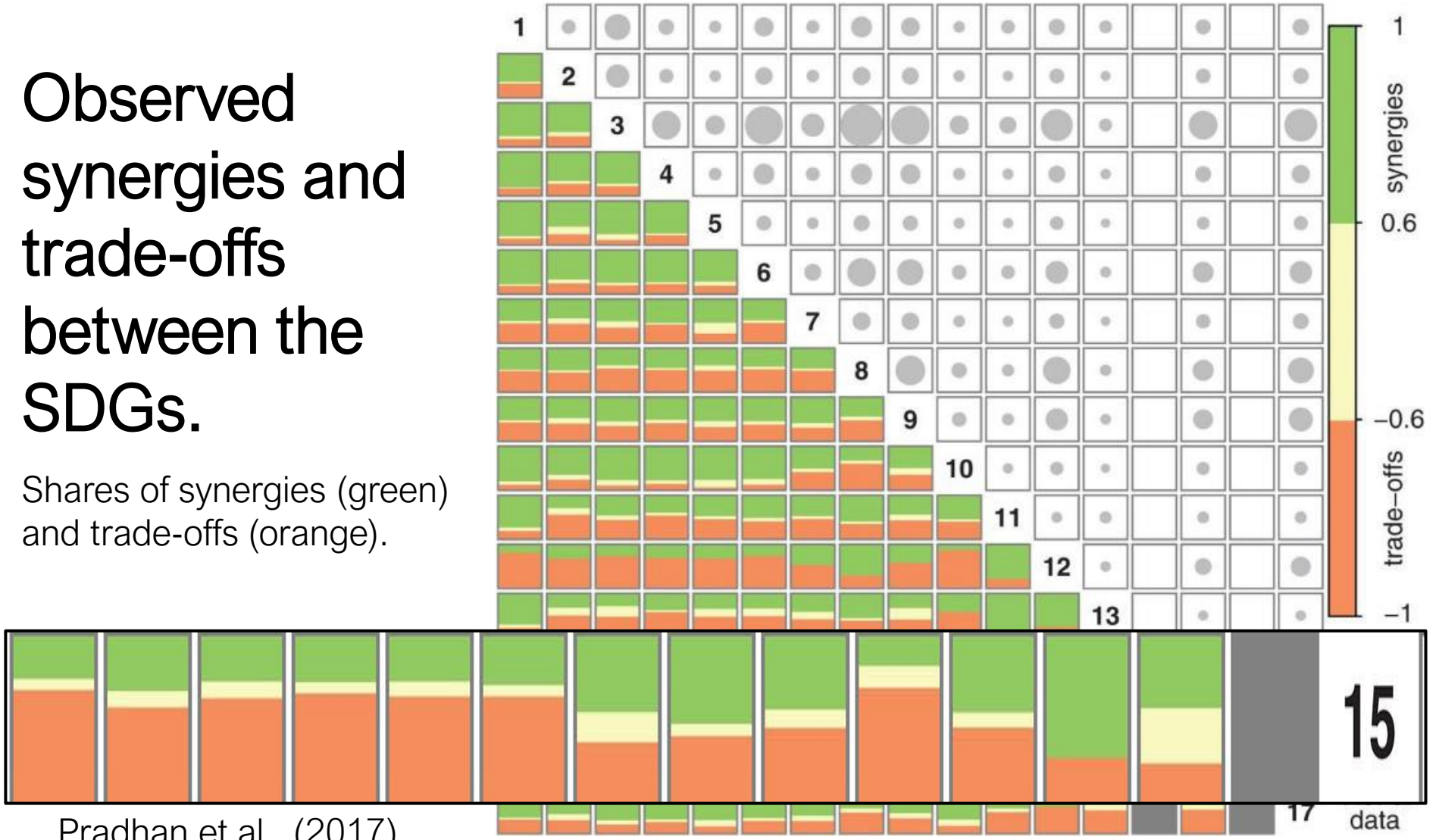
Observed synergies and trade-offs between the SDGs.

Shares of synergies (green) and trade-offs (orange).

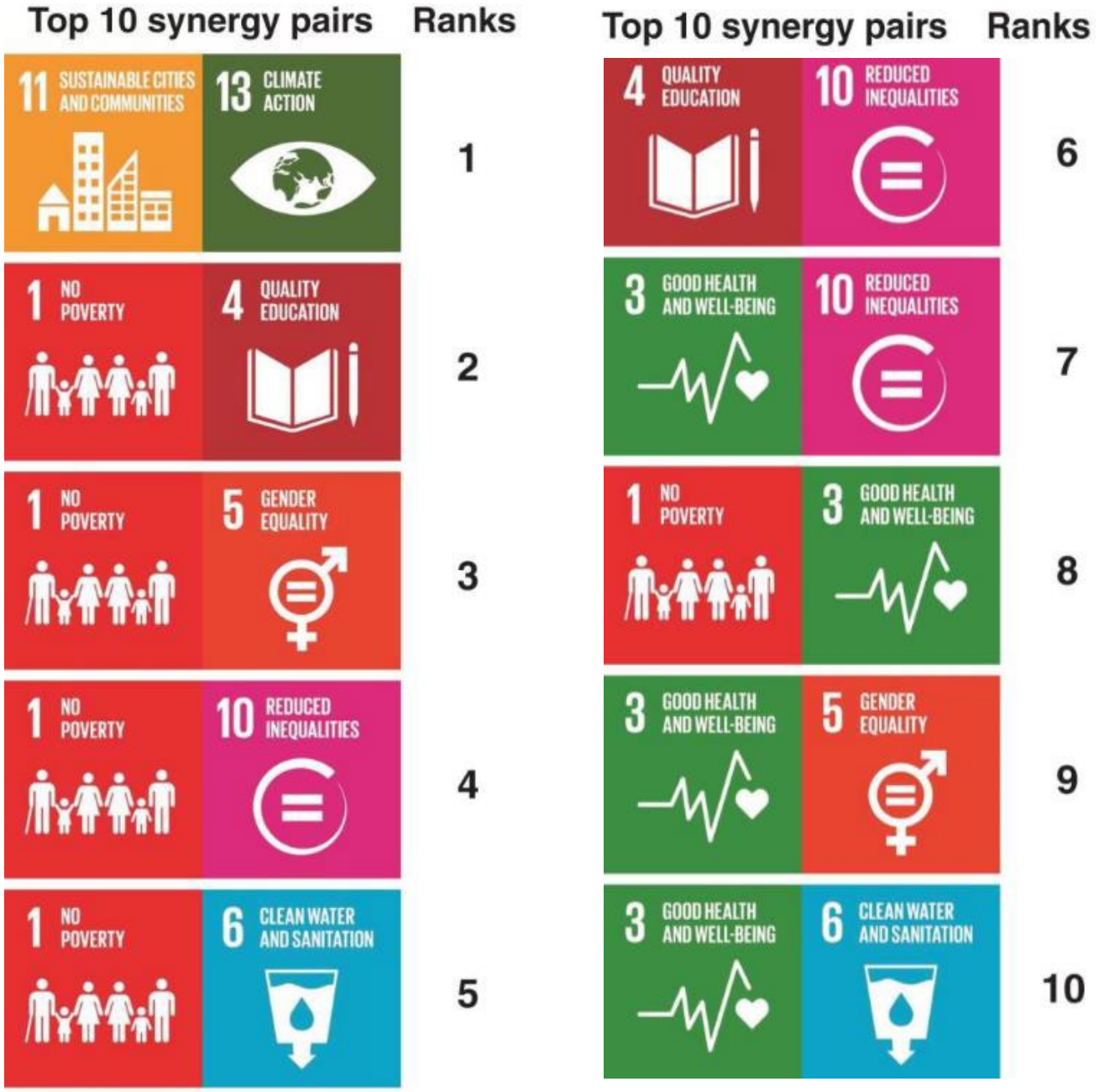


Pradhan et al. (2017)

Source: Figure 2 doi:10.1002/2017EF000632

The top synergies among SDGs are not surprising

Pradhan et al. (2017)



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Source: Figure 3 doi:10.1002/2017EF000632

…and the top trade-offs should not be surprising either

Pradhan et al. (2017)

Source: Figure 3 doi:10.1002/2017EF000632

United Nations
Convention to Combat Desertification

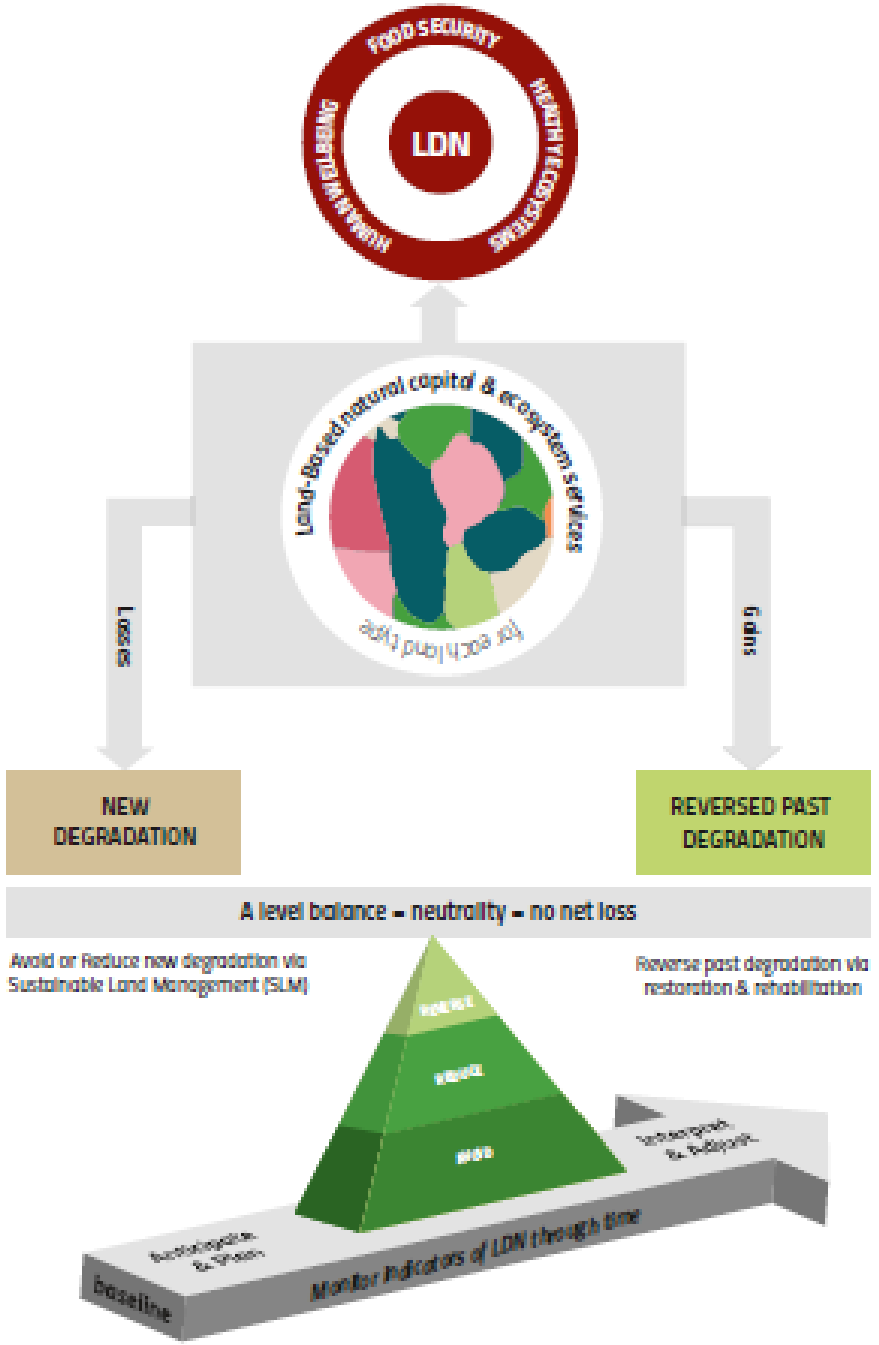
How can we navigate the inevitable SDG trade-offs?

United Nations
Convention to Combat Desertification

A balanced approach is needed.

- One that **anticipates new degradation** even as we plan to reverse past degradation
- One that **considers tradeoffs** among competing interests across the landscape

LDN provides the framework for this.



Land Degradation Neutrality (LDN)

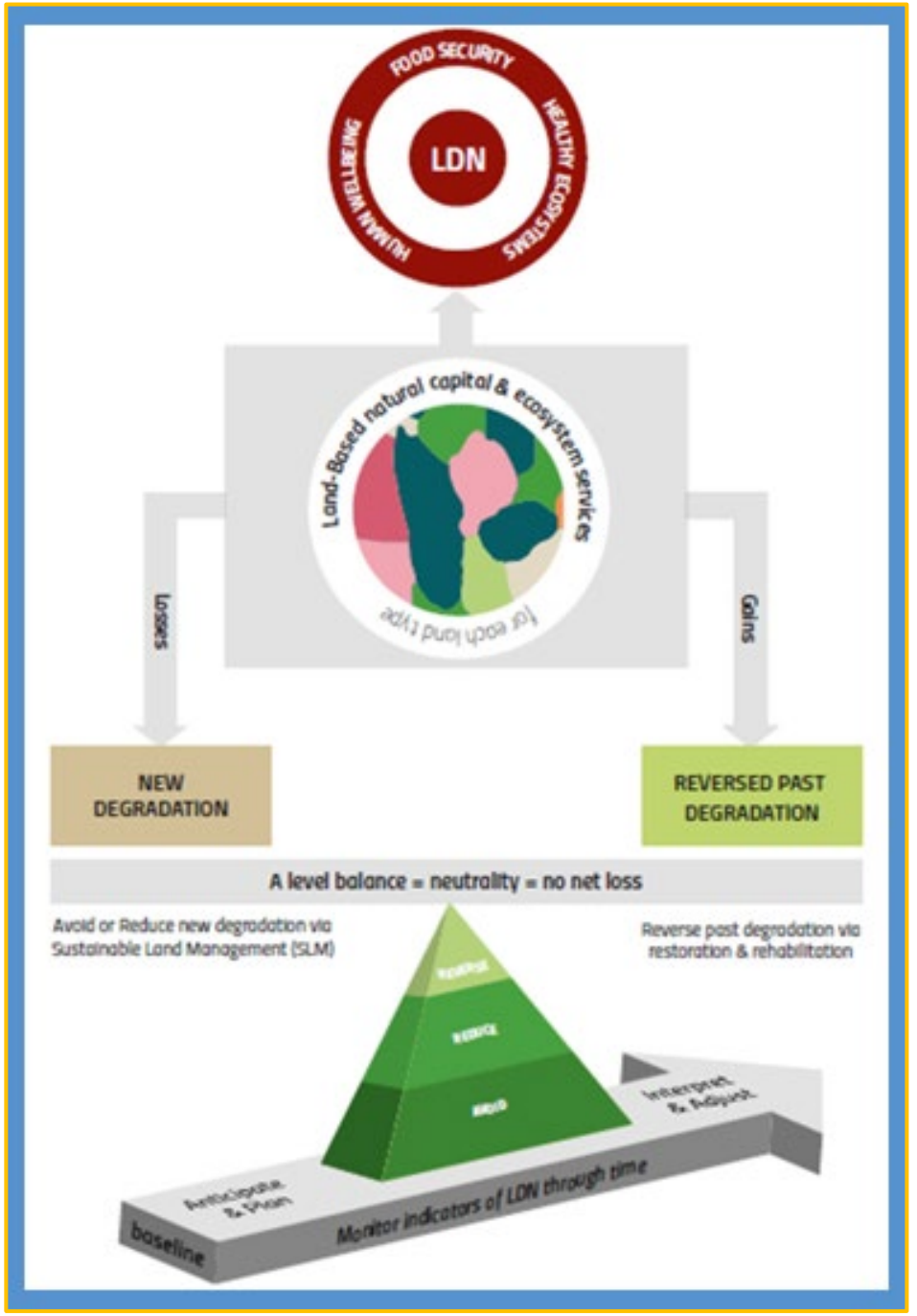
United Nations
Convention to Combat Desertification

"A state whereby the amount and quality of land resources necessary to support ecosystem functions and services and enhance food security remain stable or increase within specified temporal and spatial scales and ecosystems"

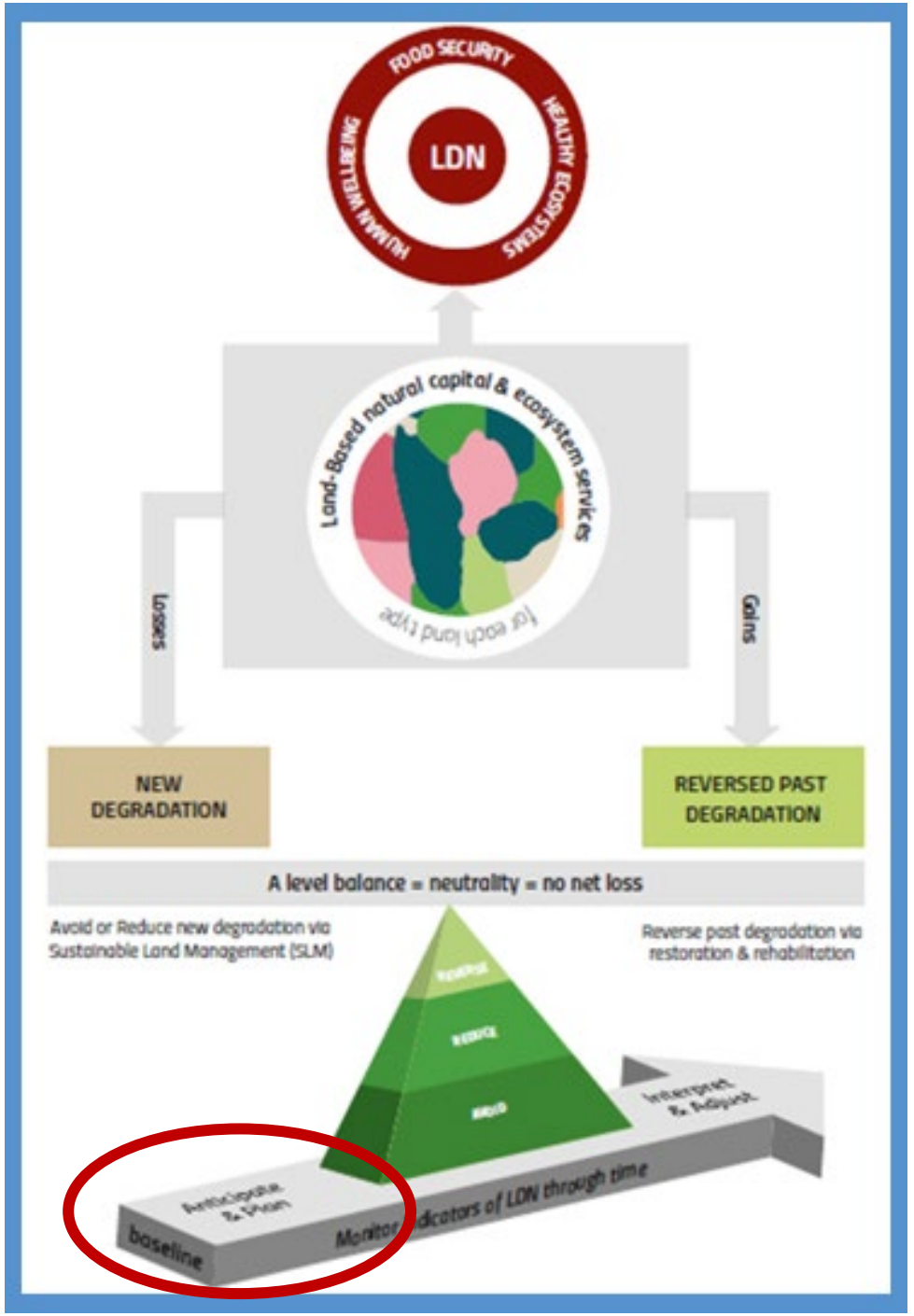
UNCCD COP12 October 2015

Land Degradation Neutrality

- LDN seeks to **maintain natural capital** and the **ecosystem services** that flow from it;
- LDN is about keeping **land in balance;**
- Keeping land in balance provides the basis for **keeping food, water, carbon and biodiversity in balance** as well;
- LDN is about achieving **multiple benefits;**
- LDN provides a framework with **multiple entry points** which facilitate **optimizing the synergies** among the Rio Conventions (Climate Change, Biodiversity, Land Degradation).



https://knowledge.unccd.int/publication/ldn-scientific-conceptual-framework-land-degradation-neutrality-report-science-policy



Integrated land use planning

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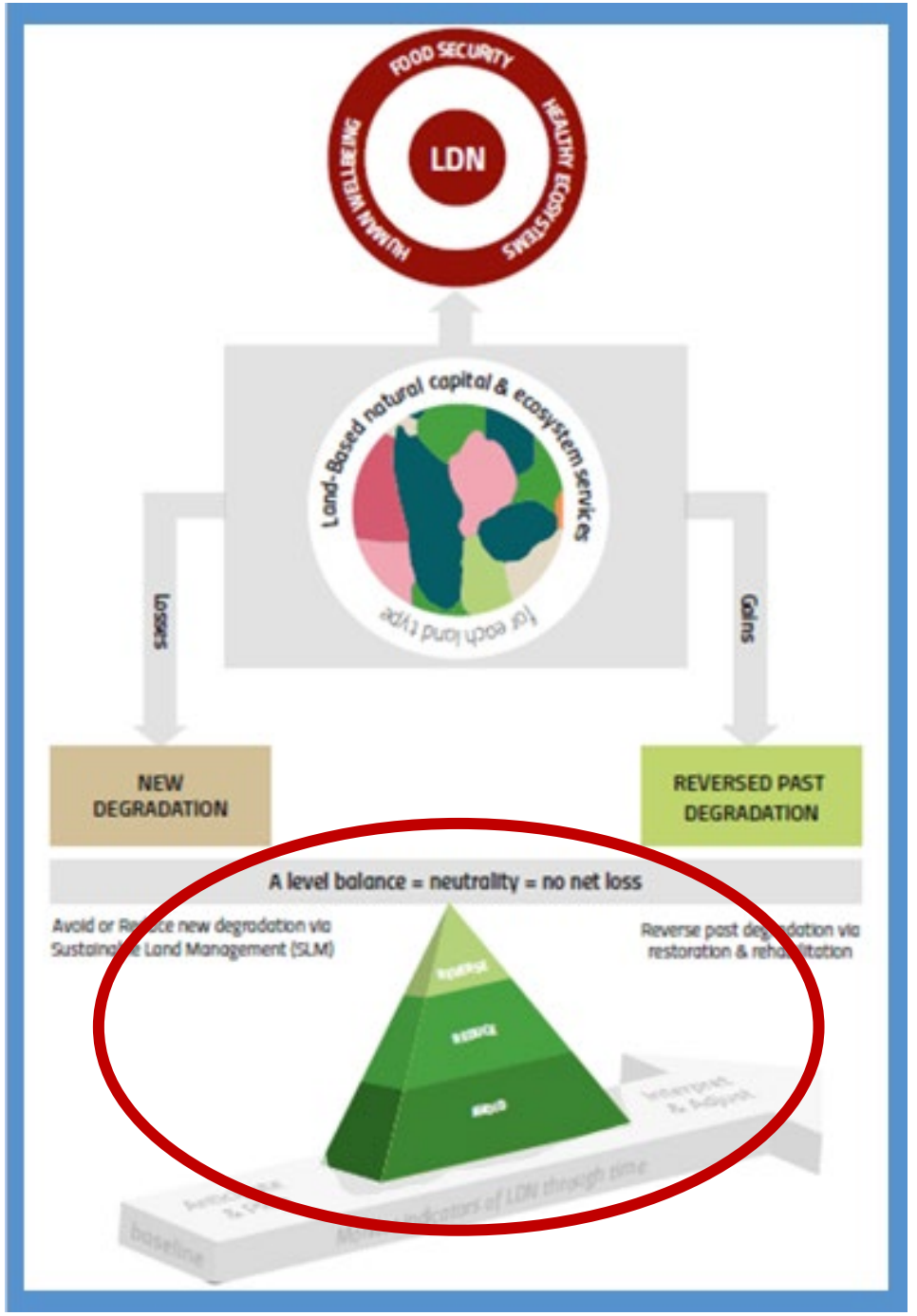
Convention to Combat Desertification

LDN planning (from target setting to territorial / spatial planning to integrated landscape management) involves anticipating where degradation is likely and modelling the tradeoffs among competing demands on land resources, location by location, so that the optimal mix of interventions across the landscape to achieve neutrality can be pursued.

Land Degradation Neutrality is about doing the **right things** in the **right places** at the **right scale**



Response Hierarchy

Prevention is better than cure

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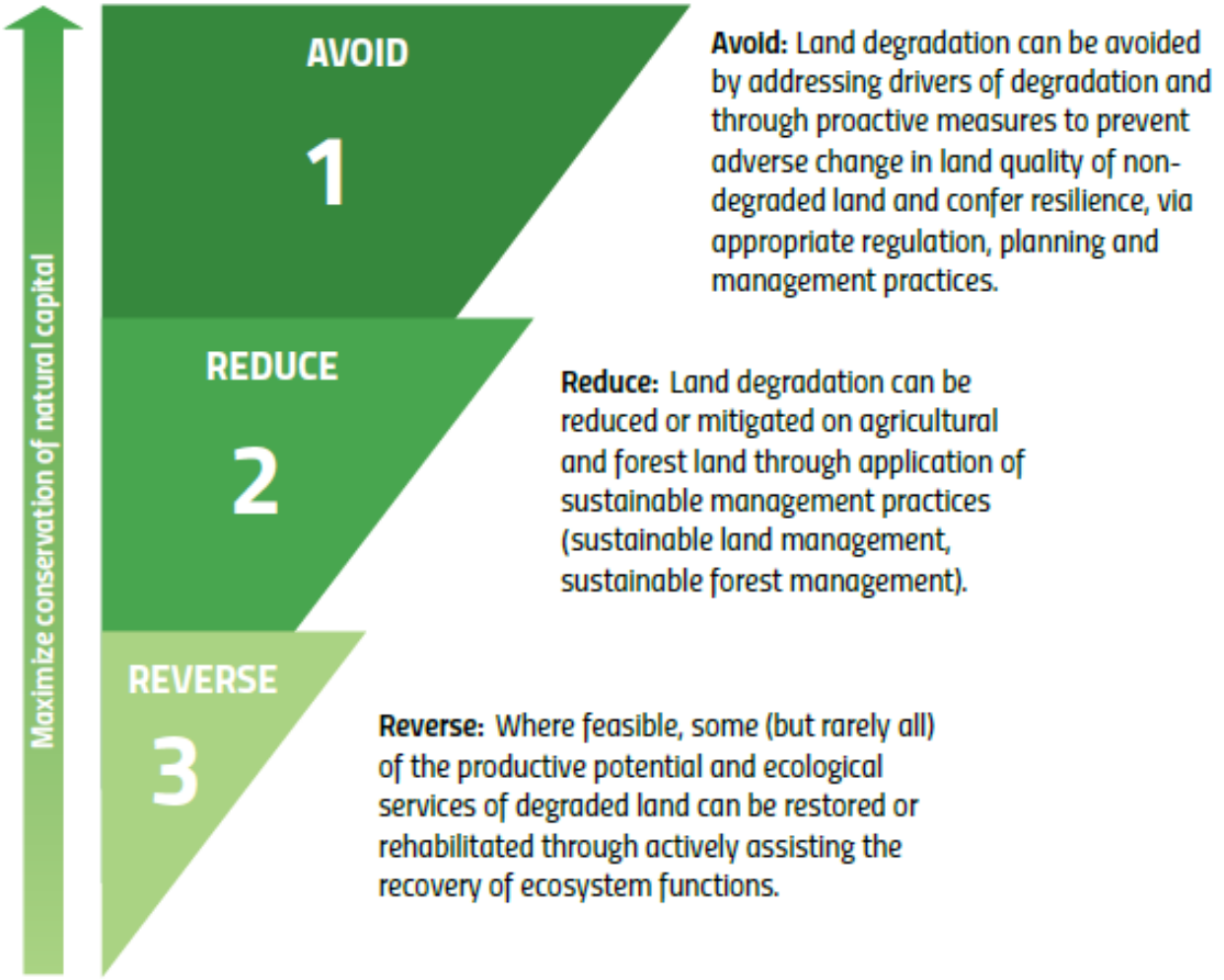
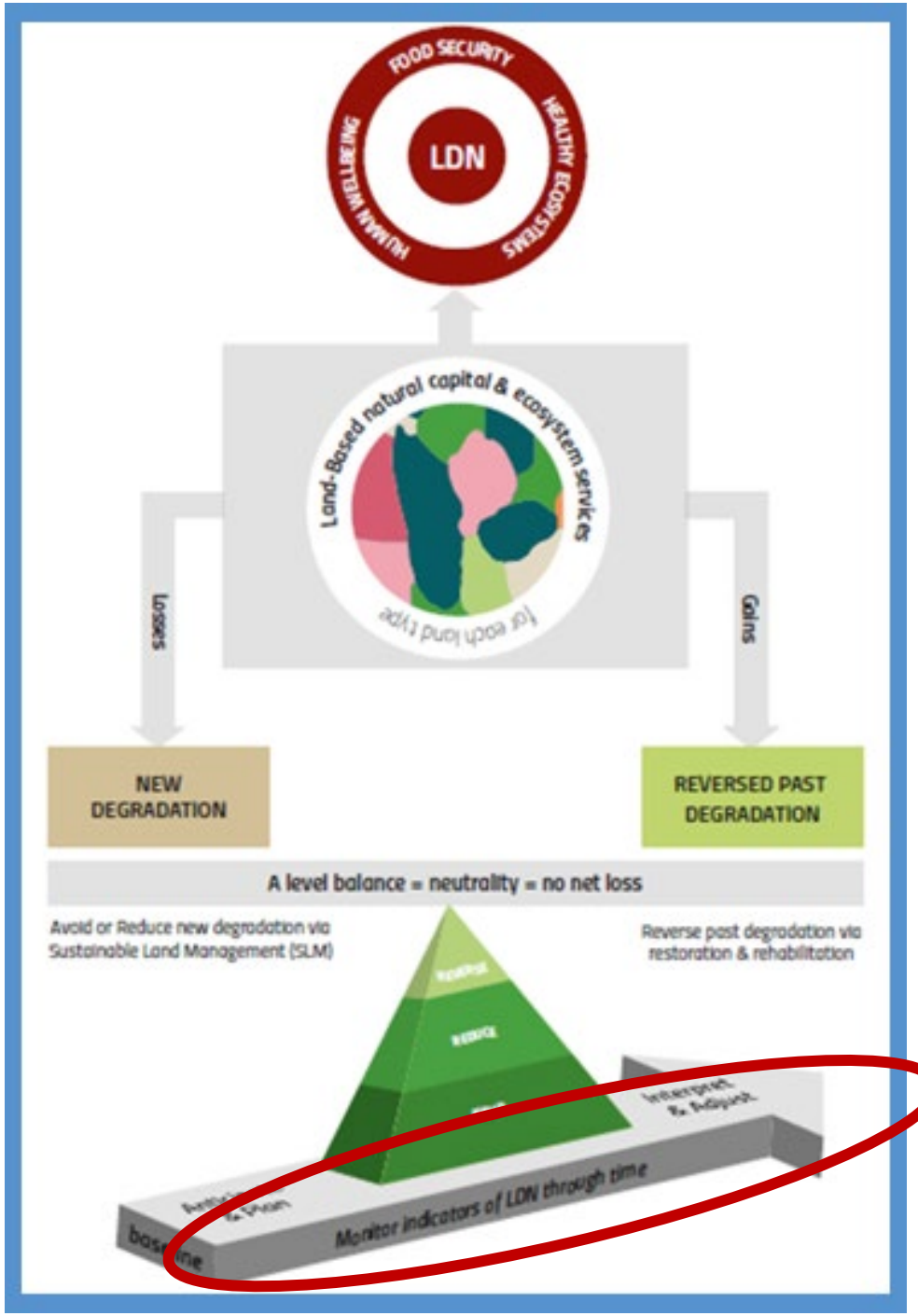


Avoid: Land degradation can be avoided by addressing drivers of degradation and through proactive measures to prevent adverse change in land quality of non-degraded land and confer resilience, via appropriate regulation, planning and management practices.

Reduce: Land degradation can be reduced or mitigated on agricultural and forest land through application of sustainable management practices (sustainable land management, sustainable forest management).

Reverse: Where feasible, some (but rarely all) of the productive potential and ecological services of degraded land can be restored or rehabilitated through actively assisting the recovery of ecosystem functions.

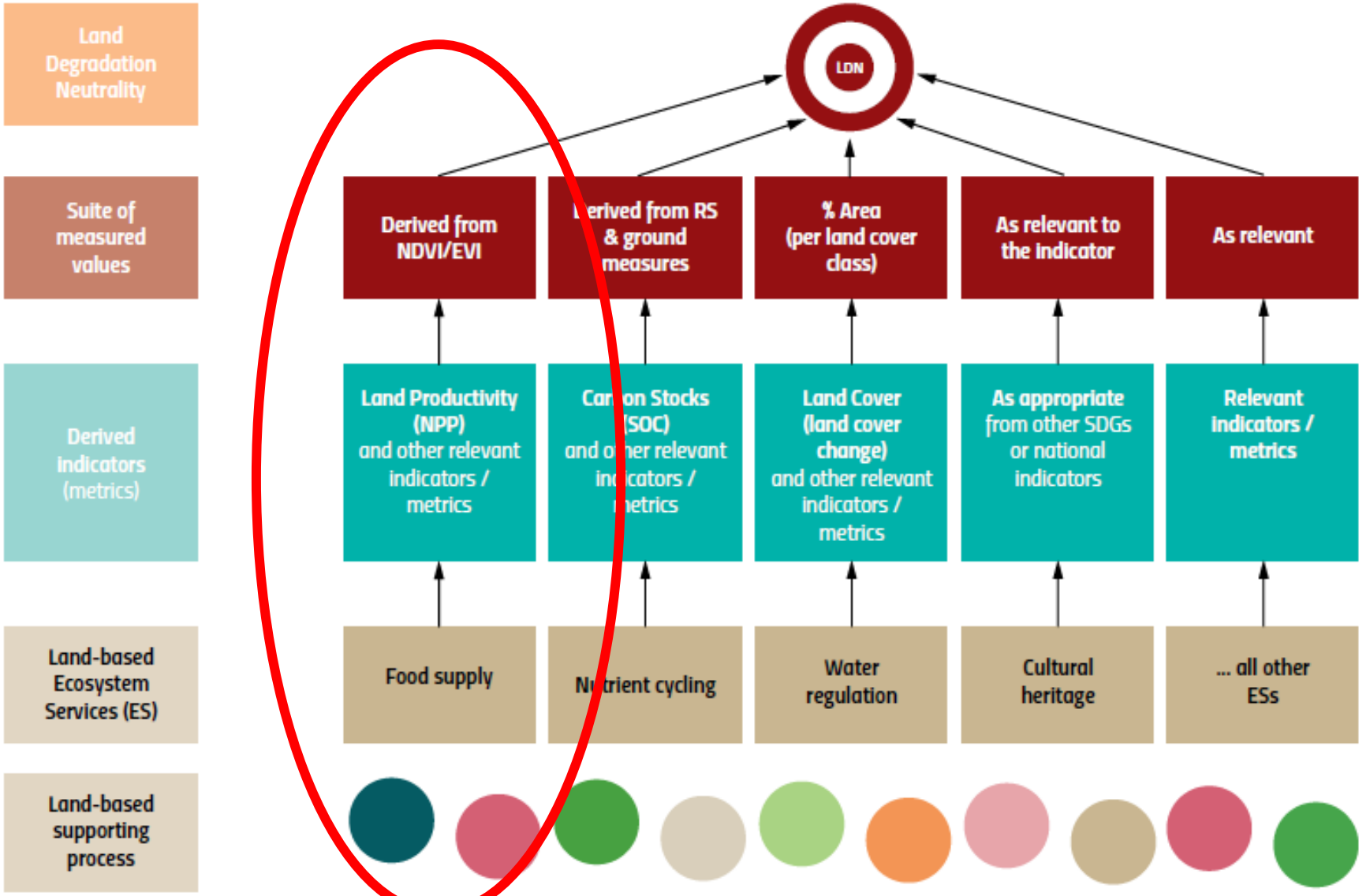


Monitoring and learning

United Nations
Convention to Combat Desertification

- Global indicators: Land cover, land productivity and soil organic carbon
- “One out, all out”, area basis
- Complemented by:
  -Locally-relevant indicators
  -Process indicators
  -Outcome indicators
- Verified using local knowledge (multi-stakeholder platforms nested across scales)

Selection of indicators based on ecosystem functions that provide ecosystem services



The LDN framework does not prescribe how to measure the indicators.

It recommends effort to achieve consensus on **common criteria** and **standards** to harmonize application.

Monitor indicators relative to the baseline

The combination = SDG indicator 15.3.1

SDG Target 15.3:

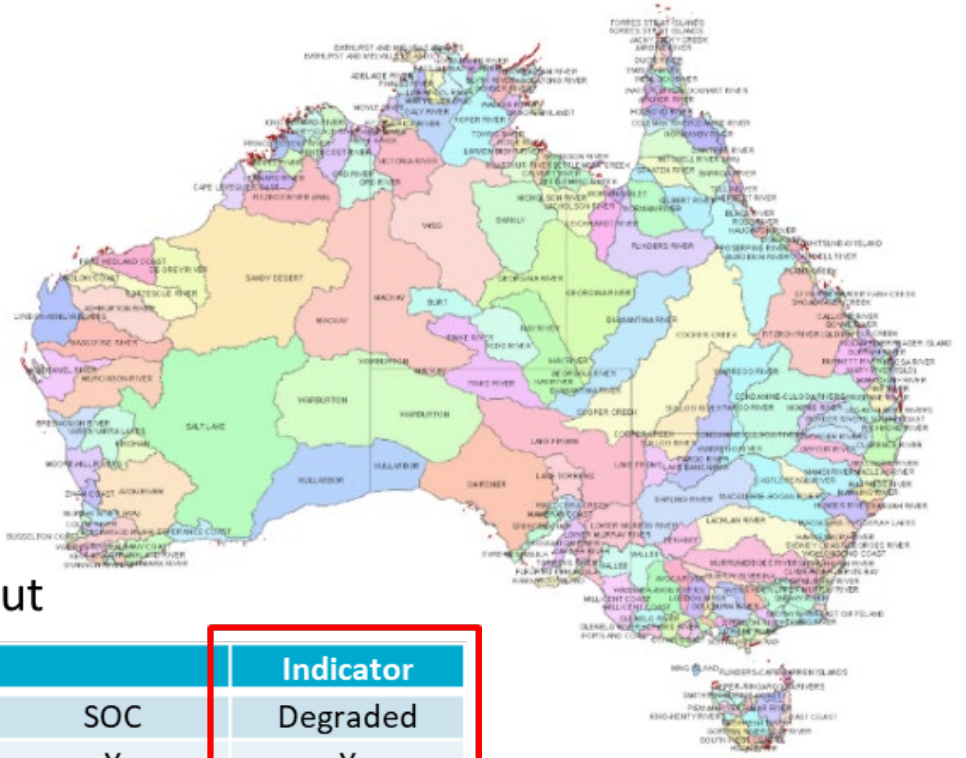
“By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation neutral world”

SDG Indicator 15.3.1:

Proportion of land that is degraded over total land area.

Calculating SDG 15.3.1

- One-Out-All-Out
- Aggregation
- Accuracy assessment



One-Out-All-Out

	Sub indicator			Indicator
Support Class	Land cover	Productivity	SOC	Degraded
1	Y	Y	Y	Y
2	Y	Y	N	Y
3	Y	N	Y	Y
4	Y	N	N	Y
5	N	Y	Y	Y
6	N	Y	N	Y
7	N	N	Y	Y
8	N	N	N	N

How do we move from “choosing the best data set or tool” to mobilizing the entire Earth observation community to help?

Engage a multilateral process which is designed to do just this:

The Group on Earth Observations

How do we move from “choosing the best data set or tool” to mobilizing the entire Earth observation community to help?

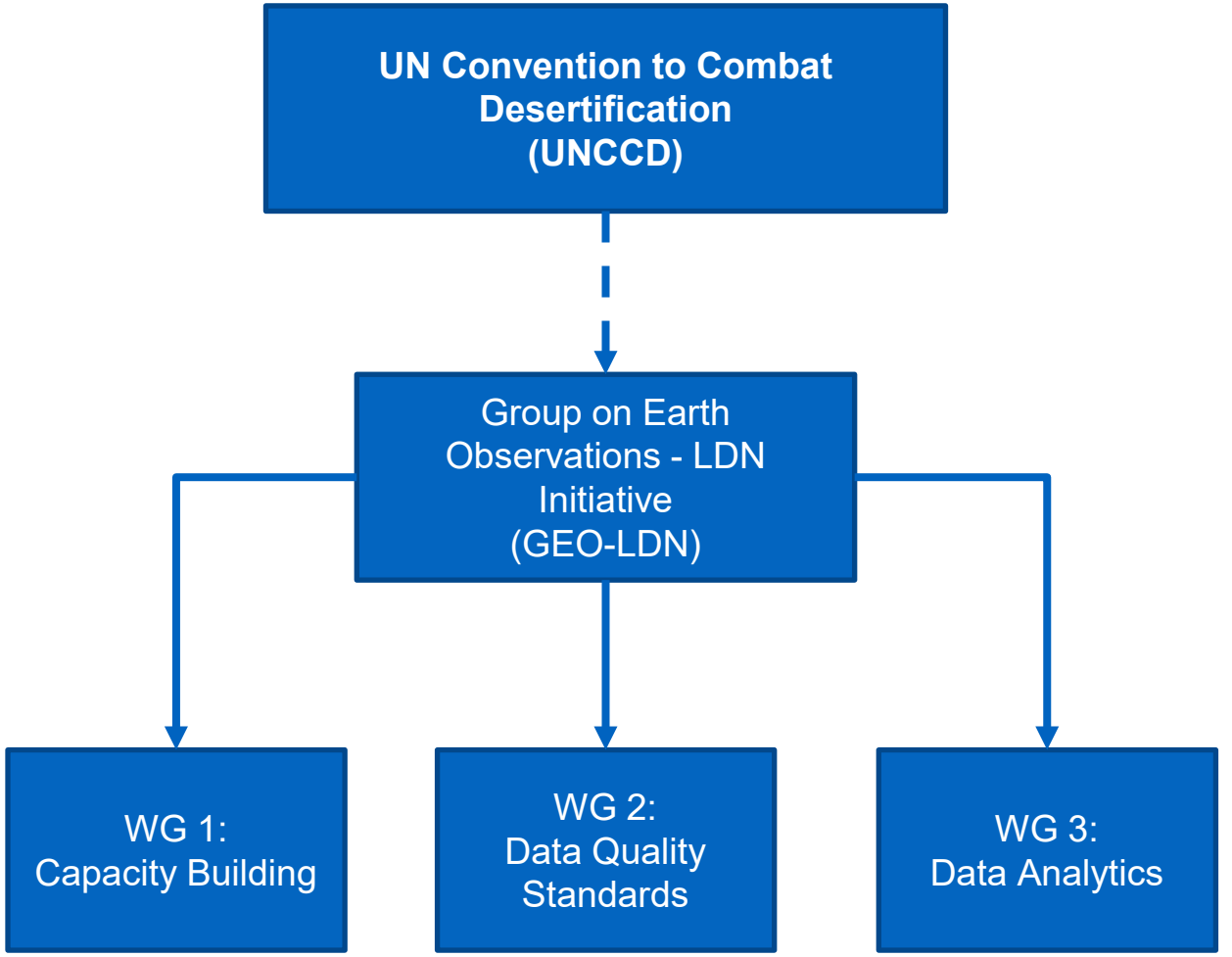
LAND
DEGRADATION
NEUTRALITY

LAND DEGRADATION NEUTRALITY

…is a unique **stakeholder-driven initiative** with a clear policy mandate from UNCCD

…helps national and local actors in all countries **use Earth observations to achieve LDN.**

... promotes and supports the collaborative development, provision and use of EO datasets, quality standards, analytical tools and capacity building



For more info:
http://earthobservations.org/geo_ldn.php

Mandate for the UNCCD approach to monitoring

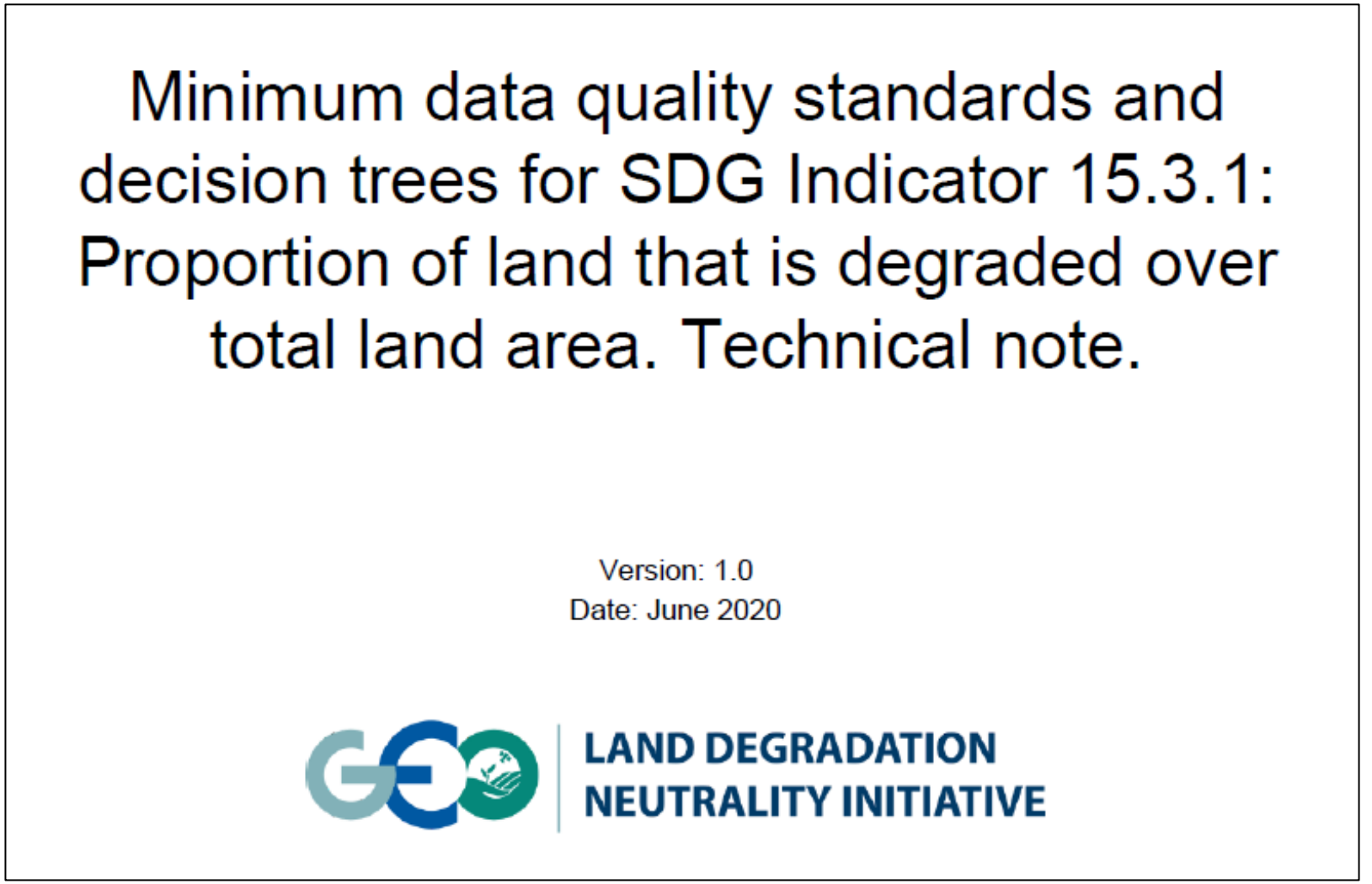
(from decisions 22/COP.11 and 11/COP.14)

Requests the secretariat to **provide** affected country **Parties with national estimates** of each respective metric of a **minimum set** of progress indicators **based on available data sources**

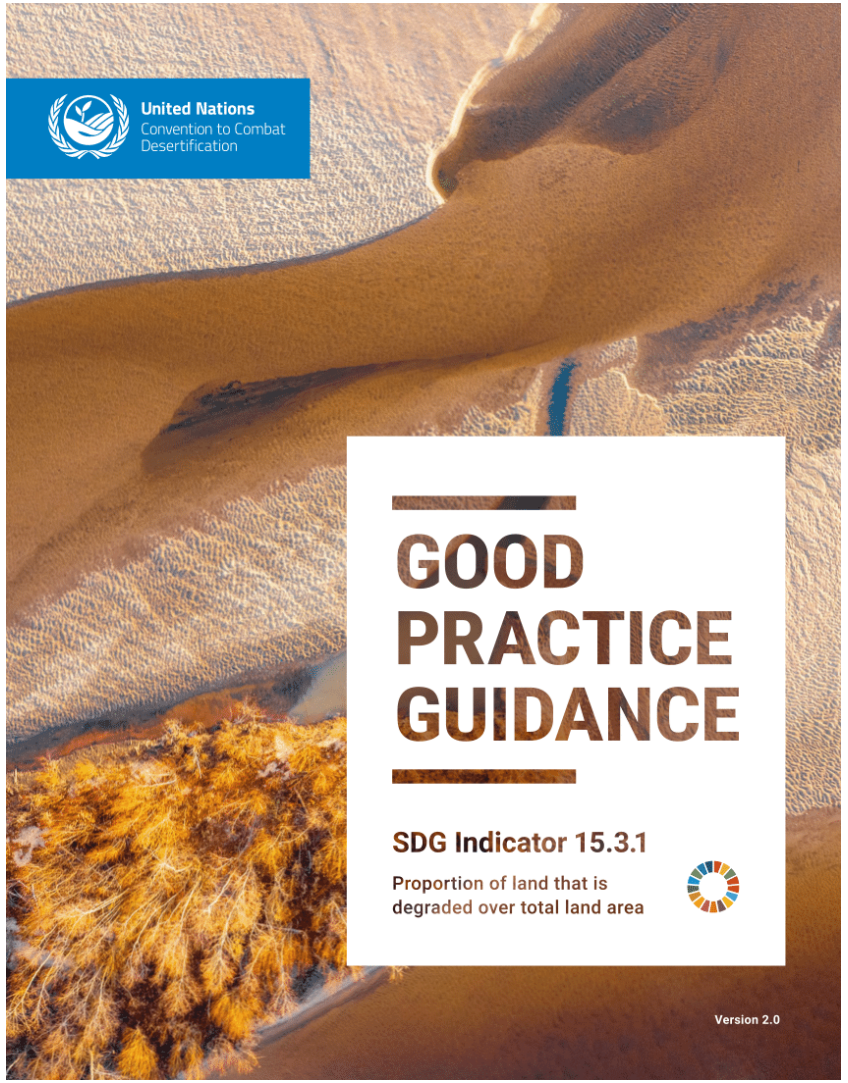
and

urges affected country **Parties to subsequently verify or replace** these national estimates using data sourced/computed nationally/locally

The EO community has embraced standards so that all data providers can support countries



Harmonized analytical methods



- The Good Practice Guidance (GPG) provides the analytical methods for calculating SDG Indicator 15.3.1 using Earth observation data
- Includes guidance the three sub-indicators, which are trends in land cover, land productivity and soil organic carbon stocks.
- Reflects current best practice, data and knowledge
- This guidance supports implementation of the Tier I methods for Indicator 15.3.1 adopted by the UN Statistical Commission

https://www.unccd.int/resources/manuals-and-guides/good-practice-guidance-sdg-indicator-1531-proportion-land-degraded

“National ownership” is about empowering countries to evaluate data sets, analyze data, and transform data according to the Good Practice Guidance

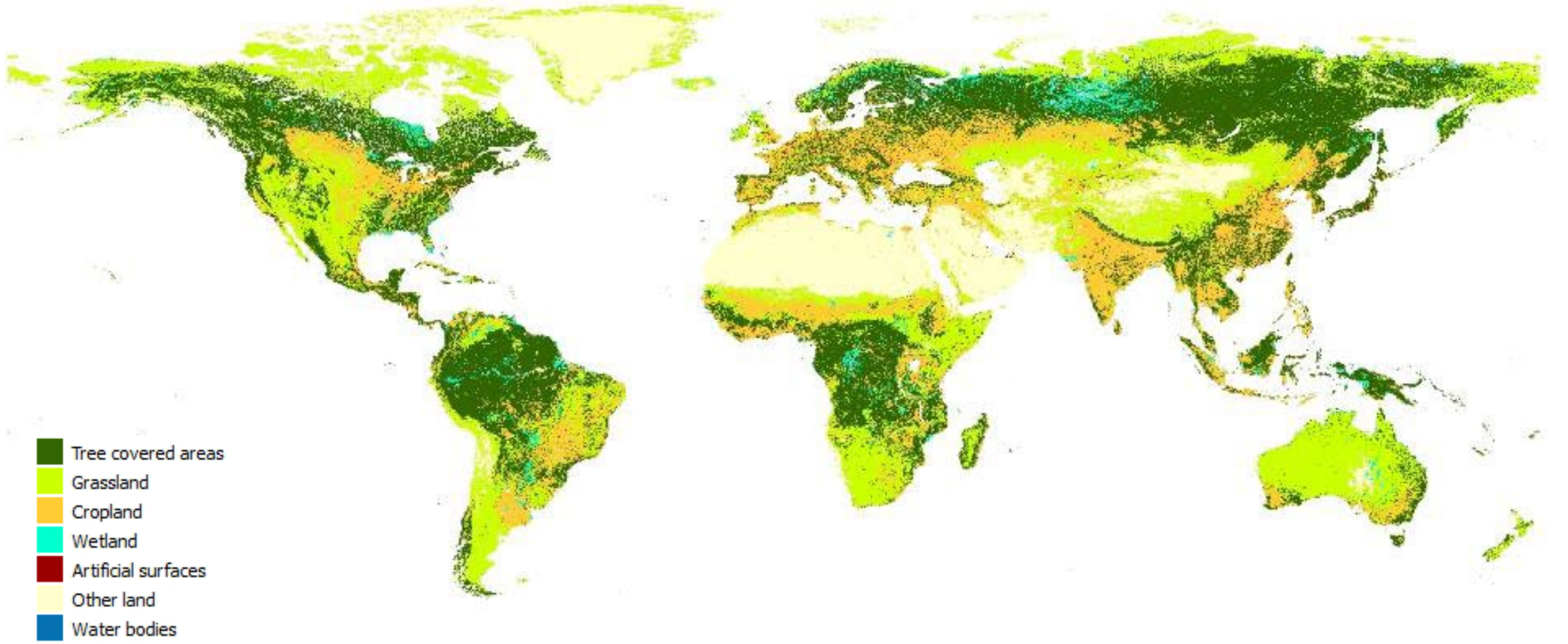
What do *we* measure?

United Nations
Convention to Combat Desertification

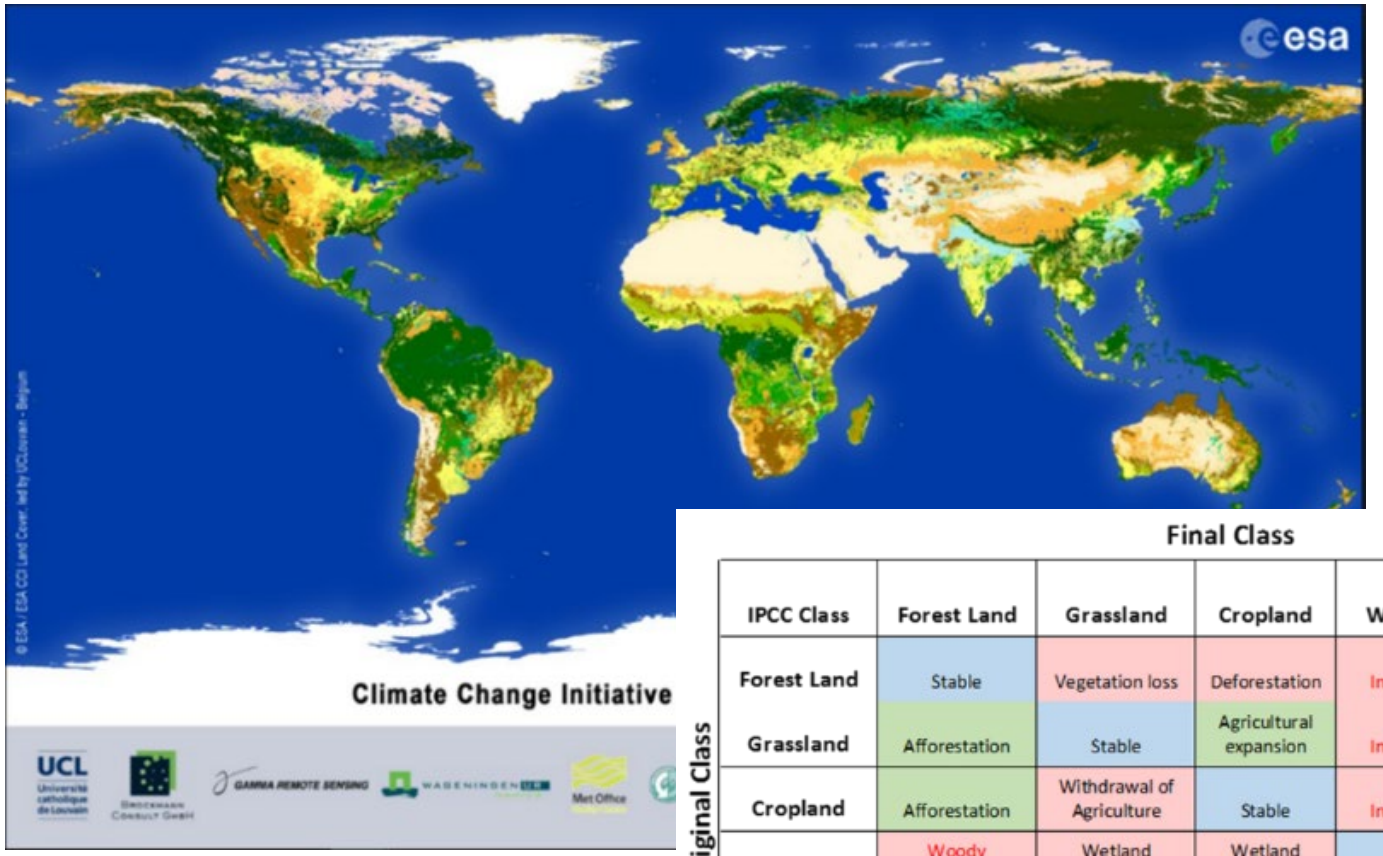
Three essential land degradation indicators are measured in all countries.

Countries also measure any other relevant indicators

Trends in land cover change



Trends in land cover change



**An example only*

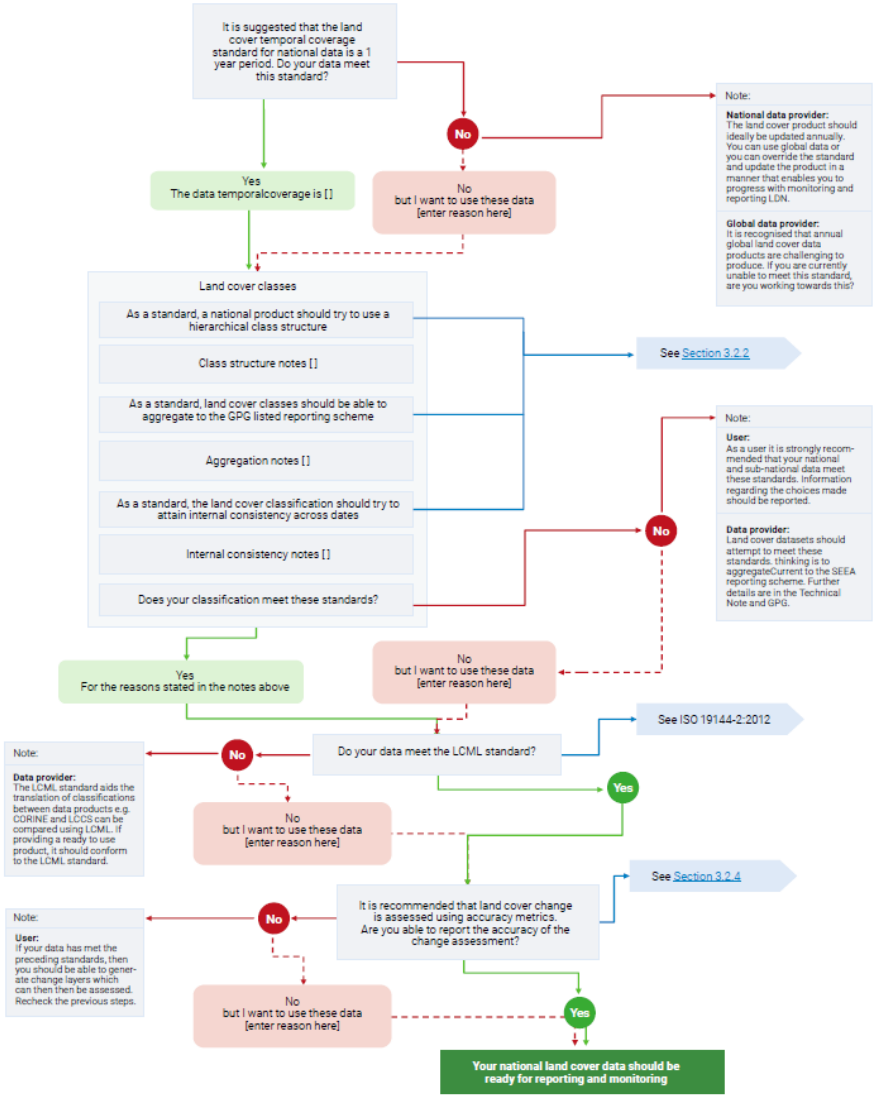
Final Class

Original Class: IPCC Class	Forest Land	Grassland	Cropland	Wetlands	Settlements	Other Land
Forest Land	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
Wetlands	Woody Encroachment	Wetland drainage	Wetland drainage	Stable	Wetland drainage	Wetland drainage
Settlements	Afforestation	Vegetation establishment	Agricultural expansion	Wetland establishment	Stable	Withdrawal of Settlements
Other Land	Afforestation	Vegetation establishment	Agricultural expansion	Wetland establishment	Urban expansion	Stable

https://www.esa-landcover-cci.org

Land Cover – Assess Available Data

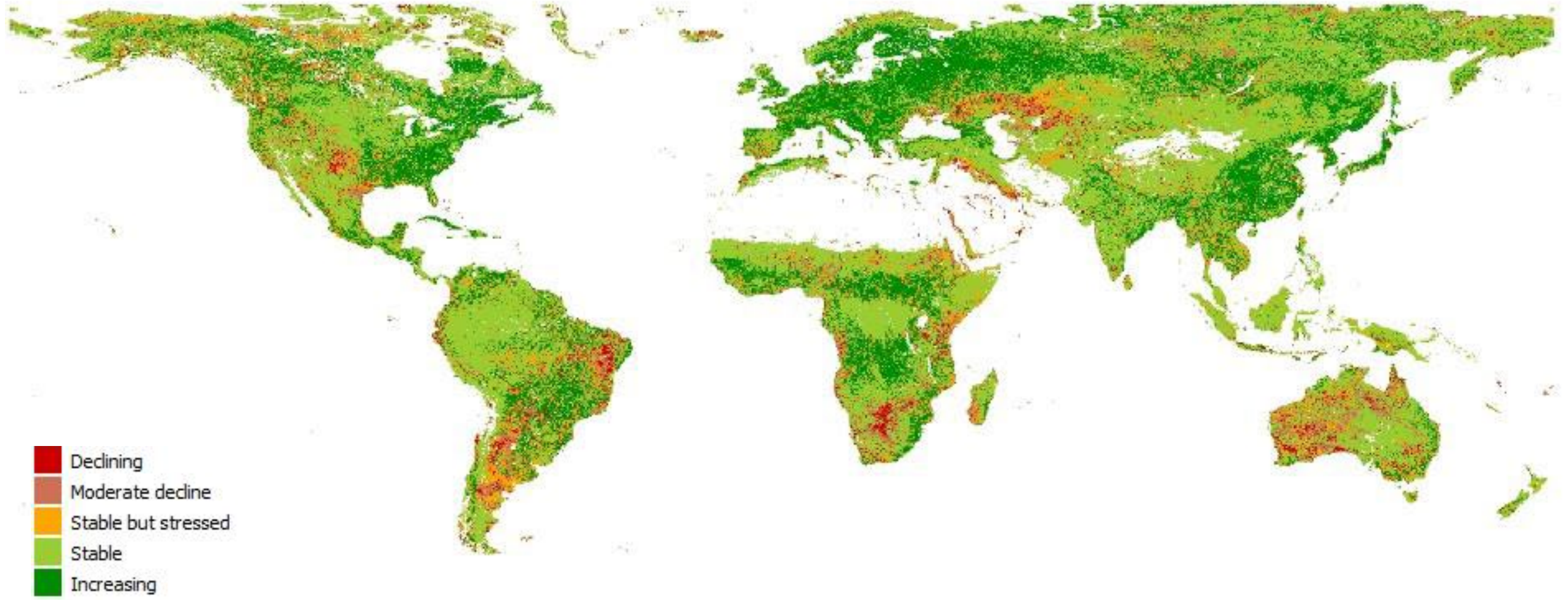
Figure 3-4. *Decision tree for determining the most appropriate data for calculation of the land cover change sub-indicator (GEO-LDN Initiative 2020)*



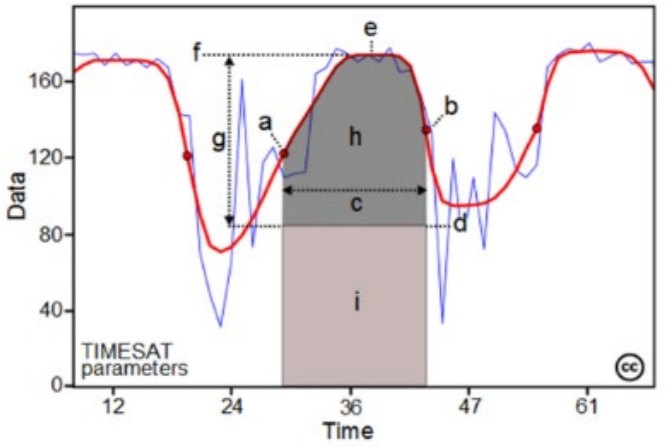
Key Criteria for Assessing LC Data

1. Legend definition:
2. Temporal range and frequency
3. Spatial coverage and resolution
4. Classification accuracy

Trends in land productivity

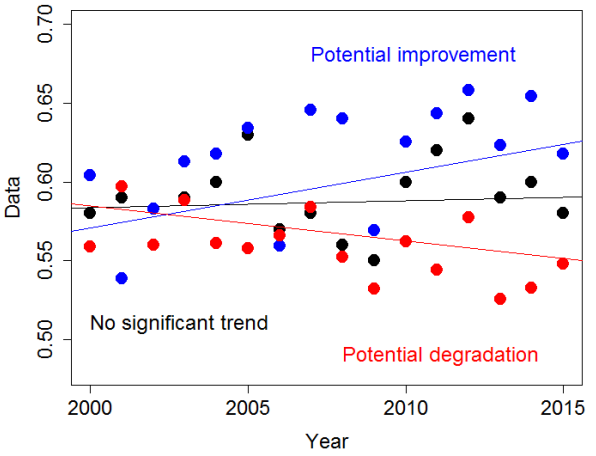


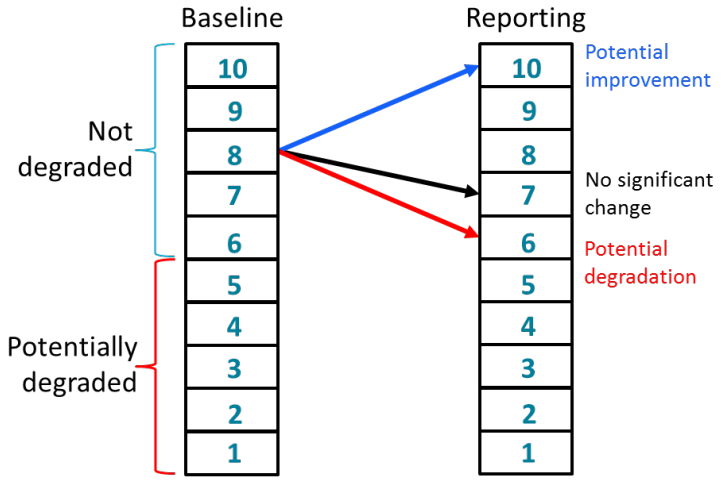
Trends in land productivity



Metrics correlated with ANPP (NDVI etc)

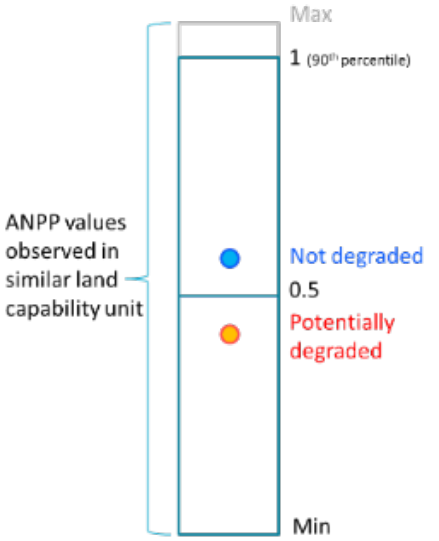
Trend (over time)





State (relative to past)

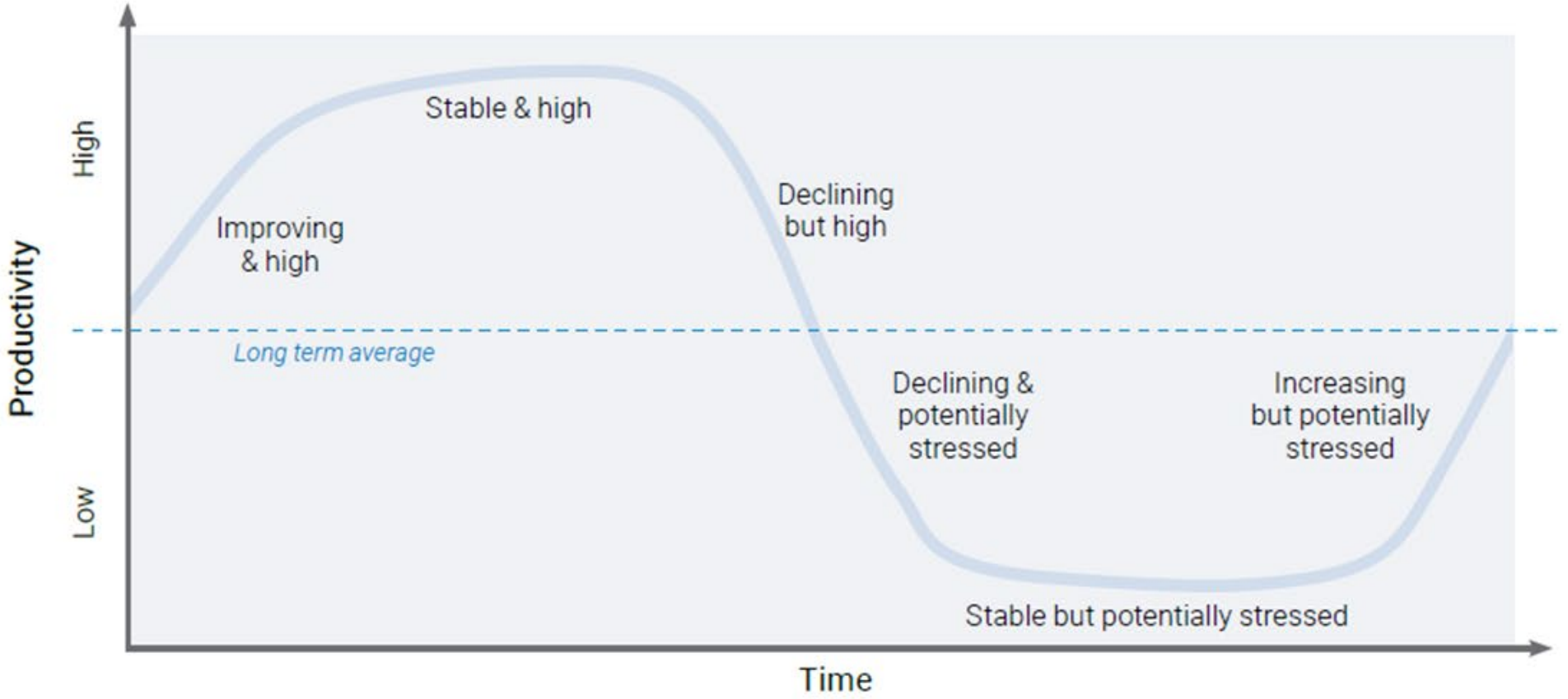
Performance (relative to other similar land capability units)



**water availability*

Land Productivity degradation dynamics

Figure 4-2
Stylised phases in the long-term average trend of land productivity. A declining trend of productivity, or productivity levels that remain below the long-term average, may indicate productivity degradation.



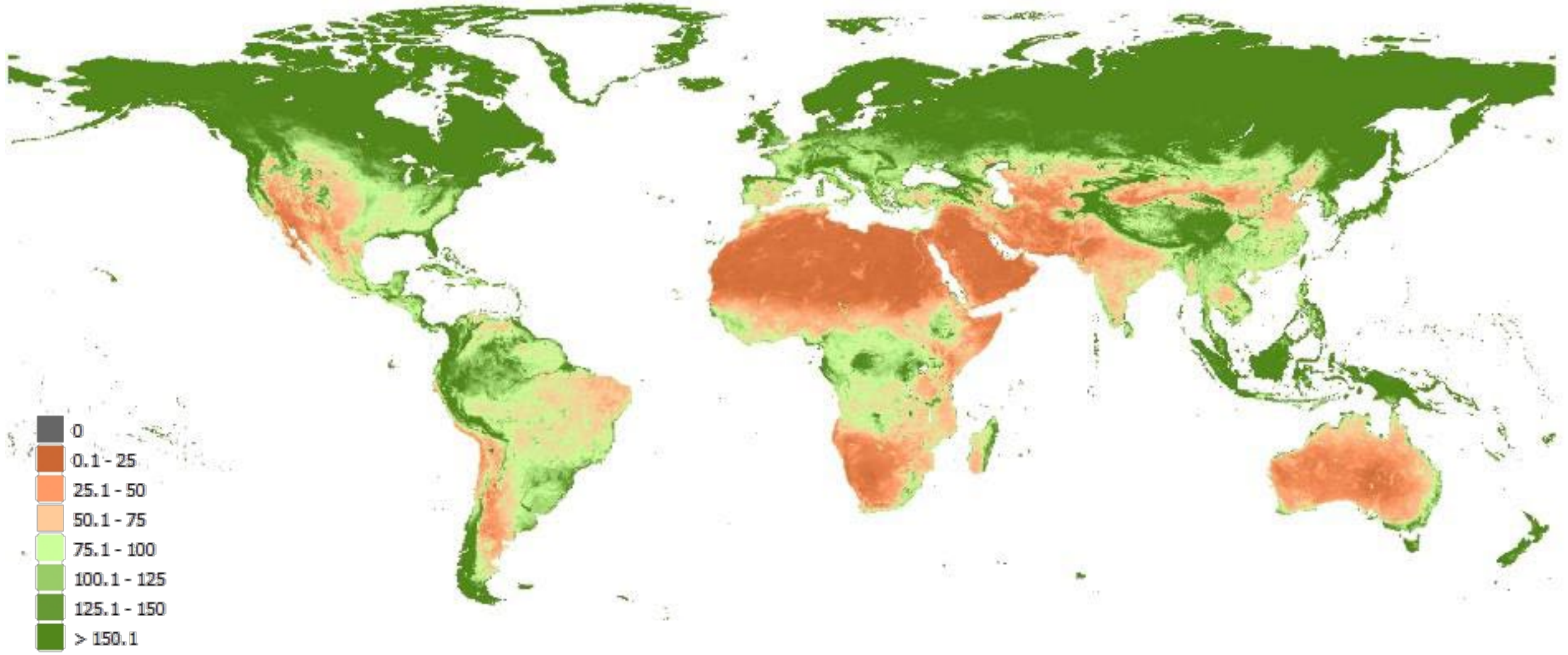
Trajectory and level

Land Productivity metrics

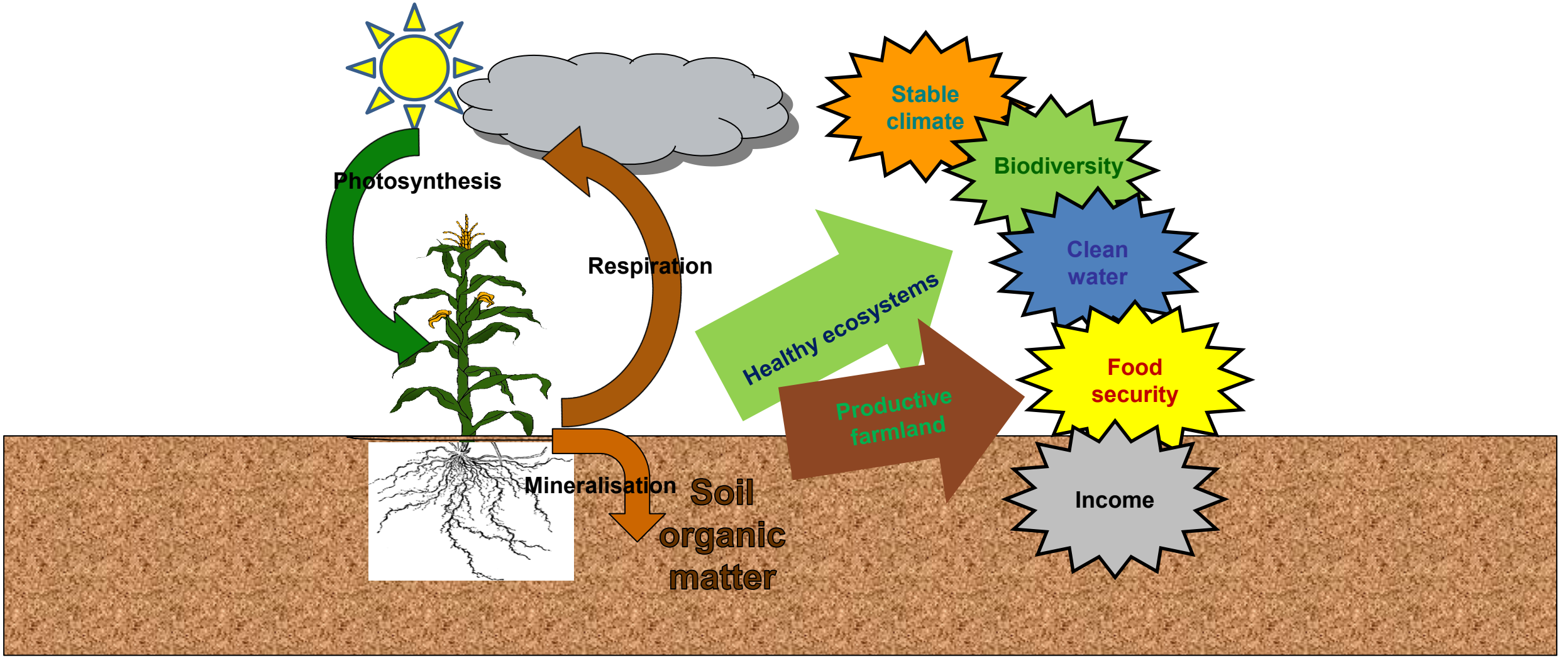
- **Trend**
  - the trajectory of change in annual productivity over the long term per pixel
- **State**
  - compares the current to historical annual productivity per pixel
- **Performance**
  - Compares local annual productivity over an area with other areas with a similar land productivity potential (LCEU)

TREND-STATE-PERFORMANCE – COMBINE TO SHOW PRODUCTIVITY DEGRADATION

Trends in soil organic carbon

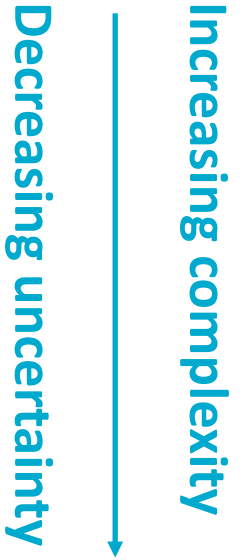


Slow ecological variable: Carbon stored as soil organic matter builds healthy soil and sustains humanity



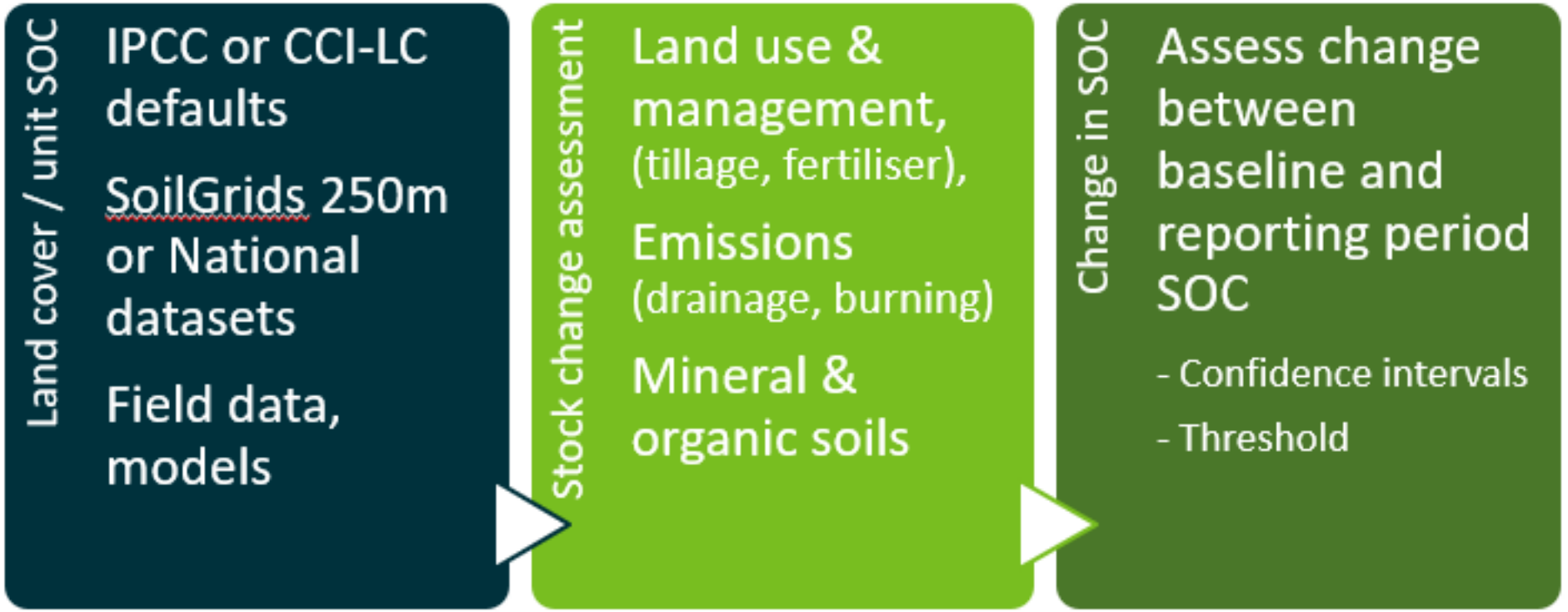
Carbon Stocks – Tiered Approach

- Consistent with IPCC guidelines, supplements & refinements (IPCC 2006; 2013; 2019)
- Tier 1: general methods with default values
- Tier 2: additional use of country-specific data
- Tier 3: more complex methods involving ground measurements & modelling



- It is good practice to use higher tiers for significant sources/sinks.

Trends in soil organic carbon stocks



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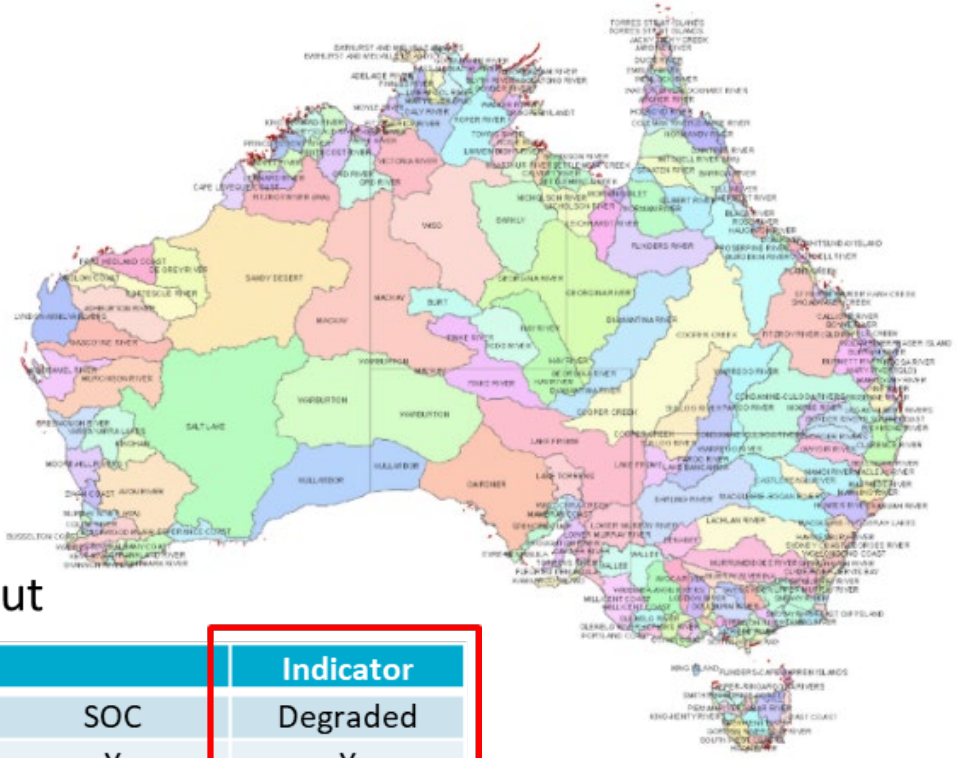

One-Out-All-Out

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5	N	Y	Y	Y
6	N	Y	N	Y
7	N	N	Y	Y
8	N	N	N	N

TRENDS.EARTH

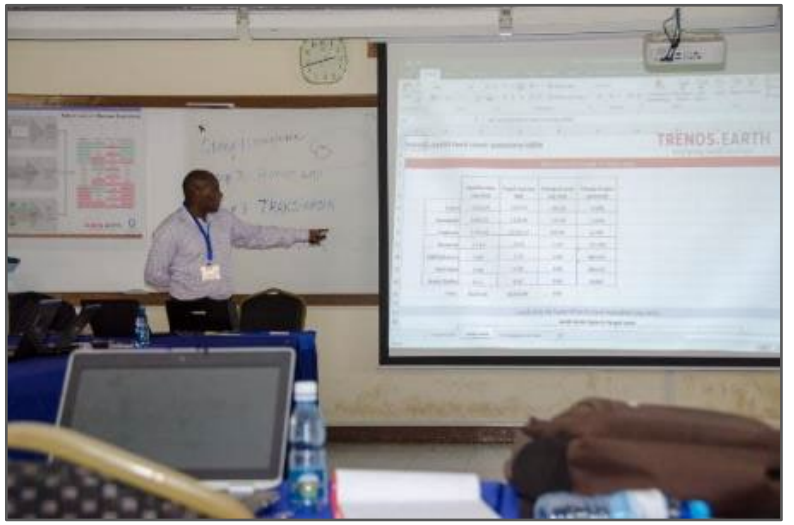
Trends.Earth is a **free and open-source** tool for monitoring indicators of land change, and in particular desertification, land degradation, and drought

Trends.Earth Supports:

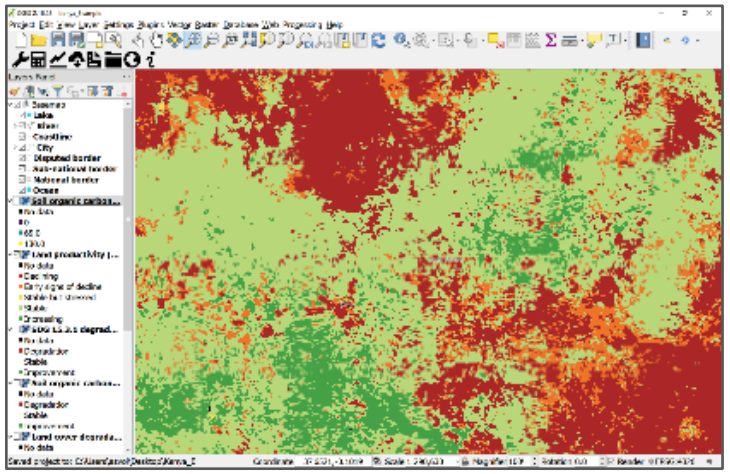
- Monitoring progress towards achieving SDG target 15.3 (land degradation neutrality) and 11.3 (sustainable cities
- Local and cloud-based processing of data
- Summarizing data for reporting to UNCCD
- Integration of local data with global datasets
- Local ownership of data and analytical process

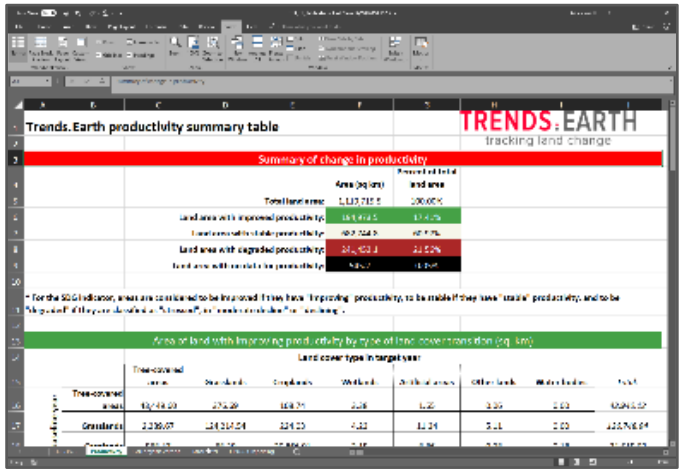
Coming soon:

- All new interface
- Direct support of reporting to UNCCD on Strategic Objectives 1, 2, and 3
- Higher resolution datasets
- Integration with LandPKS, WOCAT



https://www.trends.earth

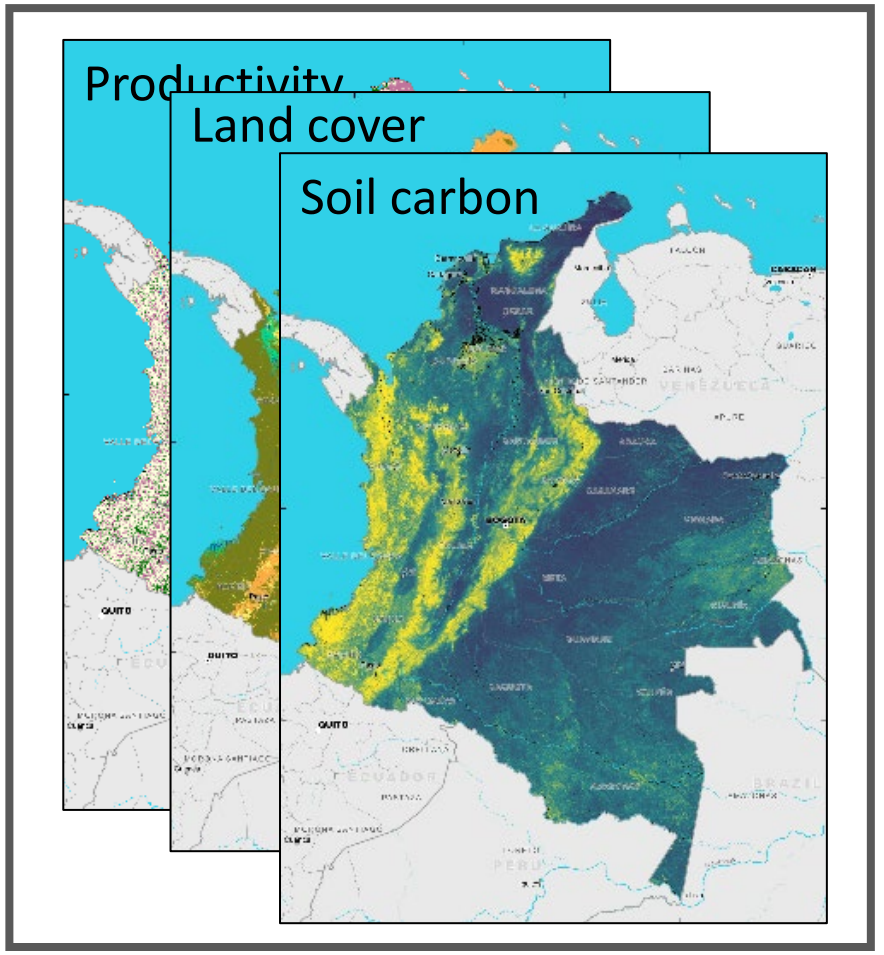


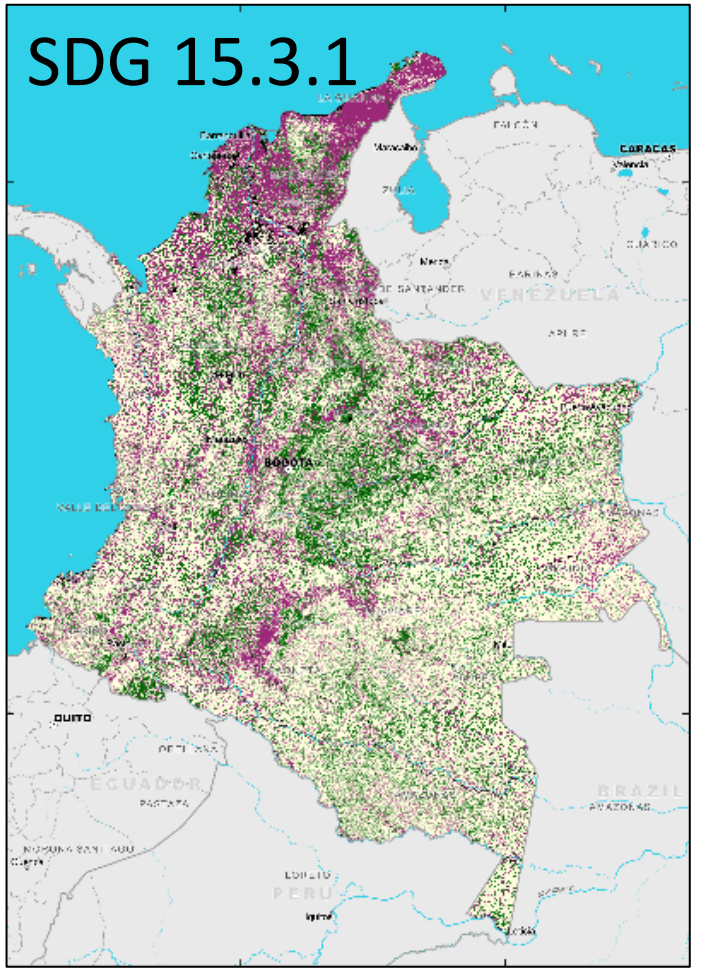


CONSERVATION INTERNATIONAL

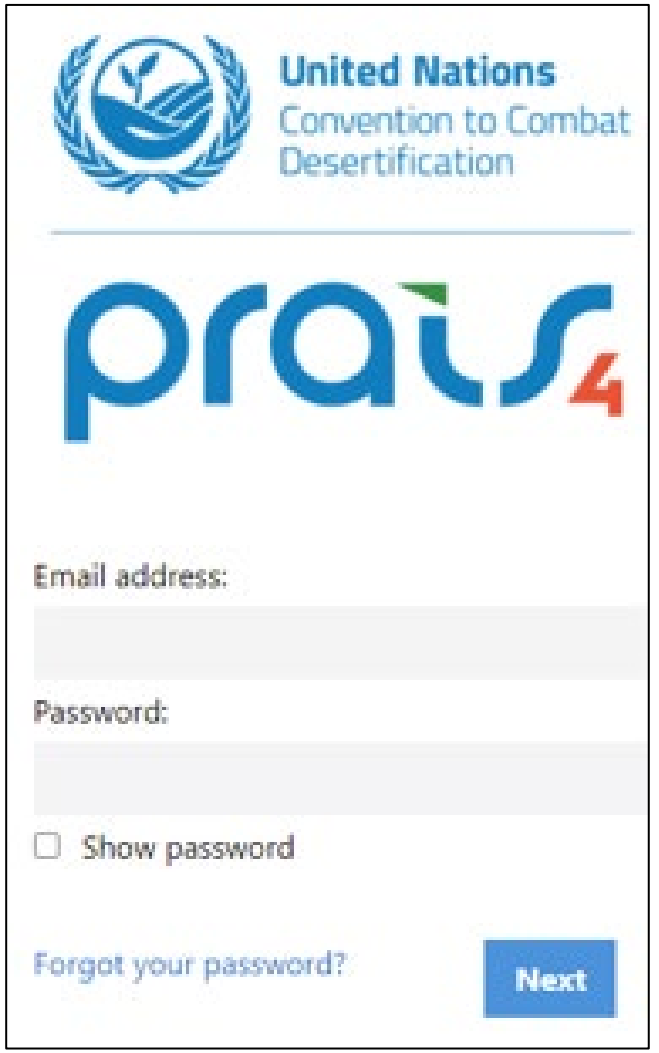
Supported by: gef NASA

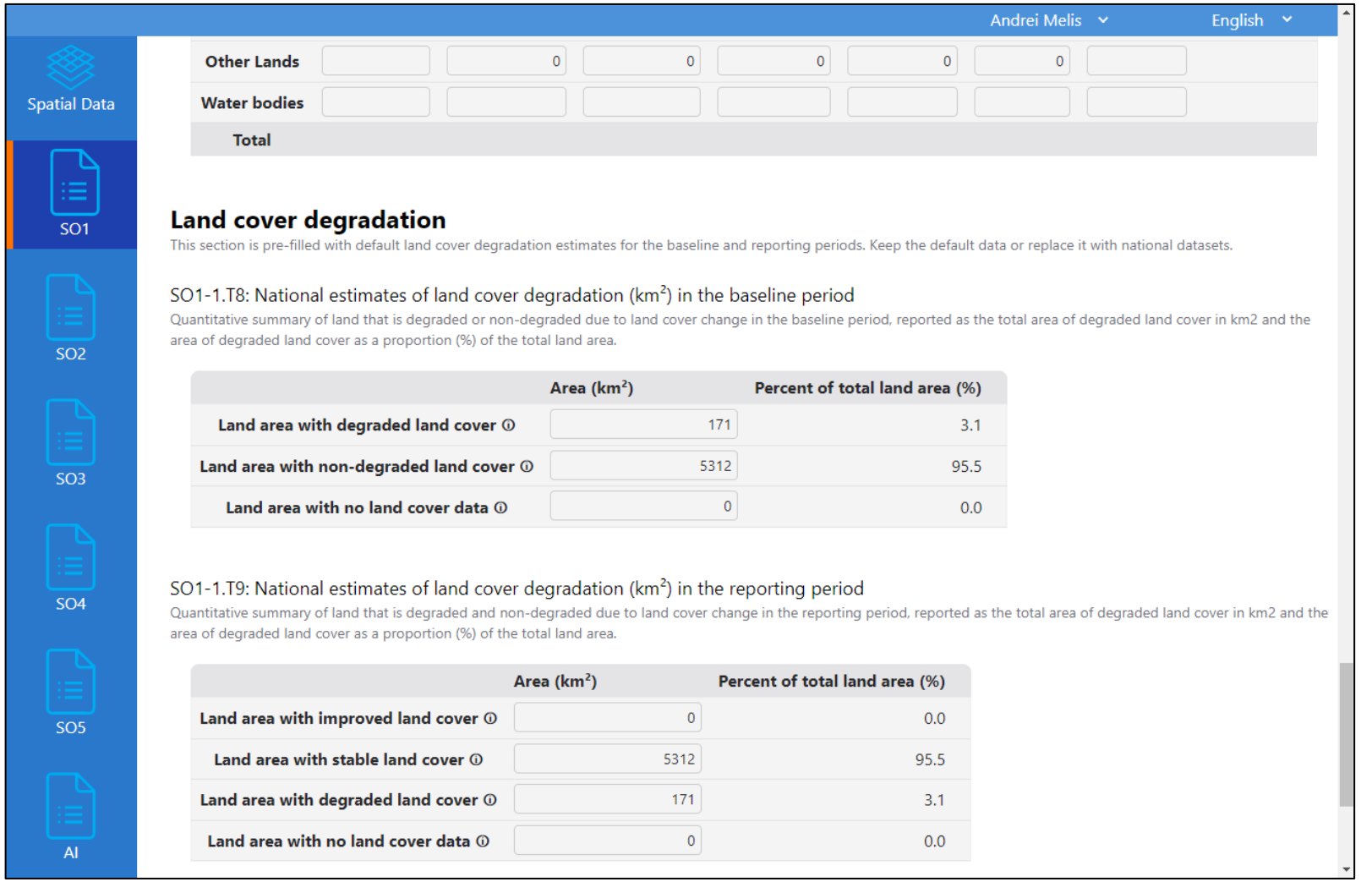
Supporting tracking of land change from local-global scales



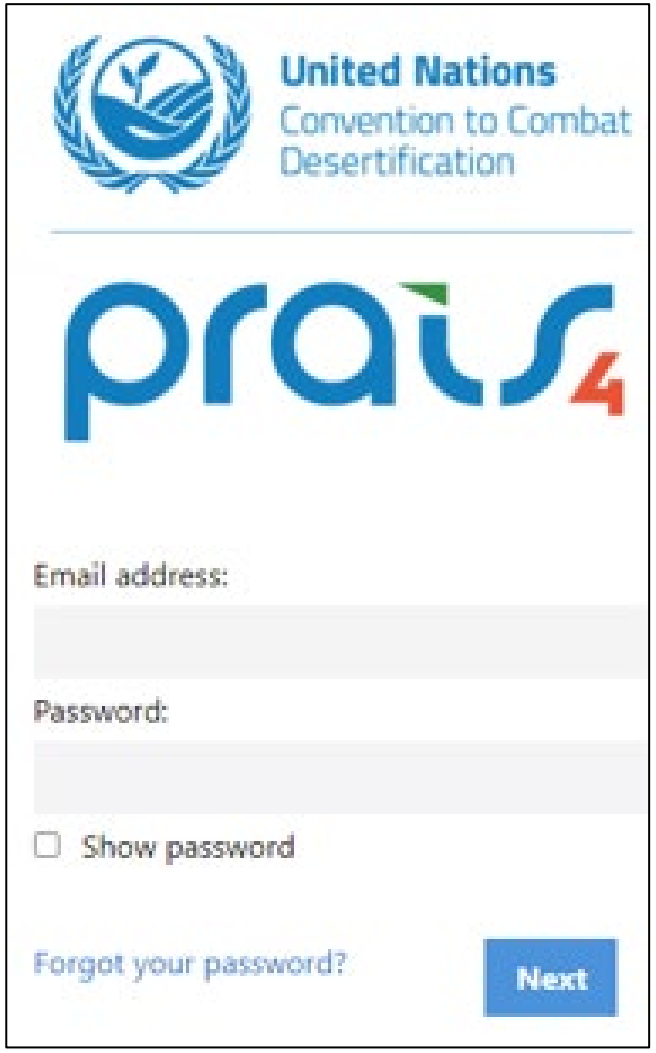


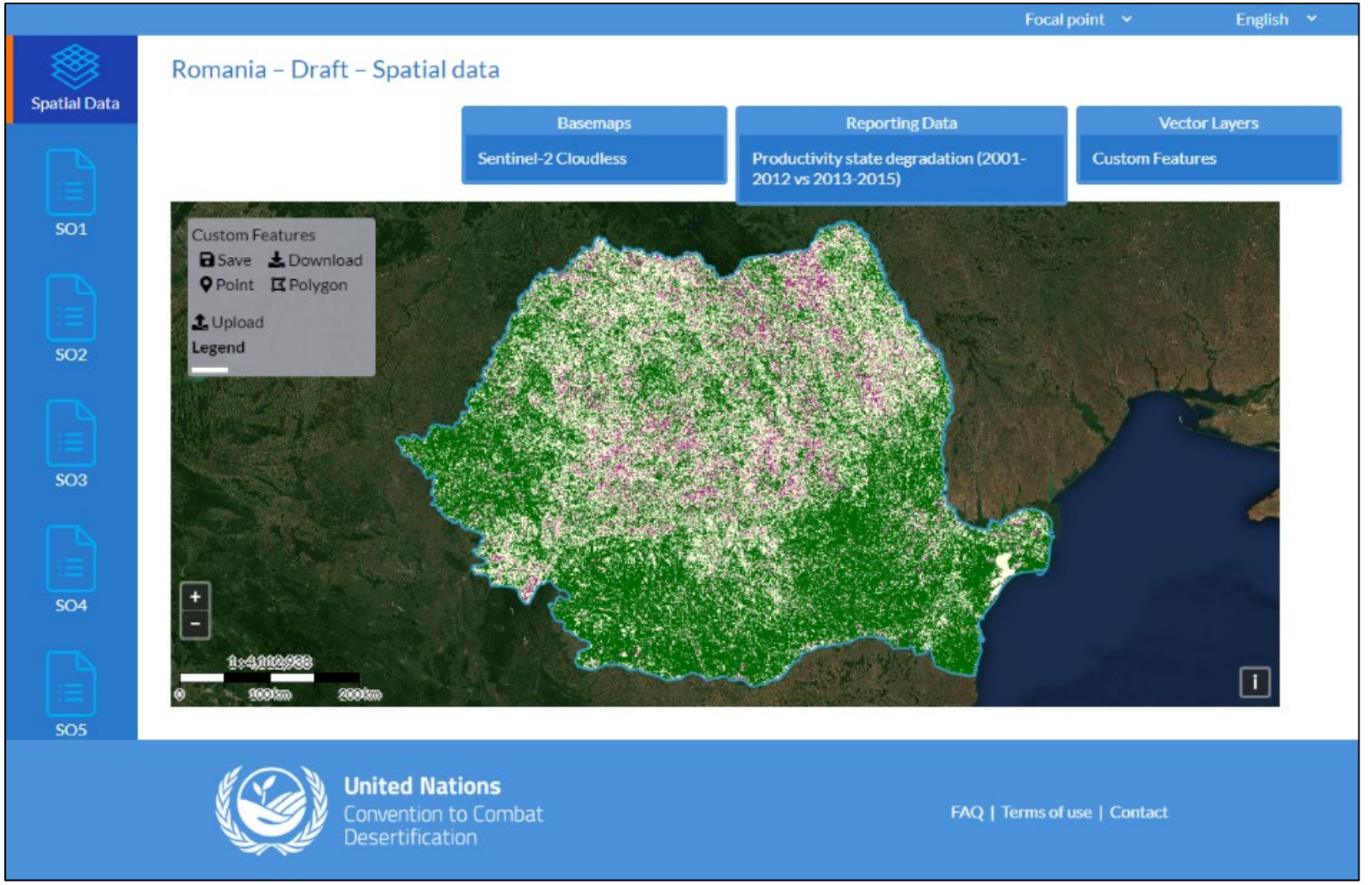
Facilitating national reporting





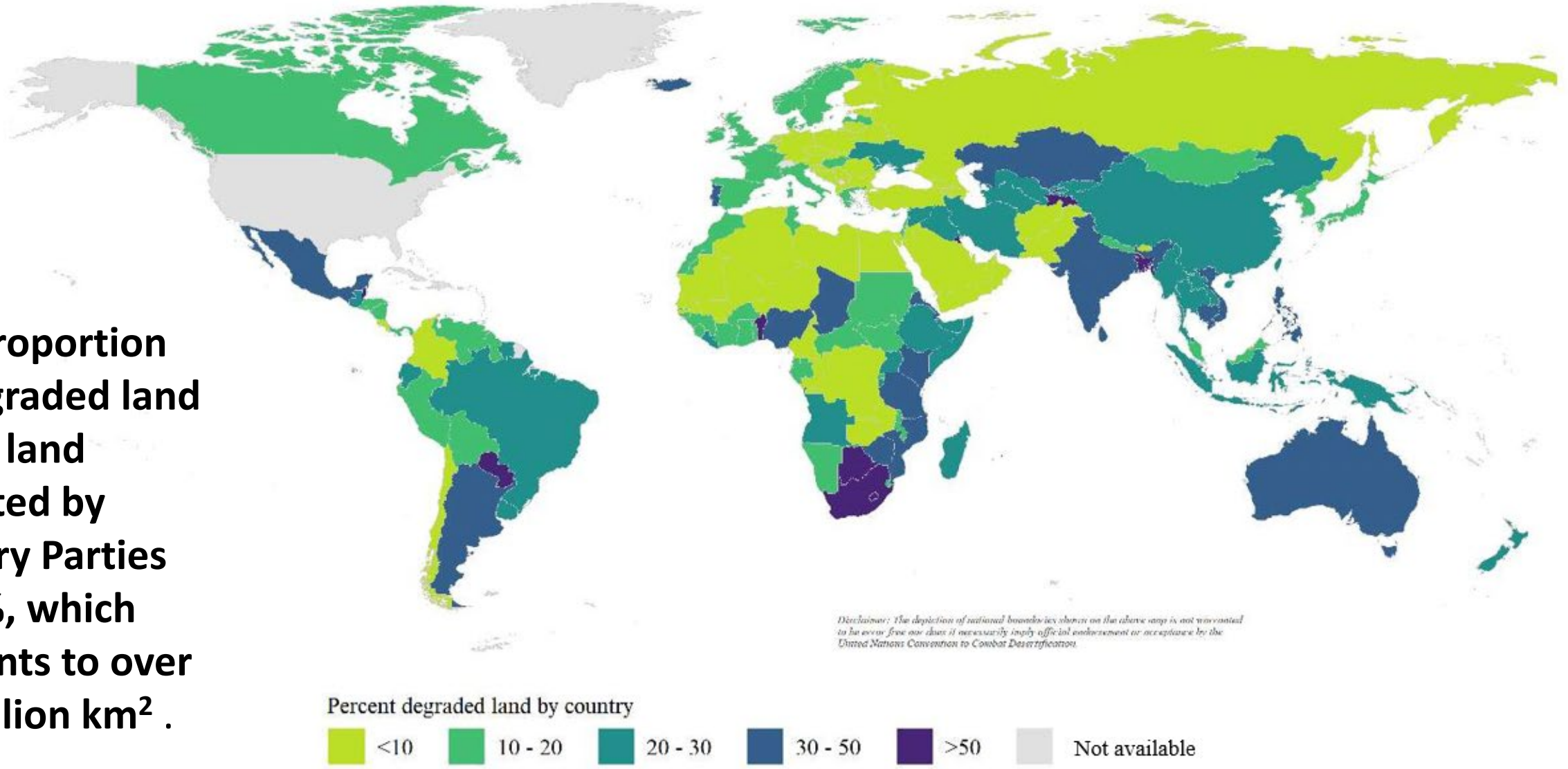
Facilitating national reporting





What was the outcome for SDG 15.3.1 reported by countries in 2019?

The proportion of degraded land for all land reported by country Parties is 20%, which amounts to over 18 million km² .

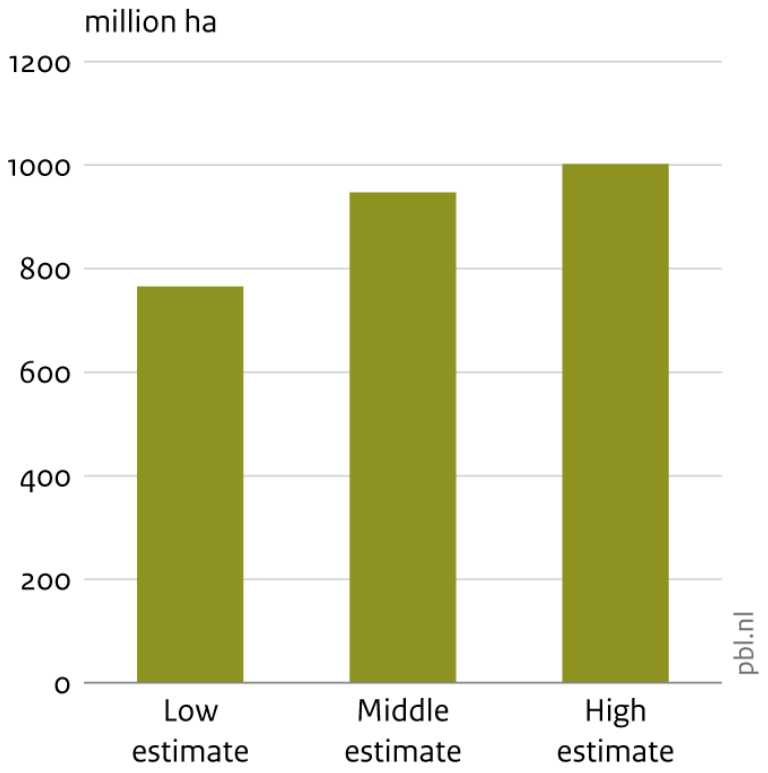


WHERE ARE
WE NOW?

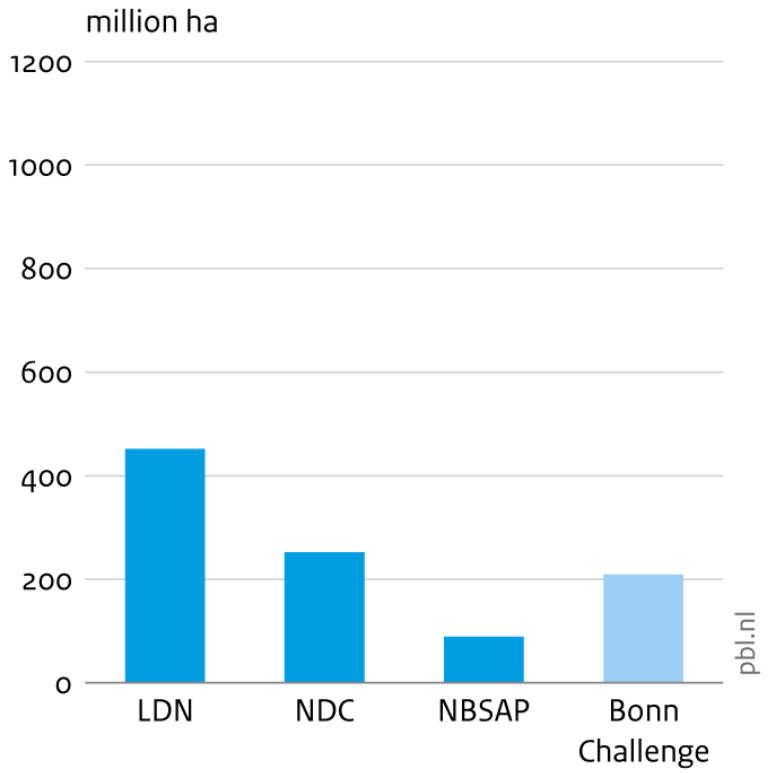
Global Commitments

PBL Netherlands Environmental Assessment Agency

Total estimate range



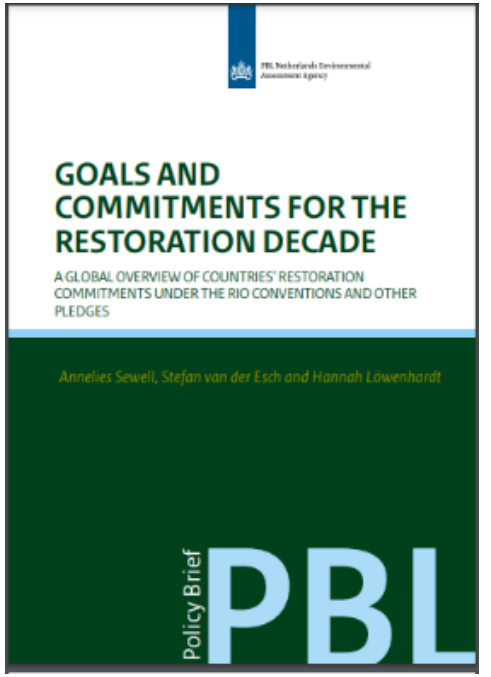
Estimate per data source



Total of national commitments under the Rio Conventions

Total of national commitments under the Bonn Challenge and the associated regional intitiatives

Source: UNCCD, UNFCCC, CBD, Bonn Challenge; collected and adapted by PBL for Global Restoration Commitments database, August 2020



Global total of country restoration commitments:

- **765 million – 1 billion hectares**
- **115 countries**

LDN targets set since 2017

United Nations
Convention to Combat Desertification

450 M ha of ambition so far…

129 countries have committed to set LDN targets (**52 in Africa**)

104 of these have completed setting their LDN targets (**48 in Africa**)

70 of these have formal government-adopted targets **(33 in Africa)**

Thank you!