The Scientific Conceptual Framework for Land Degradation Neutrality

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Science-Policy Interface of the UNCCD
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What is LDN?

Land Degradation Neutrality

“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
The SPI LDN Objective

- **Objective**: Provide scientific guidance to the operationalization of the voluntary land degradation neutrality (LDN) target.  
  *17 Oct 2015, SPI COP.12, Ankara*

- **Scope**: Develop a conceptual framework for LDN and all of its essential components in order to propose a scientific foundation for implementation and monitoring of LDN at national and global scales, serving as a common point of reference for all types of LDN policies, activities and studies.  
  *19 Jan 2016, SPI LDN Objective Action Plan*

10 independent scientists selected globally
5 independent scientists selected regionally
5 scientist delegates (the direct link to policy)
Developing the LDN conceptual framework

- Expert workshop
- “Thought-starter” survey (SPI team members and external experts) to establish scope, approach
- Internal review
- Collaboration with UNCCD Global Mechanism LDN Target setting programme
- In-depth external review
- COP Bureau review
- CRIC 15 and SPI presentations
Author team

External experts
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UNCCD Secretariat/GM
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• Alexander Erlewein
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• Sven Walter
External Peer Review Process

- Independent external peer review process as agreed by UNCCD COP.12 Decision 19
- 8 external reviewers:
  - **Richard Escadafal**: Centre d’Etudes Spatiales de la Biosphere, Toulouse & French Scientific Committee for Desertification
  - **Jeffrey Herrick**: USDA Agricultural Research Service & CST
  - **Pavel Krasilnikov**: Moscow Lomonosov State University
  - **Graham von Maltitz**: CSIR South Africa
  - **César Morales**: University of Chile & CEPAL (Economic commission for Latin America and the Caribbean)
  - **Uriel Safriel**: Hebrew University Jerusalem
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  - **Lindsay Stringer**: University of Leeds
Land in Balance
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September 2016
Technical Report

Scientific Conceptual Framework for Land Degradation Neutrality

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Land Degradation Neutrality

“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
Vision of LDN

Healthy ecosystems
Food security
Human wellbeing
Mechanism for achieving neutrality

Neutrality = **no net loss** compared to the reference state (baseline)

Baseline is NOW (current condition)

**Counterbalancing** future land degradation (anticipated **losses**) through planned measures to achieve equivalent **gains** elsewhere within the same **land type**

“like for like”
Response Hierarchy

*Prevention is better than cure*

Avoiding degradation is the highest priority, followed by reducing degradation and finally reversing past degradation.
Options for reversing land degradation

• **Restoration**: assisting recovery of a degraded ecosystem, with aim to re-establish pre-existing biodiversity, in terms of species composition and community structure

• **Rehabilitation**: Actions undertaken to reinstate ecosystem functionality, where the focus is on provision of goods and services rather than *restoration*
Sustainable Land Management

The use of land resources, including soils, water, animals and plants, for the production of goods to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental functions. Source: WOCAT
Preliminary assessments

- Ensure enabling environment
- Land potential assessment and Land stratification
- Land degradation assessment
- Resilience assessment
- Socio-economic assessment
- Gender considerations
Integrated land use planning

LDN planning involves anticipating where degradation is likely so that the optimal mix of interventions across the landscape to achieve neutrality can be pursued.

Leverage existing land use planning
Projecting the impacts of land use decisions

A Map of Land Types

Context*

Preparation for Integrated Land Use and Management Planning (t0)

Decisions

Anticipated Change in Metrics (t1)

Projected Gains vs. Losses (t1 - t0)

A1
Land Area: 15,000 ha
Use: short grazing period
Status: Not Degraded

Grazing period extended

Loss: 15,000 ha degradation anticipated

A2
Land Area: 25,000 ha
Use: grazing excluded
Status: Not Degraded

Livestock exclusion maintained

Stable: 25,000 ha no change anticipated

A3
Land Area: 10,000 ha
Use: long grazing period
Status: Degraded

Long grazing period continued

Loss: 10,000 ha degradation anticipated

A4
Land Area: 40,000 ha
Use: med. grazing period
Status: Degraded

Sustainable grazing management introduced

Gain: 40,000 ha improvement anticipated

A5
Land Area: 10,000 ha
Use: short grazing period
Status: Not Degraded

Urban expansion

Loss: 10,000 ha degradation anticipated

Legend

- Stable (no change)
- Degraded land or anticipated negative change
- Not degraded land or anticipated positive change

Land Degradation Neutrality Status Anticipated
Net Gain: 5,000 ha
Monitoring LDN status
Selection of indicators based on ecosystem services to be monitored
Ecosystem services derived from land-based natural capital: mapping indicators

External Drivers / Pressures
- Natural
  - Climate change
  - Natural disasters/extreme events
- Exacerbated by:
  - Geology/geomorphology
  - Topography
  - Soil properties
  - Biodiversity
- Anthropogenic
  - Population change
  - Migration impacts
  - Policy impacts
  - Globalization impacts
  - Market price shocks
  - Instability-insecurity-conflict
  - Negative land use change
  - Unsustainable farming practices
  - Unsustainable forestry practices
  - Unsustainable mining practices
  - Infrastructure design/urbanisation
  - Ineffective governance
  - Land tenure insecurity
  - Poor land use planning
  - Inappropriate technology
  - Waste, pollution

Degradation Processes
- Landscape modification
- Soil erosion by water and wind
- Soil surface sealing, compaction
- Soil salinisation & alkalisation
- Soil acidification
- Soil fertility decline
- Soil contamination
- Soil extraction
- Aridification
- Decline in vegetation cover
- Decline in vegetation community functioning
- Decline in biomass
- Decline in biodiversity
- Depletion of seed bank
- Increase in weeds
- Increase in invasive species
- Habitat loss
- Hydrological modification
- Change in groundwater level/quality

Legend:
- Properties
- Processes
- Drivers
- LDN and other Indicator/metric examples:
  - Land productivity/NPP
  - Land cover/LC change
  - Biodiversity/Red List Index
  - Carbon stocks/SOC
  - Other SDG indicator
  - Other national indicator

Inherent Properties
- Slope
- Orientation
- Soil depth
- Soil texture
- Clay types
- Stoniness
- Soil strength and structure (subsoil)
- Parent material
- Biodiversity

Manageable Properties
- Nutrient levels
- Soil organic matter
- Temperature
- Soil pH
- Macroporosity
- Bulk density
- Soil strength and structure (topsoil)
- Size of aggregate (topsoil)
- Sedimentation
- Land cover
- Vegetation community structure
- Water table

Ecological Services
- Cultural Services
  - Cultural heritage
  - Recreation & tourism
- Regulating Services
  - Regional climate regulation
  - Climate change mitigation
  - Disaster risk reduction (flood, drought, soil erosion)
  - Regulation of pests and diseases
  - Pollination
  - Water regulation
- Provisioning Services
  - Food
  - Water
  - Fibre, wood products
  - Medicinal resources
- Supporting Services
  - Primary production
  - Nutrient cycling
  - Water cycling
  - Soil formation
- Biodiversity
  - Biodiversity conservation
  - Soil biodiversity
  - Agrobiodiversity

Human Needs
- Self-actualisation needs
- Esteem needs (psychological)
- Social needs
- Safety & security needs
- Physiological needs

NB: All elements depicted can change over time at different rates

Modified from Dominati et al. 2010

*Services that support all other ecosystem services and also influence natural capital.
†Biodiversity underpins all ecosystem services.
## Monitoring the LDN indicators

### A Map of Land Types

**Land Type “A” = Grassland**

<table>
<thead>
<tr>
<th>A1</th>
<th>Land Area: 15,000 ha Use: short grazing period Status: Not Degraded</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2</td>
<td>Land Area: 25,000 ha Use: grazing excluded Status: Not Degraded</td>
</tr>
<tr>
<td>A3</td>
<td>Land Area: 10,000 ha Use: long grazing period Status: Degraded</td>
</tr>
<tr>
<td>A4</td>
<td>Land Area: 40,000 ha Use: med. grazing period Status: Degraded</td>
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<td>Land Area: 10,000 ha Use: short grazing period Status: Not Degraded</td>
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</tbody>
</table>

### Context*

<table>
<thead>
<tr>
<th>Metric values at Baseline (t0)</th>
<th>Decisions</th>
<th>Metric values in Future (t1)</th>
<th>Gains vs. Losses (t1 - t0)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A1</strong> Land Cover: Grassland NPP= 11.7 tDM/ha/yr SOC=54.5 tC/ha</td>
<td>Grazing period extended</td>
<td>Land Cover: Grassland NPP=7.1 tDM/ha/yr SOC=53.9 tC/ha</td>
<td>Loss: 15,000 ha significant degradation</td>
</tr>
<tr>
<td><strong>A2</strong> Land Cover: Grassland NPP= 12.8 tDM/ha/yr SOC=63.6 tC/ha</td>
<td>Livestock exclusion maintained</td>
<td>Land Cover: Grassland NPP=13.1 tDM/ha/yr SOC=63.8 tC/ha</td>
<td>No Change in LDN Status 25,000 ha stable</td>
</tr>
<tr>
<td><strong>A3</strong> Land Cover: Grassland NPP= 6.5 tDM/ha/yr SOC=51.1 tC/ha</td>
<td>Long grazing period continued</td>
<td>Land Cover: Grassland NPP=3.9 tDM/ha/yr SOC=40.7 tC/ha</td>
<td>Loss: 10,000 ha significant degradation</td>
</tr>
<tr>
<td><strong>A4</strong> Land Cover: Grassland NPP= 10.3 tDM/ha/yr SOC=47.6 tC/ha</td>
<td>Sustainable grazing management introduced</td>
<td>Land Cover: Grassland NPP=10.8 tDM/ha/yr SOC=51.2 tC/ha</td>
<td>Gain: 40,000 ha significant improvement</td>
</tr>
<tr>
<td><strong>A5</strong> Land Cover: Grassland NPP= 11.9 tDM/ha/yr SOC=54.6 tC/ha</td>
<td>Urban expansion</td>
<td>Land Cover: Urban NPP=7.1 tDM/ha/yr SOC=54.3 tC/ha</td>
<td>Loss: 10,000 ha significant degradation</td>
</tr>
</tbody>
</table>

### Metrics

- **Land Cover**: nationally refined land potential class where change in class may be characterized as positive or negative.
- **NPP level** (tDM/ha/yr), where a change in the absolute value may be positive or negative.
- **SOC stock** (tC/ha, to 30 cm) where a change in the absolute value may be positive or negative.

*NPP = Net Primary Productivity  
SOC = Soil Organic Carbon  
DM = dry matter

### Legend

- No significant change in the metric
- Significant positive change in the metric
- Significant negative change in the metric

Legend:  
- **Stable (no change)**  
- **Degraded land or negative change**  
- **Not degraded land or positive change**
### Decisions

**Grassland DM/ha/yr**
- **Grazing period extended**
  - Land Cover: Grassland
  - NPP=7.1 tDM/ha/yr
  - SOC=53.9 tC/ha
  - **Loss: 15,000 ha significant degradation**

- **Livestock exclusion maintained**
  - Land Cover: Grassland
  - NPP=13.1 tDM/ha/yr
  - SOC=63.8 tC/ha
  - **No Change in LDN Status 25,000 ha stable**

- **Long grazing period continued**
  - Land Cover: Grassland
  - NPP=3.9 tDM/ha/yr
  - SOC=40.7 tC/ha
  - **Loss: 10,000 ha significant degradation**

**Grassland C/ha**
- **Sustainable grazing maintained**
  - Land Cover: Grassland
  - NPP=4.1 tDM/ha/yr
  - SOC=58.2 tC/ha
  - **Gain: 40,000 ha stable**
values (t0)

Decisions

Metric values in Future (t1)

Gains vs. Losses (t1 - t0)

Grassland DM/ha/yr C/ha

Grazing period extended

Land Cover: Grassland
NPP=7.1 tDM/ha/yr
SOC=53.9 tC/ha

Loss: 15,000 ha significant degradation

Grassland DM/ha/yr C/ha

Livestock exclusion maintained

Land Cover: Grassland
NPP=13.1 tDM/ha/yr
SOC=63.8 tC/ha

No Change in LDN Status
25,000 ha stable

Grassland DM/ha/yr C/ha

Long grazing period continued

Land Cover: Grassland
NPP=3.9 tDM/ha/yr
SOC=40.7 tC/ha

Loss: 10,000 ha significant degradation

Grassland DM/ha/yr C/ha

Sustainable grazing maintained

Land Cover: Grassland
NPP=5.5 tDM/ha/yr
SOC=50.2 tC/ha

Gain: 40,000 ha stable
**Grazing period extended**
- Land Cover: Grassland
- NPP: 7.1 tDM/ha/yr
- SOC: 53.9 tC/ha
- Loss: 15,000 ha significant degradation

**Livestock exclusion maintained**
- Land Cover: Grassland
  - NPP: 13.1 tDM/ha/yr
  - SOC: 63.8 tC/ha
- No Change in LDN Status
  - 25,000 ha stable

**Long grazing period continued**
- Land Cover: Grassland
  - NPP: 3.9 tDM/ha/yr
  - SOC: 40.7 tC/ha
- Loss: 10,000 ha significant degradation

**Sustainable grazing management introduced**
- Land Cover: Grassland
  - NPP: 10.8 tDM/ha/yr
  - SOC: 51.2 tC/ha
- Gain: 40,000 ha significant improvement
Indicators chosen to reflect ecosystem services from land-based natural capital

The 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

**LDN Indicators**

**Three global indicators:**
- Land cover
- Land cover change
- Productivity
- NPP
- Carbon stocks
- SOC

“One out, all out”, area basis

**Complemented by:**
- Locally-relevant indicators
- Process indicators
- Outcome indicators

**Verified using local knowledge**
- False positives
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.
Synergies between the Conventions

Source: Millennium Ecosystem Assessment 2005 *Ecosystems and Human Well-being: Desertification Synthesis*. Redrawn by Ministry of the Environment, Japan
Guiding Principles (1)

Principles govern application of the framework, and prevent unintended outcomes during implementation of LDN

1. Maintain or enhance land-based natural capital.

2. Protect the rights of land users.

3. Respect national sovereignty.

4. For neutrality, the LDN target equals (is the same as) the baseline.

5. Neutrality is the minimum objective: countries may be more ambitious.

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). Not between conservation and production areas.

10. Balance economic, social and environmental sustainability.
Guiding Principles (2)

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: Avoid > Reduce > Reverse.

13. Apply a participatory process including stakeholders in designing, implementing and monitoring LDN.

14. Reinforce responsible governance: protect human rights, including tenure; ensure accountability and transparency.

15. Monitor using the three UNCCD land-based global indicators: land cover, land productivity and carbon stocks.

16. Use “one-out, all-out” to interpret the three global indicators.

17. Use national and sub-national indicators to aid interpretation and fill gaps.

18. Apply local knowledge to verify and interpret monitoring data.

19. Apply a continuous learning approach: anticipate, plan, track, interpret, review, adjust, create the next plan.
Governance principles

The Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries, Forests (VGGT) underpin guidance on governance of LDN. Principles for LDN Governance:

• **Effectiveness**: define clear LDN goals and targets at all levels of government;

• **Efficiency**: maximise the benefits of LDN interventions at least cost;

• **Trust and engagement**: ensure inclusiveness through collaborative legitimacy, ensuring the security of livelihoods and fairness for all;

• **Sustainability and local responsiveness**: balance economic, social, and environmental needs of present and future generations;

• **Legitimacy and equity**: collaborative processes; fairness, impartiality; gender considerations; non-discriminatory access to services;

• **Transparency, accountability and predictability**: demonstrate stewardship, respond to feedback and communicate decisions;

• **Integrity**: separate private interests and governance decisions.
Proposals to CST (ICCD/COP(13))/CST/2

• Adopt the scientific conceptual framework for LDN and encourage elaboration and practical verification

• Call upon Parties choosing to pursue LDN to consider the guidance and apply the principles of the framework

• Invite Parties to identify case studies on LDN implementation, to be synthesised by secretariat for presentation to COP.14

• Request the SPI to analyse LDN implementation experience, based on the case study synthesis, and report on lessons learned, including refined guidance for implementation of LDN
Further information

  http://www2.unccd.int/publications/scientific-conceptual-framework-land-degradation-neutrality

  http://www.unccd.int/Lists/SiteDocumentLibrary/Publications/10_2016_spi_pb_multipage_eng.pdf
Thank you!