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Items resulting from the work programme of the Science-Policy Interface for the biennium 2016–2017
The scientific conceptual framework for land degradation neutrality

The scientific conceptual framework for land degradation neutrality

Synthesis report by the Science-Policy Interface

Summary

The United Nations Convention to Combat Desertification (UNCCD) defines land degradation neutrality (LDN) as “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”.

The scientific conceptual framework for LDN was developed by the UNCCD Science-Policy Interface to guide countries choosing to pursue LDN in operationalizing this definition. The framework provides a scientifically-sound basis for understanding LDN, to inform the development of practical guidance for pursuing LDN and to monitor progress towards the LDN target.

This document presents a summary of the main scientific findings related to the operationalization of LDN as a well as conclusions and proposals for consideration by the Committee on Science and Technology at its thirteenth session.

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I. Background

1. In September 2015, the United Nations General Assembly adopted the outcome document “Transforming our world: the 2030 Agenda for Sustainable Development”, which includes Sustainable Development Goal (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”, and 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”.

2. At its twelfth session, the Conference of the Parties (COP) of the United Nations Convention to Combat Desertification (UNCCD) recognized that striving to achieve SDG target 15.3 is a strong vehicle for driving implementation of the UNCCD within the scope of the Convention, and invited Parties to formulate voluntary targets to achieve land degradation neutrality (LDN) in accordance with their specific national circumstances and development priorities.

3. By decision 3/COP.12, the COP endorsed a definition of LDN as follows: “Land degradation neutrality is 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”. Within the UNCCD, this definition is intended to apply to affected areas as defined in the Convention text.

4. In the same decision, the COP also requested the secretariat and Convention bodies to develop guidance for formulating national LDN targets and initiatives. In particular, Parties directed the UNCCD Science-Policy Interface (SPI) to provide scientific guidance for the operationalization of the voluntary LDN target (i.e. objective 1 of the SPI work programme for the biennium 2016–2017, adopted by decision 21/COP.12).

5. In response to this request, the SPI developed a scientific conceptual framework for LDN. The conceptual framework is intended to provide a scientifically-sound basis for understanding and implementing LDN, and to inform the development of practical guidance for pursuing LDN and monitoring the achievement of LDN for the UNCCD Parties choosing to pursue an LDN target.

6. The scientific conceptual framework for LDN was prepared in accordance with the rules and procedures established by the COP, by which any scientific output prepared under the supervision of the SPI should undergo an international, independent review process (decision 19/COP.12). The conceptual framework was prepared by an author team of 2 lead authors and 11 contributing authors. An author meeting was held on 22–23 February 2016 in Washington DC, USA; SPI members as well as external experts in neutrality applied to environmental challenges participated in the meeting. The draft produced by the authors underwent a three-step review process, including an internal review (13 reviewers), an external scientific peer-review (8 reviewers) as well as a review by the Bureau of the COP. The lead authors have ensured that all government and expert review comments received appropriate consideration.

7. The scientific conceptual framework for LDN was published in February 2017 in the form of a technical report.¹ An associated science-policy brief was also published.²

8. This document presents a summary of the main scientific findings related to the operationalization of LDN as well as conclusions and proposals for consideration by the Committee on Science and Technology (CST) at its thirteenth session.

II. Summary of the main scientific findings

A. Why land degradation neutrality?

9. Land resources provide food, feed and fibre and support the often overlooked regulating and supporting services on which these provisioning services depend, as well as the cultural services delivered by healthy ecosystems. Pressure on the world's finite land resources will grow as the population grows and increases in affluence. Increased competition for land resources is likely to increase social and political instability, exacerbating food insecurity, poverty, conflict and migration. Maintaining the land's ability to deliver ecosystem services will depend on increased resilience of the land resource base.

10. While demands on global land resources are increasing, the overall health and productivity of land is declining. Thus, it is critical to find effective measures to address land degradation. Avoiding and reversing land degradation will have joint benefits for climate change mitigation and adaptation, and biodiversity conservation, in addition to enhancing food security and sustainable development.

11. LDN is the new paradigm for managing land degradation, introduced to halt the ongoing loss of healthy land as a result of unsustainable management and land conversion. Defined as "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" (decision 3/COP.12), the goal of LDN is to maintain the land resource base to ensure it continues to supply ecosystem services such as the provision of food and the regulation of water and climate, while enhancing the resilience of communities that depend on the land.

12. The target of LDN is a major plank in the global 2030 Agenda for Sustainable Development: LDN will underpin the achievement of multiple SDGs related to food security, poverty reduction, environmental protection and the sustainable use of natural resources.

B. Overview of the conceptual framework

13. The scientific conceptual framework for LDN provides a scientific foundation for planning, implementing and monitoring LDN. It was developed by a group of experts led by the SPI of the UNCCD, and has been reviewed by technical experts and policy makers.

¹ Orr, B.J., A.L. Cowie, 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. 2017. Scientific conceptual framework for land degradation neutrality. A report of the Science-Policy Interface. United Nations Convention to Combat Desertification (UNCCD), Bonn, Germany. ISBN 978-92-95110-42-7 (hard copy), 978-92-95110-41-0 (electronic copy).

² UNCCD/Science-Policy Interface (2016). Land in balance. The scientific conceptual framework for land degradation neutrality. Science-Policy Brief 02. September 2016. United Nations Convention to Combat Desertification (UNCCD), Bonn, Germany, ISBN 978-92-95110-36-6 (hard copy), 978-92-95110-35-9 (electronic copy).

By defining the LDN concept in operational terms, the framework is designed to create a bridge between the vision and its practical implementation. It articulates the scientific basis for the vision and logic of LDN, and thus presents a strategy for achieving LDN, an approach to monitoring LDN status, and guidance on interpreting the monitoring results.

14. The objectives of LDN, as articulated in the conceptual framework, are to:
- (a) Maintain or improve ecosystem services;
 - (b) Maintain or improve productivity in order to enhance food security;
 - (c) Increase resilience of the land and populations dependent on the land;
 - (d) Seek synergies with other environmental objectives;
 - (e) Reinforce responsible governance of land tenure.

15. The framework is structured around five ‘modules’: the *Vision of LDN*, which articulates the aspirational goal of LDN; the *Frame of Reference*, which explains the LDN baseline against which achievement is measured; the *Mechanism for Neutrality*, which describes the counterbalancing mechanism; *Achieving Neutrality*, which presents the theory of change (logic model), describing the pathway for implementing LDN, including preparatory analysis and enabling policies; and *Monitoring Neutrality*, which presents the indicators for assessing achievement of LDN. The conceptual framework is described in a report presenting the five modules, and focuses on the neutrality aspect of LDN, highlighting the features of LDN that differ from historical approaches to land degradation assessment and management.

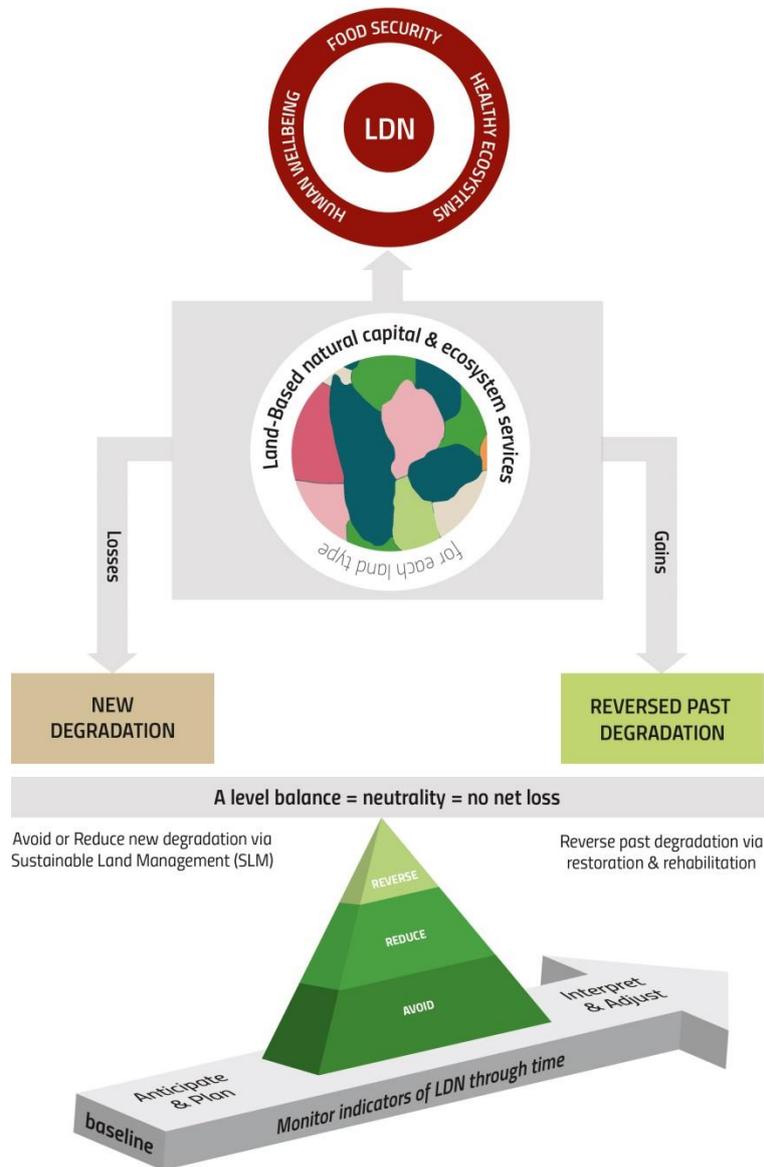
16. The framework presents principles to be followed by all countries choosing to pursue LDN. Principles govern application of the framework and help prevent unintended outcomes during implementation and monitoring of LDN. There is flexibility in the application of many principles but the fundamental structure and approach of the framework are fixed to ensure consistency and scientific rigour. The conceptual framework is summarised in figure 1.

17. Figure 1 illustrates the interrelationships among the major elements of the scientific conceptual framework for LDN. The target at the top expresses the vision of LDN, emphasizing the link between human prosperity and the natural capital of land – the stock of natural resources providing flows of valuable goods and services. The balance scale in the centre illustrates the mechanism for achieving neutrality: ensuring that future land degradation (losses) is counterbalanced through planned positive action elsewhere (gains) within the same land type (same ecosystem and land potential). The fulcrum of the scale depicts the hierarchy of responses: avoiding degradation is the highest priority, followed by reducing degradation and finally reversing past degradation. The arrow at the bottom of the diagram illustrates that neutrality is assessed by monitoring the LDN indicators relative to a fixed baseline. The arrow also shows that neutrality must be maintained over time through land use planning that anticipates losses, plans gains, and applies adaptive learning (where tracking of impacts permits mid-course adjustments to help maintain neutrality in the future).

18. In order to achieve the SDG target of a land degradation-neutral world, countries have been invited to commit voluntarily to LDN at the national level. While the scope of the UNCCD is limited to drylands, the conceptual framework is intended to be applicable across all land types, land uses, and ecosystem services. Thus, owing to its voluntary nature, it can be used by countries in line with their individual circumstances. Therefore, the conceptual framework is designed to apply to all land uses (i.e. land managed for production, e.g. agriculture, forestry, land managed for conservation, e.g. protected areas, and land occupied by human settlements and infrastructure) and all types of land

degradation, covering the wide variety of country circumstances. This allows it to be implemented in a harmonized fashion by all countries choosing to pursue LDN.

Figure 1
Schematic of the scientific conceptual framework for land degradation neutrality



C. The elements of the conceptual framework

1. The vision and baseline

19. The aspirational goal of LDN is to maintain or enhance the natural capital of the land and associated land-based ecosystem services. Pursuit of LDN therefore requires an effort to avoid further net loss of land-based natural capital relative to a reference state, or baseline. Therefore, unlike past approaches, LDN creates a target for land degradation management, promoting a two-pronged approach with measures to avoid or reduce land

degradation, combined with measures to reverse past degradation. The intention is that losses are balanced by gains to achieve a position of no net loss of healthy and productive land.

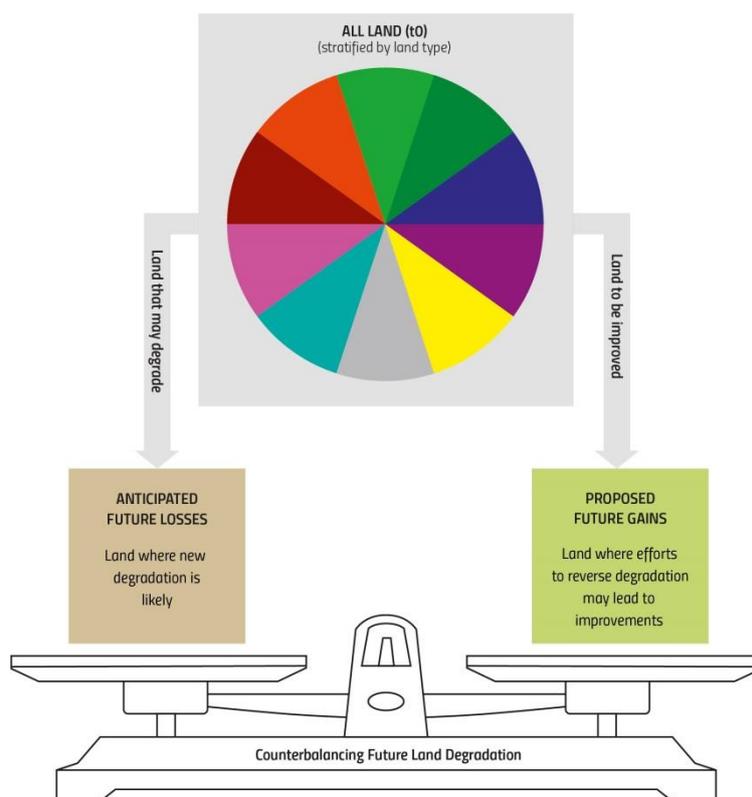
2. Integrated land use planning and the counterbalancing mechanism

20. Achieving LDN will require the tracking of land use changes where degradation is anticipated to allow cumulative negative impacts to be estimated, and the implementation of an optimal mix of interventions designed to avoid, reduce or reverse land degradation, with the intent of achieving neutrality at national scale. The conceptual framework thus introduces a new approach in which land degradation management is coupled with land use planning. Decision-makers are encouraged and guided to consider the cumulative effects on the health and productivity of a nation’s land resources caused by the collective impact of their individual decisions influencing the management of specific parcels of land. LDN thus promotes integrated land use planning with a long-term planning horizon, including consideration of the probable impacts of climate change.

21. The counterbalancing mechanism requires the implementation of interventions that will deliver land-based natural capital gains equal to or greater than anticipated losses caused by degradation elsewhere (see figure 2).

Figure 2

The LDN mechanism for neutrality is the counterbalancing of anticipated gains and losses in land-based natural capital within unique land types via land use and management decisions.

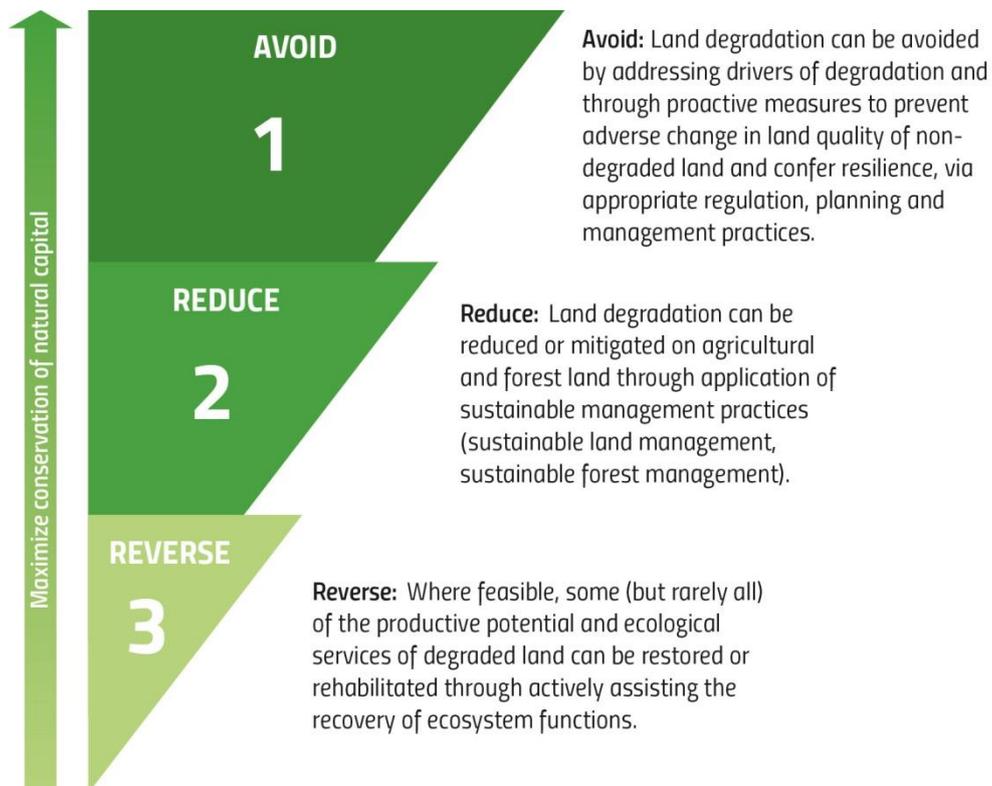


3. Achieving neutrality

22. Actions to achieve LDN include sustainable land management approaches that avoid or reduce degradation, coupled with efforts to reverse degradation through restoration or rehabilitation of degraded land. The response hierarchy of Avoid > Reduce > Reverse land degradation (see figure 3) expresses the priorities in planning LDN interventions: the priority should be avoiding land degradation as prevention is better than cure given that restoring degraded land is time-consuming and expensive.

Figure 3

The land degradation neutrality (LDN) response hierarchy encourages broad adoption of measures to avoid and reduce land degradation, combined with localised action to reverse degradation to achieve LDN across each land type.



23. The implementation of LDN is managed at the landscape scale. Counterbalancing anticipated losses with measures to achieve equivalent gains is to be undertaken within each land type. Land types are defined by land potential, a reflection of inherent properties such as soil type, topography, hydrology and biological and climatic features.

24. Land potential influences vegetation community composition and productivity, and determines suitability for uses such as cropping, grazing, forestry, infrastructure or urban development. Counterbalancing will not generally occur between different land types to ensure “like for like” when assessing and managing the counterbalancing between losses and gains. In other words, a gain in one land type cannot counterbalance a loss in a different land type. Also, the counterbalanced land should have as high or higher natural capital value than that which is anticipated to be lost. It should also be noted that land with the same biophysical characteristics may have a different value with respect to human

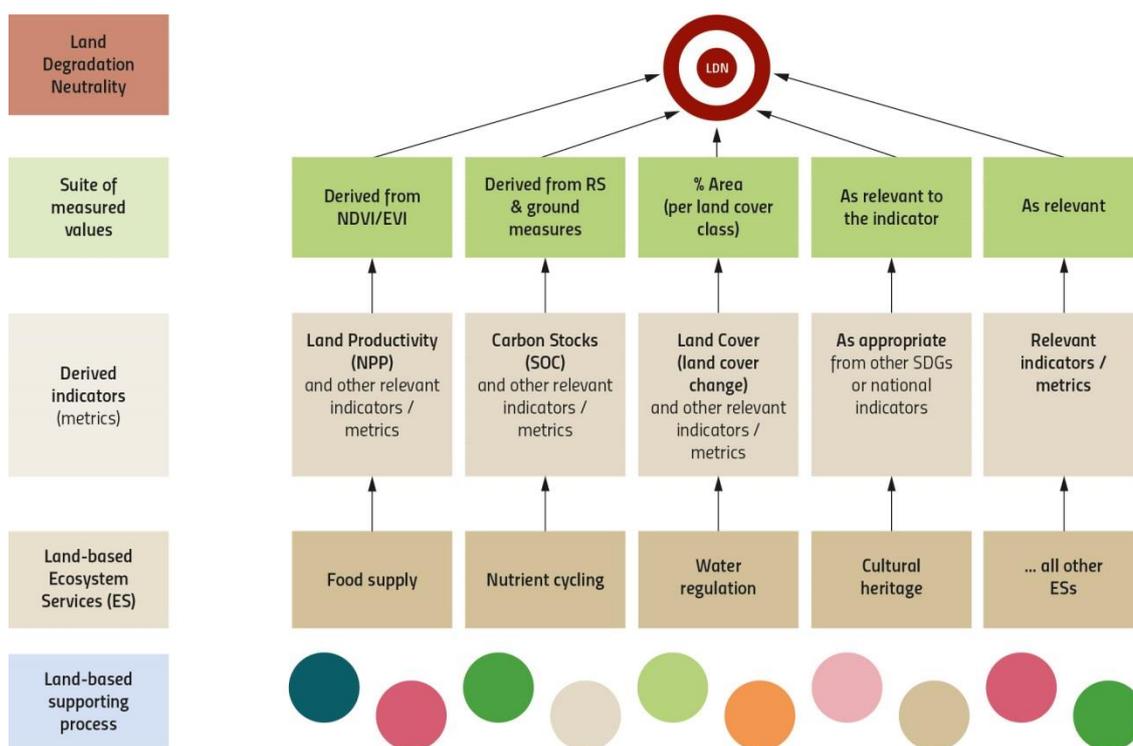
wellbeing and livelihoods, depending on its location. Counterbalancing losses in land types managed for conservation with gains in land types managed for production should be avoided.

25. To achieve the broader development objectives of the UNCCD and the SDGs, LDN activities should seek to deliver ‘win-win’ outcomes whereby land restoration and rehabilitation contribute to broader environmental goals and more sustainable livelihoods. Planning of LDN measures should therefore consider the full environmental, social and economic implications of alternative options. The resilience of the measures should be assessed to ensure that the restoration activities undertaken will provide counterbalancing of degradation in the longer term.

4. Monitoring land degradation neutrality

26. Monitoring achievement of neutrality will quantify the balance between the area of gains (significant positive changes in LDN indicators=improvements) and the area of losses (significant negative changes in LDN indicators=degradation) within each land type across the landscape. The LDN indicators specify what to measure, while the metrics state how each of the indicators is assessed. Indicators for LDN were selected to reflect the land-based ecosystem services that LDN seeks to support. The relationship between ecosystem services, indicators and metrics is illustrated in figure 4.

Figure 4
Selection of indicators based on ecosystem services to be monitored



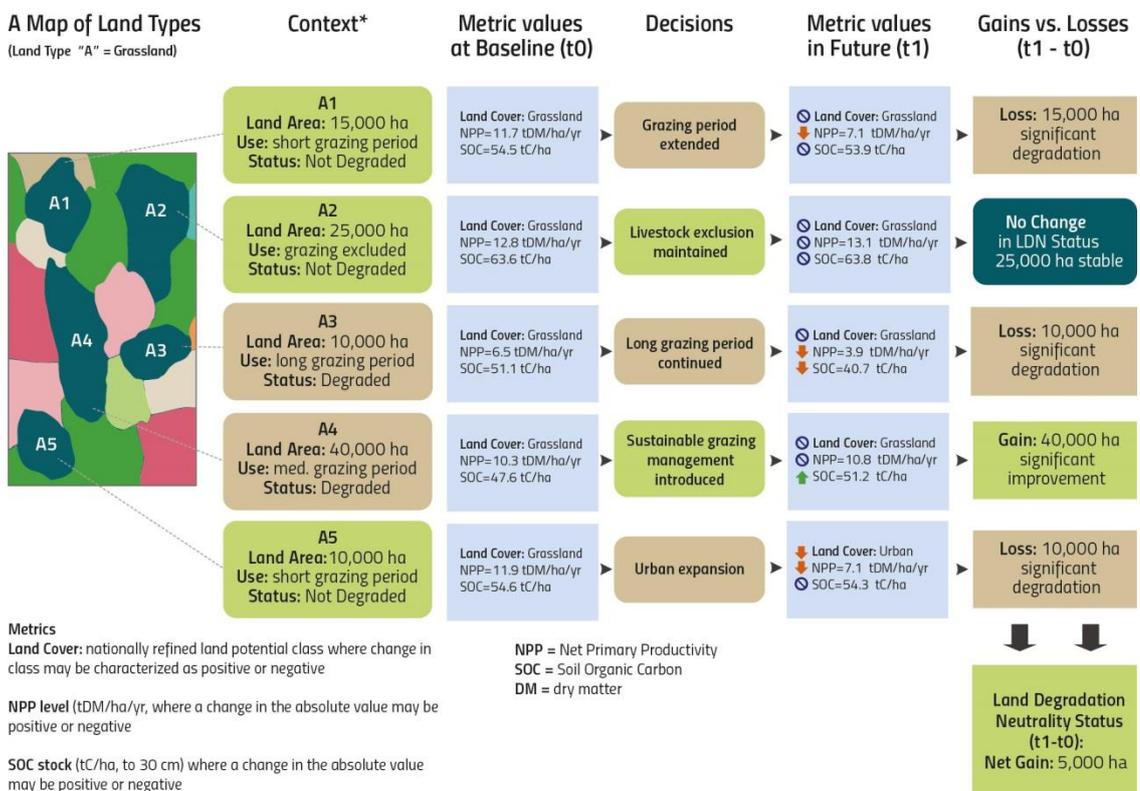
27. The global LDN indicators (and associated metrics) are land cover (land cover change), land productivity (net primary production) and carbon stocks (soil organic carbon stocks). These indicators are applied in a “one out, all out” approach: if any of the indicators shows significant negative change, it is considered a loss, and conversely, if at

least one indicator shows a positive trend and none shows a negative trend, it is considered a gain (figure 5).

28. Countries are encouraged to supplement the three global indicators with additional indicators for the ecosystem services not covered by the three global indicators, which may include other SDG indicators and/or national indicators relevant to their context, such as land contamination or biodiversity impact measures.

29. A participatory review of results monitoring will help ensure accuracy and local relevance, allowing for refinements to account for false positives such as invasive shrub encroachment.

Figure 5
A hypothetical example, showing how land degradation neutrality status is monitored on the basis of changes in metric values, using the one-out, all-out approach applied to each land unit.



* This hypothetical example is designed to explain how LDN can be monitored. The initial status is not necessary for monitoring LDN, but provides context for each of the five examples. This example illustrates a grassland grazed by livestock.

D. Governance, stakeholder engagement and learning

30. Governance of LDN is a critical element. Suitable policies should be enacted to support the implementation of LDN. Safeguards should be introduced to ensure that vulnerable communities are not displaced when lands are targeted for restoration activities. The conceptual framework recommends adoption of the Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security (VGGTs), which provide practical guidance on how to protect the rights of local land users, especially those individuals and communities with no advocate in land use decision-making.

31. Stakeholders should be involved in the planning and implementation of LDN, and in the verification and interpretation of monitoring results.

32. At local, regional and national levels, there are many relevant stakeholder groups, including land users, policy makers and regulators involved in land use planning and resource management, as well as experts in land assessment and restoration, and agricultural extension officers. Where available and effective, stakeholder engagement for LDN should utilise existing local and regional networks.

33. Learning is a key cross-cutting element of the conceptual framework. Knowledge from monitoring should be verified through stakeholder consultation, and lessons learned should be used for adaptive management, that is, applied to adjust plans for the implementation of LDN, and for future management of land degradation.

E. Principles to govern land degradation neutrality

34. The conceptual framework proposes the following principles to govern the implementation of LDN:

- (a) Maintain or enhance land-based natural capital;
- (b) Protect the rights of land users;
- (c) Respect national sovereignty;
- (d) For neutrality, the LDN target equals (is the same as) the baseline;
- (e) Neutrality is the minimum objective: countries may elect to set a more ambitious target;
- (f) Integrate planning and implementation of LDN into existing land use planning processes;
- (g) Counterbalance anticipated losses in land-based natural capital with interventions to reverse degradation to achieve neutrality;
- (h) Manage counterbalancing at the same scale as land use planning;
- (i) Counterbalance “like for like” (within the same land type);
- (j) Balance economic, social and environmental sustainability;
- (k) Base land use decisions on multi-variable assessments, considering land potential, land condition, resilience and social, cultural and economic factors;
- (l) Apply the response hierarchy when devising interventions for LDN: Avoid > Reduce > Reverse land degradation;

- (m) Apply a participatory process: include stakeholders, especially land users, in designing, implementing and monitoring interventions to achieve LDN;
- (n) Reinforce responsible governance: protect human rights, including tenure rights; develop a review mechanism; and ensure accountability and transparency;
- (o) Monitor using the three UNCCD land-based global indicators: land cover, land productivity and carbon stocks;
- (p) Use the “one-out, all-out” approach to interpret the result of these three global indicators;
- (q) Use additional national and sub-national indicators to aid interpretation and to fill gaps for ecosystem services not covered by the three global indicators;
- (r) Apply local knowledge and data to validate and interpret monitoring data;
- (s) Apply a continuous learning approach: anticipate, plan, track, interpret, review, adjust and create the next plan.

III. Conclusions and proposals

35. Land degradation neutrality is a new approach to the management of land degradation, intended to encourage action to avoid or reduce degradation and restore degraded land in order to achieve the goal of no net loss in healthy, productive land, at national level. The scientific conceptual framework for LDN provides scientifically-based guidance in planning, implementing and monitoring LDN.

36. To achieve LDN, countries must assess the cumulative effect of land use decisions and undertake measures to restore degraded land in order to counterbalance anticipated losses. Linking LDN objectives with existing land use planning mechanisms will facilitate the implementation of LDN. Countries should consider the social, economic and environmental outcomes of alternative options when planning LDN measures, and engage relevant stakeholders.

37. Counterbalancing anticipated losses with measures designed to achieve gains should occur on a “like for like” basis, and be managed within each land type at the same scale as land-use planning.

38. Three indicators that reflect the land-based ecosystem services have been selected to report on LDN: land cover, land productivity and carbon stocks. The conceptual framework provides practical guidance, including theoretical examples of how the indicators are assessed. The practical approach presented in the conceptual framework has led to significant country buy-in: in September 2016, the Global Mechanism of the UNCCD announced that 110 countries – over half of all UNCCD signatories – had embarked on the process of establishing national targets for LDN.

39. The SPI suggests that the CST consider the following proposals and recommends that the COP:

(a) *Proposal 1:* Adopts the scientific conceptual framework for LDN summarised in the present document and encourages further conceptual elaboration, and practical verification;

(b) *Proposal 2:* Calls upon those Parties choosing to pursue LDN to give consideration to the guidance provided by the scientific conceptual framework for LDN and apply the principles contained in section II.E of this document;

(c) *Proposal 3:* Invites Parties to identify case studies on LDN implementation and requests the secretariat to collect these case studies, and prepare a synthesis of case studies for presentation to the fourteenth session of the COP;

(d) *Proposal 4:* Requests the SPI to analyse the LDN implementation experience, based on the case study synthesis, and report on lessons learned, including refined guidance for implementation of LDN, building upon the scientific conceptual framework for LDN, as part of its work programme for 2018–2019.
