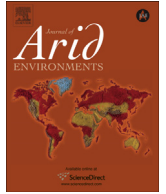




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Operationalizing Zero Net Land Degradation: The next stage in international efforts to combat desertification?

Pamela Chasek ^{a, c, 1}, Uriel Safriel ^{b, c, *}, Sem Shikongo ^d, Vivian Futran Fuhrman ^e

^a Earth Negotiations Bulletin, International Institute for Sustainable Development, 300 East 56th Street #11D, New York, NY 10022, USA

^b The Jacob Blaustein Institutes for Desert Research, Sede Boqer Campus of Ben-Gurion University of the Negev 84990, Israel

^c The Department of Ecology, Evolution and Behavior, The Hebrew University of Jerusalem, Safra Campus, Jerusalem 91904, Israel

^d Ministry of Environment and Tourism, Republic of Namibia, Private Bag 13306, Windhoek, Namibia

^e Ben-Gurion University of the Negev, Albert Katz International School for Desert Studies, Jacob Blaustein Institutes of Desert Research, Sede Boqer Campus, 84990, Israel

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ABSTRACT

At the United Nations Conference on Sustainable Development (Rio+20) in June 2012, governments adopted “The Future We Want” outcome document, which recognized (in paragraph 206) “the need for urgent action to reverse land degradation. In view of this we will strive to achieve a land-degradation neutral world” This paragraph sets a goal of maintaining a world where the total amount of degraded land remains constant, and that would secure the currently available productive land for the use of present and future generations.

This article examines the challenges of operationalizing this concept of Zero Net Land Degradation (ZNLND) and its global derivative, a land degradation neutral world (LDNW).

First, the concept and need for ZNLND is introduced and explained. Then we look at the expectations from ZNLND/LDNW targets within the context of promoting the recognition of land degradation as a global threat and contributing to global food security. Next we elaborate the challenges in making ZNLND operational, including: scoping (determining the spatial scale and the selected domain for which land degradation neutrality is to be achieved); mapping (classifying the lands by their current use and state of their productivity); prescribing (prescribing management practices relevant to each of the land classes); applying the selected land management (for either reducing degradation, restoring productivity, or increasing resilience); and monitoring management and its outcome.

We then examine the enabling environment necessary to capture ZNLND opportunities and address the technical challenges facing the operationalization of ZNLND. The article concludes with recommendations for the way forward: first, recognize existing projects suitable for ZNLND testing and establish new pilot projects at the local community or landscape scales; and the second, seek recognition and support for achieving ZNLND at the global scale through the United Nations system.

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1. Introduction: What is Zero Net Land Degradation and a Land Degradation Neutral World?

At the United Nations Conference on Sustainable Development (Rio+20) in June 2012, governments adopted “The Future We

Want” outcome document, which recognized (in paragraph 206) “the need for urgent action to reverse land degradation. In view of this we will strive to achieve a land-degradation neutral world ...” (United Nations, 2012). This paragraph sets a goal of maintaining a world where the total amount of degraded land remains constant, i.e., it does not increase, and that would secure the currently available productive land for the use of present and future generations (UNCCD, 2012a,b). Achieving a state of land degradation neutrality involves both reducing the rate of land degradation, and offsetting newly occurring degradation by restoring the productivity and the provision of other ecosystem services of currently degraded lands; in other words, achieving zero **net** (rather than

* Corresponding author. The Jacob Blaustein Institutes for Desert Research, Sede Boqer Campus of Ben-Gurion University of the Negev, 84990, Israel. Tel.: +972 77 300 6905.

E-mail addresses: pam@iisd.org (P. Chasek), uriel36@gmail.com (U. Safriel), sts@met.na, s_shikongo@hotmail.com (S. Shikongo), Vivian.Futran@gmail.com (V.F. Fuhrman).

¹ Manhattan College, Riverdale New York, 10471, USA.

zero) land degradation - ZNLD (Lal et al., 2012), whose global-scale derivative is a land degradation neutral world (LDNW).

Including a “land degradation neutral world” in the UN vision of “The Future We Want” is a result of the advocacy of the Secretariat and other stakeholders of the United Nations Convention to Combat Desertification (e.g., UNCCD, 2012a and b), an intergovernmental treaty that defines “land degradation” as “the reduction or loss ... of the biological or economic productivity ...” of all types of land uses (UNCCD Article 1(f)). More recently, researchers (Vogt et al., 2011), suggested that land degradation is qualified as a **process** of persistent reduction or loss of biological productivity, whose terminal **state** is that of **desertification** (defined as land degradation in the drylands (UNCCD Article 1(a)). It has been also suggested (Vogt et al., 2011) that “*though the risk of land degradation and desertification is mostly addressed in the drylands, this also impinges on non-drylands.*” It follows, therefore, that the term “land degradation” in ZNLD includes all types of land degradation the world over, including that of “desertification,” thus qualifying LDNW (land degradation neutral world) as a global derivative of ZNLD.

This concept of land degradation neutrality is based on three premises. The first is a realization that a goal to completely prevent further degradation (“zero land degradation”) is currently too ambitious and hence not likely to be attainable. This is because in spite of increased attention to land degradation since the UNCCD entered into force in 1996, productive lands continue to be degraded by their users at all levels. Locally, for example, in Tongyu County, China, during the period 1992–2002 an area of 1814 km² became degraded through excessive reclamation of grassland for farming, over cultivation and overgrazing (Gao and Liu, 2010). Regionally, for example, during the period 1961–2009 per capita arable land in Sub-Saharan Africa fell by about 76 square meters a year (Nkonya et al., 2011a). Globally, four percent human-induced degradation occurred during the period 1981–2006, expressed by a land degradation proxy—a climate factored-out estimate of biomass-generated greenness detected from space (Bai et al., 2010). These are only samples of the available knowledge on ongoing degradation that support the claim that “there are few ‘win–win’ opportunities to simultaneously increase production and reduce land degradation” (Pender et al., 2004) and the recognition that completely stopping land degradation is unattainable. However, the observation that only part of the land under use is being degraded attests to the fact that land can be used without causing additional degradation, which is indeed the case (e.g., Mortimore and Harris, 2005). Furthermore, information on degradation-reducing practices that are successfully adopted by land users is currently being accumulated (e.g. Liniger and Critchley, 2007), which suggests that although land degradation cannot be completely prevented its rate can be reduced.

The second premise is the observation that at the end of the 20th century 10–20 percent of global lands have been already degraded (Millennium Ecosystem Assessment, 2005; Safriel, 2007). The third premise is the experience that productivity and the provision of other ecosystem services of degraded lands can be recovered or even restored. Examples of this include in Burkina Faso, restoration of rangeland productivity by changing livestock management practices (Reij et al., 2005); and in Niger, restoration of productivity through Farmer Managed Natural Regeneration (FMNR) of indigenous trees, over an area of 5–6 million hectares, within which areas that had lost all tree growth by 1984 had tree cover of 100–120 trees/hectare (Tougiyani et al., 2009). Thus, ZNLD can be achieved when in a given site or region degradation of used land is either avoided, reduced or offset by restoring the productivity of a similar amount of already degraded land, such that the area of productive land remains stable or increases (Lal et al., 2012), and the accumulation of local

and regional successes would result in a land degradation neutral world.

The distinct feature of the ZNLD as a strategy to address land degradation is the integration of the three activities prescribed by the UNCCD (Article 1(b)) for “combating desertification,” through offsetting degradation occurring in spite of efforts aimed at “prevention and/or reduction of land degradation” by restoration, either through “rehabilitation of partly degraded land,” or by “reclamation of desertified land.” This offsetting is an essential component of the ZNLD approach, yet unlike the “cap and trade” system for emissions reductions (e.g. Hepburn, 2007), the ZNLD tool should not in any way constitute a “license to degrade.” It is not envisaged to restore the productivity of a one area of degraded land for offsetting degradation that has taken place somewhere else on the planet. Rather, a “land degradation neutral world” is the sum of land degradation neutrality achieved by local communities the world over—implementing the adage “think globally, act locally.”

2. What is the need for ZNLD/LDNW?

2.1. Strengths and weaknesses of the UNCCD in addressing land degradation

Defining desertification as land degradation in the drylands, the UNCCD set to address its objective to “combat desertification” by employing “... integrated strategies that focus ... on increased productivity ... and the rehabilitation, conservation and sustainable management of land ...” (UNCCD Article 2) Yet, 16 years after the UNCCD entered into force the 2012 Rio+20 conference still recognized a “need for urgent action to reverse land degradation.” This does not belittle the UNCCD’s achievements. The UNCCD text excels in capturing sustainability by linking economic and social development with an environmental concern (Bassett and Talafre, 2003): it provides an effective framework for poverty reduction, gender equality, community participation, and science-based land management. Indeed, the Convention’s institutions and its stakeholders highlighted the links between land degradation and poverty, which incentivized mainstreaming of land degradation issues into the development realm (Poulsen and Lo, 2006), and the integration of dryland issues into bilateral and regional development cooperation programmes. The Convention also advocated for and supported the involvement of civil society, the private sector and the scientific community in addressing land degradation, it also set implementation targets as well as the indicators for monitoring their success, and it dramatically increased awareness of land degradation within the UN system and the international community.

Yet, on the ground, implementation of the Convention was and still is, fraught with difficulties: the parties’ obligations and the Convention’s expectations from parties are not quite clear, the robust financial and political capital necessary for its implementation is still not in place, the major tool for on the ground implementation, the National Action Plans (NAP), are irrelevant to mainstream policy making and development cooperation, and in many cases donors address land degradation issues bilaterally rather than under the framework of the Convention (Bassett and Talafre, 2003). Furthermore, the meaningful involvement of local communities in defining, identifying, monitoring and responding to desertification, namely participation, which is one of the UNCCD centerpieces of “combating desertification”, is for various internal and external reasons often missing (Stringer et al., 2007). Given these constraints in addition to its dryland-restricted mandate, the UNCCD is hindered from assuming global responsibility for land degradation. The result is that there is no clear indication of the amount of land degradation that has been successfully reversed in

the drylands during the lifetime of the UNCCD, let alone at the global scale, or an indication that improvement detected in some regions (Bai et al., 2010) is due to UNCCD implementation.

2.2. The emergence of the ZNLD and the Sede Boqer workshop

The need for a shift in focus of the UNCCD (e.g., Bassett and Talafre, 2003 calling for using the UNCCD as a flexible instrument for addressing desertification) and to rethink policies (Adeel et al., 2007; calling for effective mainstreaming of desertification policies within the context of larger social and economic development policies) and other voices paved the way for the emergence of the ZNLD concept within the context of the UNCCD in 2011. A commissioned “background paper” (Lal et al., 2012) set the stage for assessing the scientific and policy rationale of ZNLD and provided material for the UNCCD Secretariat to present the ZNLD concept in a document submitted to the Preparatory Committee for the Rio+20 conference (UNCCD, 2011). This was followed by additional UNCCD Secretariat documents advocating the concept during Rio+20 itself in June 2012 (UNCCD, 2012a and b). Following the outcome of the Rio+20 Conference, a day-long session (13 November 2012) during the Fourth International Conference on Drylands, Deserts and Desertification at the Blaustein Institutes for Desert Research, Sede Boqer Campus of Ben-Gurion University, Israel, sought to address the ZNLD concept through a series of presentations, followed by an open discussion and brainstorming workshop. The report of this workshop, “Zero Net Land Degradation: Outcome of ‘Operationalizing the Zero Net Land Degradation (ZNLD) Target’ session,” was submitted to the UNCCD Secretariat (UNCCD, 2013a), and along with other advocacy material, initiated the “post Rio+20” UN process of translating the LDNW aspirational goal of the “The Future We Want” into action on the ground.

2.3. Merits of the ZNLD/LDNW

The ZNLD and its LDNW global derivative are not a remedy for all shortcomings of the efforts of the international community to address land degradation. But logistically, addressing land degradation in a way different from the tactics used so far is likely to trigger a rich, vibrant discourse and provoke refreshing discussions. These are likely to capture the attention of stakeholders at all levels, and thus breathe new life into land degradation theory and practice.

The experience with the Millennium Development Goals and targets demonstrates that setting a target can help shape expectations and create the conditions for all stakeholders to assess progress and take appropriate action in addressing an issue. As noted above, “combating desertification,” is a goal, but its shortcomings may be due to lack of a focus on tangible, pragmatically achievable land-relevant objectives that can be specifically targeted. ZNLD can be a focused, quantifiable and time-sensitive target that safeguards land and its productivity, thus contributing to local poverty alleviation, and when applied globally (i.e., LDNW) would also contribute to global food security. Setting a ZNLD target can help put this issue on the international agenda and would assist in generating the necessary political will, support and commitment, often expressed by attracting the required resources.

3. What are the expectations from ZNLD/LDNW targets?

3.1. Promoting the recognition of land degradation as a global threat

The UNCCD restricts both “desertification” (Article 1(a)) and “land degradation” (Article 1(f)) to drylands (excluding hyperarid

areas). But land degradation also occurs in other ecosystems, where it may even be more extensive than in the drylands (Bai et al., 2008; but see a cautionary note, Wessels, 2009). However, since the term “land degradation and desertification” (LDD) has been naturalized throughout the UN discourse and documentation (e.g. UNCCD, 2012b), as well as in the scientific literature (Vogt et al., 2011), the phenomenon of land degradation is currently associated with the UNCCD, and is often captured as a dryland problem, i.e., mostly confined to “marginal” land and mainly affecting marginalized populations (e.g. Safriel and Adeel, 2005). Viewed as such, the global significance of the UNCCD and its subject matter, land degradation (including desertification), has habitually been underestimated, leading to an implicit denial of land degradation as an issue of global concern, and to a low appreciation of the UNCCD as an instrument worthy of substantial support (Stringer, 2008). The absence of “land degradation” or “desertification” from the 7th Millennium Development Goal addressing environmental sustainability, while it does address the subject matters of the two “sister” Rio Conventions, the UN Framework Convention on Climate Change (UNFCCC) and the Convention on Biological Diversity (CBD) (United Nations, 2002), may be a reflection of this problem.

Responding to this apparent handicap, the UNCCD has taken some steps that implicitly expand its mandate beyond the drylands. When elaborating its 10-year Strategy, the Conference of the Parties realized that although the Convention’s “relevance is particularly recognized for the drylands, ... it is increasingly positioning itself as an instrument that can make a lasting global contribution ...” (UNCCD, 2007). Also, during the 4th meeting of its Conference of the Parties (December 2000), the UNCCD amended its text by including a new, fifth implementation annex, for 17 Central and Eastern European countries, 11 of which have no drylands within their borders, but are affected by land degradation just the same (Safriel, 2007). These responses have not gone unnoticed. For example, it was explicitly proposed that the UNCCD should “shift its scope away from desertification and land degradation in specific climatic areas, towards a more holistic view, ... thus guiding global land sustainability around the world,” which would enable it to “become the principal global framework for protecting the world’s soils” and “develop a broader geographical focus to ensure that all ecosystems and climatic zones are explicitly included,” and provide it with a “clearly defined role as an international environmental Convention addressing a globally occurring problem,” an approach that would also maximize the synergies between the subject matter of the CBD and the UNFCCC (Stringer, 2008).

As conceived by the UNCCD Secretariat, ZNLD/LDNW is a land degradation-focused target that is explicitly operational at the global scale. If it is operationalized by the UNCCD, it would position the Convention to be in line with its two sister Rio Conventions that operate at the global scale, which would also generate a synergistic effect on the Aichi Biodiversity Targets (CBD, 2010), and the REDD+ mechanism (provision of incentives to promote reductions in greenhouse gas emissions from deforestation and forest degradation and sustainable management of forests, e.g., UNFCCC, 2010).

3.2. Contributing to global food security

Land is a finite, non-renewable natural capital, and the biological productivity that it generates is used by people first and foremost for food production, hence the degradation of the land has a direct impact on agricultural productivity. Although estimates of agricultural productivity loss due to land degradation vary greatly and most are based on expert opinion or assumptions rather than on rigorous experimental efforts (Ruben et al., 2007), it is evident that lower production levels of staple food crops, further exacerbated by the loss of household income, can cause or increase food

insecurity (Diao and Sarpong, 2007; Lal, 2009; Nkonya et al., 2011b; Pingali et al., 2014). While the adverse effects of land degradation on food security can be buffered somewhat by crop management, fertilizers, irrigation and expanding cultivation (Lal, 2009), malnutrition still prevails across the globe, and famines repeatedly occur in certain areas. These phenomena are likely to be exacerbated when the current (beginning of 2014) population of 7.1 billion will increase to 9.7 billion by the year 2050 (Pison, 2013). To feed this projected global population would require raising overall food production by some 70% between 2005 and 2050, much of which expected to come from cultivation intensification of currently used lands, especially in developing countries (FAO, 2009), and the rest at the expense of forests, grasslands, wetlands and other natural ecosystems, their biodiversity and hence their ecosystem services (Tilman et al., 2001, Godfray et al., 2010). Further expansion of cultivation into the remaining natural ecosystem within the agricultural landscape would reduce their provision of critical ecosystem services such as water regulation, pest regulation and pollination, services that support agriculture itself and contribute to its sustainability (Zhang et al., 2007).

For this and other reasons, humanity cannot afford to further increase the expansion of arable land (Foley et al., 2005), and alternative strategies for matching supply with the projected demand for food in 2050 have been proposed. These include: implementing available technologies and management practices for improving productivity that is currently below the potential (“closing the yield gap,” which in some cases is 60%); mobilizing physiological and innovative genetic research for increasing productivity beyond the current potential (“increasing production limits”); reducing waste, which amounts to 30–40% of the produced food, and occurs at all links of the food-chain; changing diets—by reducing the consumption of meat and increasing the proportion of high-efficiency meat production practices (e.g. grazing livestock), the land required for meat production would be reduced and the number of people that can be fed would be increased; and expanding aquaculture, which would relieve the pressure on land (Godfray et al., 2010).

Indeed, it is likely that the implementation of these five strategies combined could enable the currently available arable land to feed the projected global population in 2050. However, this will only be the case if these lands are not affected by land degradation that would reduce their productivity. Thus, the currently available arable land could support the 2050 human population if the arable land becomes and remains land degradation neutral. This neutrality can be achieved by reducing the current rate of productivity loss, and offsetting any additional degradation by restoring at least a similar amount of already degraded land.

Although restoration of land productivity may be more costly than avoiding degradation, ensuring that new degradation is matched with new restoration could secure long term maintenance of land degradation neutrality, which would significantly contribute to local, regional and global food security, and “improve the livelihoods of affected populations, improve the conditions of affected ecosystems and generate global benefits,” the strategic objectives of the UNCCD (UNCCD, 2007).

4. ZNLD Challenges

To make ZNLD operational a plan of action is required. The plan's proposed steps are scoping (determining the spatial scale and the selected domain for which land degradation neutrality is to be achieved), mapping (classifying the lands by their current use and state of their productivity), prescribing (prescribing management practices relevant to each of the land classes), applying the selected land management (for either reducing degradation, restoring

productivity, or increasing resilience), monitoring management and its outcome, which should go together with assessment of the monitoring results). The challenges posed by each of these steps are illustrated below.

4.1. Scoping – scale and domain

Although LDNW implies global scale neutrality, this globality is similar but not identical to the globality of greenhouse gas emissions. Whereas emissions from a local site directly affect global warming, local land degradation directly affects the local land user, but only indirectly affects global food security. Therefore, striving for an LDNW is a cumulative result of striving to increase the number of sites that achieve ZNLD. Thus, countries, organization or sectors that wish to contribute to an LDNW need to determine the spatial scale and the specific geographic or thematic domain within which they aspire to achieve ZNLD. The selected geographic domain can be an individual farm, a rural community, a watershed, an administrative region or a geopolitical region, and a thematic domain may be an area of specific land use—cultivation, rangeland, agroforestry or sylvipastoral, each embedded in a specific geographical category. Once the domain is agreed, mapping degradation within its boundaries can proceed.

4.2. Mapping degradation

ZNLD's added value to the UNCCD tradition of “combating desertification” through addressing ongoing degradation (“prevention and/or reduction of land degradation”) and restoring already degraded land (“rehabilitation of partly degraded land; and reclamation of desertified land”), is in its mobilizing both “prevention and reduction” on the one hand, and “rehabilitation and restoration” on the other hand, to act in unison to stabilize the amount of productive, non-degraded land by neutralizing any additional degradation. This attribute of ZNLD poses a major challenge—the need to quantitatively offset by restoration of degraded land, what has been degraded within a given time period in spite of the invested efforts to curb on-going degradation. This requires classifying and mapping the lands in the area where land degradation neutrality is to be achieved, i.e. to identify lands whose current use is degrading and those that are already degraded (either abandoned or still in use); the former are candidates for applying measures to reduce degradation, and the latter are eligible for applying restoration measures. A third land type may also be identified—land where its current use is not degrading, yet precautionary measures conferring resilience to future degradation risks can be considered.

The challenge is, however, that “already degraded” and “being degraded” are not discrete states, since “land degradation” is a continuum (Zucca et al., 2002). Therefore, a prerequisite for operationalizing ZNLD is making two critical decisions. The first decision is on the appropriate selection of indicators for “land degradation,” which depends on how “land degradation” is defined for the purpose of implementing ZNLD.

The search for appropriate indicators should be led by the understanding of why land degradation matters to people. The 7.1 billion people on this planet at the beginning of 2014 depend on the biological products derived from the soil for their food, which are provided by the 2.6 billion farmers whose livelihoods depend on generating food from soil (FAO, 2013). This biological productivity of economic value (mainly food but also other biological products from the land, e.g., fiber, forage, firewood, medicinal and industrial compounds) depends on the local soil nutrients, soil organic carbon and soil biodiversity, and ecosystem services, such as water regulation and soil conservation, provided by the vegetation cover of

the soil, as well as by the socio-economic and policy drivers that can change these factors. Accurate and relevant assessment methods of land degradation, with a flexible scale combining socio-economic, institutional, and biophysical aspects, and driving forces must be linked to the need to protect the land and to monitor its performance, as well as its response to restoration and conservation efforts (Kapalanga, 2008; Snel and Bot, 2003). What should and could be relatively easily measured is, therefore, what directly matters to people, and this is the end product of the land—the biologically produced, consumed and marketed products (Millennium Ecosystem Assessment, 2005). These are routinely monitored such that both persistent reductions as well as sustained improvements can be detected. Thus, depending on local conditions and measuring capacity, the effect of soil degradation on biological productivity of economic value (i.e., its effect on the land's food provisioning service), as expressed by decline in the crop yield, would serve as an indicator for land degradation, provided that the effect of industrial inputs (irrigation, fertilizers, pesticides) and the effect of natural climatic variability as well as the effects of local expressions of global climate change, are factored out.

But depending on local conditions, other indicators can be selected that address different ecosystem services. Thus, the loss of the land's vegetation cover, driven by topsoil loss or overgrazing (i.e. the effect on the land's regulating and cultural services), can serve as an indicator. Similarly, the chemical and physical degradation of the soil (i.e. the degradation of the land's supporting services) could serve as an alternative indicator.

Once the decision is taken regarding what indicators should be measured for detecting and mapping land degradation, it is necessary to select the appropriate measuring methodology. Several methodologies are available, such as mobilizing expert and local knowledge, monitoring agricultural productivity trends, and employing geospatial observation, among others (e.g., LADA, 2009a; b.; Reed et al., 2011).

When all available degradation states/processes within the domain are mapped, it will be necessary to decide where along the assessed land degradation continuum to place the transition points, from land under non-degrading use (first class land, which can be used as a benchmark, and may require resilience-conferring action), to land under degrading use (second class land, requiring degradation mitigation), and from that to the third class land, of already degraded (or at an extreme degraded state requiring restoration efforts). Following classification and mapping, the targeted domain should be surveyed to assess the degree of degradation in the lands classified as under degrading use (second class) and in those classified as degraded (third class), for establishing baseline values of degradation. What comes next is to link remedies to diagnosis (Akhtar-Schuster et al., 2010)—prescribing relevant management practices to each of the diagnosed land classes.

4.3. Prescribing relevant management practices

There is much scientific, technological and agrotechnical knowledge and experience for using land without degrading it (e.g. Stocking and Murnaghan, 2001; Roling and Wagemakers, 2000), and much of this knowledge habitually comes under the umbrella of “Sustainable Land Management” (SLM) that is elaborated by the World Overview of Conservation Approaches and Technologies (WOCAT) group that documents and evaluates its options and experiences (Liniger and Critchley, 2007). SLM has several definitions (e.g. “to maintain or improve ecosystem services for human well-being, as negotiated by all stakeholders” (Zucca et al., 2002); “land management that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Buenemann et al., 2011)). What is common to all

definitions and what makes SLM distinct from just “land management” is that land management does not address the land's provisioning service alone, but also conserves all other ecosystem services provided by the land. In the land degradation context SLM provides a useful tool box for reducing on-going degradation. It includes tools for: improving water-use efficiency; conservation-minded tillage methods; traditional water-harvesting techniques; water storage; protecting soils from erosion, salinization, and other forms of soil degradation; improving crop-livestock integration; and improving resource use with efficient germplasm (Zucca et al., 2002). These tools would require local adaptation, given the specific states of the lands within the domain. Tools for restoration are also listed, although the experience in their application may be insufficient (Bainbridge, 2009), e.g., restoration of vegetation cover through the establishment of seed banks and reintroduction of selected species (Zucca et al., 2002).

The challenge here is that much of the literature and the practice often prescribe the same practices for both non-degrading use and restoration together, without making a distinction between the two alternative states of the land. This distinction is important, since to secure sustainable use of the restored land it is necessary to remove or at least minimize the effect of the direct biophysical drivers that caused the degradation, as well as the underlying, socio-economic and policy drivers of that degradation. Finally, regarding the class of non-degraded but used lands, it is also recommended to explore applying measures to reduce degradation risks. This, too, requires identification of the direct and indirect underlying drivers of degradation risk and applying measures for their removal.

4.4. Monitoring and assessment

Once classifying and mapping the selected domain's lands and prescribing the appropriate management to each of the land classes, implementation of the management strategy can begin. Yet, a mechanism is required to evaluate the success of the management strategy as expressed in approaching the domain's land degradation neutrality. This mechanism, monitoring and assessment (M&A) has already been intensively discussed (e.g. Reed et al., 2011) but rarely applied. Despite an abundance of research efforts on combating land degradation, progress has been hampered by lack of effective monitoring and assessment not only of the state of the land but also of the performance and impact of interventions (Akhtar-Schuster et al., 2010). This is mostly because while land users do invest in measures to reduce degradation, they habitually do not invest in monitoring and assessment, since these constitute scientific, technological and financial challenges. For example, technologies and methodologies employed for ground monitoring and assessment at the local level, differ from the technologies and methodologies used for monitoring at the regional and global levels. Thus, when institutions do engage in collection and analysis of information they address the global scale (Safriel, 2007), rather than the needs of local communities (as required by Article 16 of the UNCCD).

Absence of monitoring impairs detection of threats to the applied management strategy and undermines the effective implementation of future endeavors that address land degradation (Zucca et al., 2002). It is, therefore, recognized that land management needs to involve local monitoring that merges both top-down and bottom-up approaches (Reed et al., 2006; Thomas, 2008).

Monitoring should not be deferred to projects' official termination dates—these mechanisms need to be in place as of the initiation of the ZNLD venture such that the management and its results are continuously monitored and the monitoring information is periodically assessed. To evaluate land responses to the management and asserting that land degradation neutrality has not

only been achieved but is also being sustained, authoritative and consensual monitoring and assessment of used land needs to function at all scales on a permanent basis, as a way to detect progress towards the ZNLD target. Finally, once a monitoring system and assessment mechanism are in place there needs to be a mechanism for verifying degradation and restoration rates established by the local or national government at the relevant scale, and executed by experts (Akhtar-Schuster et al., 2010). Such a mechanism would enable assessing the effectiveness of the measures mobilized for attaining the ZNLD target, and would determine what is still necessary to achieve the target.

5. The enabling environment

Capturing ZNLD opportunities and addressing the technical challenges facing the operationalization of ZNLD require an enabling environment that can generate awareness, motivation, human and financial resources, which are addressed in the following.

5.1. Financial resources

While measures required for practicing non-degrading land use are likely to be within reach of many land users, restoring already degraded land as well as monitoring and assessment requires investments whose returns are not immediate. Therefore, land users need greater access to credit and loans (Akhtar-Schuster et al., 2011). Financial resources are also required for the monitoring mechanism (Akhtar-Schuster et al., 2010), especially since monitoring is indispensable for operationalizing a quantifiable target such as ZNLD. Here international financial resources must be mobilized. Indeed, “The Future We Want” recognized that striving “to achieve a land-degradation neutral world in the context of sustainable development” “should act to catalyze financial resources from a range of public and private sources,” and, furthermore, commissioned the UNCCD “to take coordinated action nationally, regionally and internationally, to monitor, globally, land degradation and restore degraded lands” in the drylands (United Nations, 2012).

However, to date, the UNCCD has not been an adequate funding source for combating land degradation in the drylands. Therefore, since the ZNLD approach was conceived by the UNCCD as a tool for empowering its implementation, and its implementation is to be led by the UNCCD, further exploration of this situation is essential. Part of the problem is that both multilateral and bilateral donors do not have a common interpretation of what constitutes direct support to UNCCD implementation and what supports the objectives of the convention indirectly. The UNCCD is perceived as an environmental convention, even though its primary focus is to fight land degradation through sustainable rural development while reducing poverty (Chasek, 2013). According to Falloux et al. (2006:138), following the Earth Summit in Rio in 1992,

It was initially thought that the environment label would provide higher visibility and better support to the UNCCD. Unfortunately, this has not materialized. As a consequence, national UNCCD focal points are generally situated within ministries of environment without adequate links to ministries of finance, agriculture and other departments positioned to influence policies and budgets pertinent to UNCCD implementation (such as rural development and agriculture) As a result, desertification is rarely cited among the priorities put forward by developing countries in their discussions with donor agencies.

Developed countries, on the other hand, have located their focal points within development agencies. However, they have failed to

take the lead in helping their developing country counterparts raise the profile of desertification into development planning. The result is that the money is focused elsewhere (Falloux et al., 2006). This assessment is echoed by Hicks et al. (2008), who argue that “land use and desertification have arguably created the greatest number of environmentally related deaths over the past two decades. Yet we find this type of aid is relatively neglected and funding does not appear to be flowing to the places where it is most needed.” While there are cost-effective interventions for improving soil health and combating land degradation including erosion control, sediment recapture, fertilizers, green manure, fertilizer trees, crop residues, and water conservation, funds to combat the destruction of soil resources are only “trickling in” from the aid community (Hicks et al., 2008).

Therefore, to successfully implement the ZNLD target, land degradation must be given a high priority amongst other competing environmental and development issues in order to succeed in the struggle for adequate resources. The UNCCD's Global Mechanism (GM) has developed guidelines for countries to promote a better financial enabling environment that could prove useful in achieving ZNLD. The GM's strategy aims to identify and harness a mixture of financial sources, instruments and mechanisms to fund efforts to combat land degradation (Global Mechanism, 2007, 2008).

At the national level, the political, legal and institutional frameworks that influence the allocation of financial resources to land degradation and the ZNLD target need to be considered. Consideration must be given to the multifaceted nature of national public and private financing processes and mechanisms, as a range of complementary approaches may need to be mobilized to achieve the ZNLD target. Funding sources include the domestic public and private sectors as well as external sources from the donor community, philanthropists and innovators. Following the identification of funding sources it is possible to analyze the financial flows and the conditions that can influence the mobilization of financial resources within a country. ZNLD would have to become a priority, with national leadership and country-driven demands interfacing with international funding agencies. To achieve this there is a need for strong partnerships and the identification of key personnel or nodes of activity where different stakeholders can be brought together to define a common vision and understanding of the bottlenecks in financing (Akhtar-Schuster et al., 2011).

5.2. Awareness, motivation and empowerment

Currently available knowledge for practicing non-degrading land use and restoration of degraded land is sufficient for addressing land degradation in the ZNLD context. But there are obstacles to the implementation of these practices, mostly cultural (e.g., striving for short-term at the expense of long-term benefits), social (population pressure, gender inequality, inequity), economic (access and vulnerability to global markets) (Akhtar-Schuster et al., 2010), policy (land tenure, restrictions imposed on traditional pastoral practices) (Akhtar-Schuster et al., 2010) and governance (weak institutions) (Chasek et al., 2011), that need to be addressed first. Underlying these obstacles is the lack of institutional, financial and human capacity (Akhtar-Schuster et al., 2011; Requier-Desjardins et al., 2011). To overcome these challenges, investment in education, awareness, motivation, and empowerment of individual land users, especially women, local community leaders, local and national governments, the private sector and national and international institutions at all levels, must be mobilized (Reynolds et al., 2007).

In addition, achieving the ZNLD target involves a multiplicity of interconnected environmental, economic and social issues, which cut across the responsibilities of different government agencies and

governance levels. Greater governmental collaboration and cooperation is necessary to: bring together the fragmented knowledge base (on for example, agriculture, rangeland management, meteorology, hydrology, biodiversity, soil science, local and indigenous knowledge); incorporate the input of all relevant stakeholders; bridge the science-policy divide; synthesize and harmonize the abundance of information available; and implement coordinated activities at the national level that will also interact with the community and international levels (Chasek et al., 2011).

Better coordination at the international level could be accomplished by harnessing international political will through the existing United Nations architecture. There may not be a need for new and additional structures and resources, but new and additional investments in motivating national governments and empowering local leaders are still required.

5.3. Upscaling and joint bottom-up and top-down ZNLD implementation

The road from achieving land degradation neutrality through local implementation of ZNLD to a land degradation neutral world must have a joint upscaling and bottom-up trajectory. Local communities can strive to achieve ZNLD within local community boundaries, incentivized and led by motivated local leadership. The information about the best practices and local success stories could then be shared both horizontally and vertically (local/community, national, regional and international), such that the LDNW target at the global scale constitutes an aggregate of attained regional, national and local ZNLD.

However, full success also requires simultaneous top-down leadership and support at the international level. This can be accomplished through, possibly, the adoption of a sustainable development goal on land and ZNLD within the context of the UN's post Rio+20 and post-2015 development agendas (Fukuda-Parr, 2012). Leadership is also needed to integrate an operationalized ZNLD into the work of the UNCCD, the other Rio Conventions and relevant UN agencies, such as FAO, UNESCO, UNEP and UNDP, and international financial institutions such as the World Bank and the Global Environment Facility (GEF). With such simultaneous bottom-up and top-down approaches, stakeholders and policy makers at the national and regional levels will come on board and integrate ZNLD into national development and agricultural planning.

6. The way forward

The way forward is two pronged—first, recognizing existing projects suitable for ZNLD testing, establishing new pilot projects at the local community or landscape scales, and projects at the regional level, all guided by agreed-upon protocols and guidelines, prepared, improved, adapted or amended by joint expert and stakeholders working group(s); second, seeking recognition and support for achieving ZNLD at the global scale through the United Nations system. Work on both tracks can be carried out in parallel, but the tangible success of pilot and regional projects testing ZNLD at these scales, success that is also reflected at the policy level of local and national government mandates, would significantly facilitate and expedite the UN track. However, irrespective of the timetable and pace of the UN processes, pilot testing of the ZNLD concept driven by local leadership and carried out at the community level could be considered and even implemented earlier.

6.1. Pilot testing ZNLD at the local level

The first step to test ZNLD at the local level would be to search for, detect and identify already existing ongoing actions and

projects whose success and experience can inspire and provide a model, such as, for example, communities in Niger that already excel in restoration (Tougianni et al., 2009). In addition, suitable areas for new and innovative pilot projects should be identified, such that success in these sites could be replicated in other comparable areas. It will then be necessary to identify the relevant stakeholders that could define the roles and responsibilities of those involved in actions on the ground. These stakeholders could also compile guidelines for establishing baselines, monitoring and verification of the results of the projects, with respect to achieving the ZNLD target.

There are several options for testing the operationalization of the ZNLD at the local community level. As an example for a project based on the generic plan of work presented earlier (see Section 4), the scoping stage would be initiated by the UNCCD Secretariat, in conjunction with governments and other actors, as relevant, contacting local non-governmental organizations (NGOs) or community-based organizations (CBOs) and other partnerships operating in rural areas, who are already working, or wish to work, with land users to improve their livelihoods, and inform them about the ZNLD target and approach. Together with the selected community the area, the time frame in which land degradation neutrality is to be achieved will be agreed upon.

Next, the commissioned NGO, together with the community (and other stakeholders, as relevant, such as government agencies, other NGOs, experts and researchers who have been studying the area, etc.), will carry out the mapping and the management prescribing stages. They will then design a budgeted plan of action for implementing the ZNLD-required activities on the ground, including monitoring and milestones for assessing the monitoring results. Attention will be then directed to recruiting and mobilizing the required human and financial resources, and addressing the other socio-economic issues that would enable the actual work on the ground to take off.

It is envisioned that by the time such a pilot project would reach the stage of attaining land degradation neutrality the UN process will be at a stage ripe for incorporating the results of the local ZNLD projects into the global aggregated LDNW system.

In addition, the results of these pilot projects would be shared through existing and new knowledge management systems, which would facilitate moving from the local to the regional and even global-scale ZNLD implementation.

6.2. Promoting ZNLD at the global level

While efforts are essential at the local or community level, action is also needed at the global level to promote the concept of ZNLD and streamline it into the work of the United Nations system. Recognizing the importance of examining the ZNLD concept within the UNCCD framework, following the Sede Boqer workshop (UNCCD, 2013a), the UNCCD's eleventh meeting of the Conference of the Parties adopted Decision 8/COP.11, which establishes an intergovernmental working group to: (1) establish a science-based definition of land degradation neutrality in arid, semi-arid and dry sub-humid areas; (2) develop options relating to arid, semi-arid and dry sub-humid areas that Parties may consider should they strive to achieve land degradation neutrality; and (3) advise the Convention on the implications for its current and future strategy, programmes and the resources requirements (UNCCD, 2013b). While the mandate of this working group is limited by the parameters of the Convention, and the desire of some Parties to ensure these parameters are adhered to, it is the first step to integrating the ZNLD concept and its LDNW derivative into the work of the UNCCD.

While land degradation is directly related to people's livelihoods, as has been acknowledged in the preamble of the UNCCD text, it is also interlinked with biodiversity loss, deforestation, climate change, poverty, migration and refugees and, most importantly, with global food security. The ZNLD-LDNW concept should, therefore, be incorporated into the work of relevant multilateral environmental agreements and bodies, including the CBD, the UNFCCC, and the UN Forum on Forests. UN organizations, such as the Food and Agriculture Organization, the United Nations Environment Programme, the United Nations Development Programme and the United Nations Industrial Development Organization, can also ensure that relevant programmes and plans work together with the UNCCD's efforts to operationalize the concept.

Finally, the ZNLD concept should be incorporated within the context of the UN's post-2015 development agenda and the elaboration of a set of global sustainable development goals (SDGs) under the auspices of the United Nations General Assembly. The UN system has launched a process to build on and replace the Millennium Development Goals (whose target date is 2015) to address challenges, such as sustainable development, continuing conflicts, human rights, rising inequality and demographic pressures. The post-2015 agenda will reflect new development challenges and is linked to the outcome of Rio+20, which called for an intergovernmental process to develop a set of global SDGs. As called for in "The Future We Want," these goals should be "action oriented, concise and easy to communicate, limited in number, aspirational, global in nature and universally applicable to all countries, while taking into account different national realities, capacities and levels of development and respecting national policies and priorities" (United Nations, 2012). Given this, it is logical that one of these goals or targets should address land degradation and possibly be formulated to achieve ZNLD by 2030. If this goal or target is set, it could generate the necessary political will, support and commitment to improving the lives of people in rural areas around the world, through striving to achieve the ZNLD target at all scales.

7. Conclusions

Zero Net Land Degradation and its global derivative, a Land Degradation Neutral World, are aspirational targets expected to be more successful than previous and current efforts to effectively draw the attention of people and the international community to the significance of land and soil to human well-being and to the risks brought about by land degradation. ZNLD-LDNW encapsulates the resolve for not giving up lands that have already lost their productivity. It also recognizes that although action to achieve ZNLD is to be taken locally, its operation also requires action at the international level, and its implementation addresses global risks to food security, the climate system, biodiversity and more. Presenting the neutrality concept as valid for effectively addressing the land degradation issue is innovative, challenging but also promising in eliciting interest and rallying wide support, provided that it is effectively presented to people and decision makers at all levels.

To make ZNLD-LDNW operational, several actions need to be taken, starting with pilot testing at the community level, which would establish a template for projects at increasing scales. These include defining the spatial and temporal domain within which to achieve land degradation neutrality, classifying the lands within this domain in a way that would distinguish between lands that are candidates for reducing their ongoing degradation (second class) and lands that are degraded and would be subjected to restoration efforts (third class) for offsetting added degradation. First class land is used sustainably and whose productivity could serve as a baseline when measures to reduce degradation are taken. It is then necessary to prescribe to each of the land classes appropriate

remedial actions. Finally, from the outset of field implementation a monitoring mechanism needs to be in place, and its results need to be professionally and periodically assessed for verification of achievements and to ensure the land maintains a stable amount of sustained productivity.

For all this to occur an enabling environment need to be in place—capacity, awareness, funding, guidelines for establishing baselines, monitoring and verification, agreement on indicators to be monitored, accessibility to information on best practices and agricultural techniques and guidelines for their implementation. Finally, in order to include ZNLD-LDNW in the policy and legal frameworks of governments, relevant UN institutions, funding agencies and other stakeholders, champions at all levels need to be recruited to make it happen, so that global land degradation neutrality can improve land users' livelihoods and strengthen global food security.

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