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EDITORIAL

SCIENCE FOR IMPROVING THE MONITORING AND ASSESSMENT OF DRYLAND DEGRADATION

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ABSTRACT

The United Nations Convention to Combat Desertification (UNCCD) commissioned its First Scientific Conference in 2009 to deliberate on ways to improve the global monitoring and assessment of dryland degradation to support decision-making in land and water management. The papers included in this issue of *Land Degradation & Development* elaborate the reasoning behind the 11 recommendations that emerged from the Conference and were formally submitted to the UNCCD. These papers argue for a more holistic, harmonised and integrated approach to dryland monitoring and assessment, and describe scientific and institutional approaches for achieving this goal. A central challenge is to integrate human/social with environmental observations in accordance with the Convention's view that the interactions and tradeoffs between human development needs and land condition must be considered. A global monitoring and assessment regime should be established to gather and analyse relevant data on a routine basis, allowing locally-relevant indicators to be aggregated into meaningful classes appropriate to different decision-making levels. The underlying forces that cause changes in land condition should also be monitored and assessed so that remedial actions can target the true causes of dryland degradation, including social, economic, policy, institutional and knowledge drivers that have often been overlooked in the past. Monitoring and assessment should hybridise differing types of knowledge generated by different stakeholders in order to strengthen collective capacities to combat dryland degradation. An independent scientific advisory mechanism should be created to advise the UNCCD about the results emerging from the monitoring and assessment regime in order to improve decision-making.

KEY WORDS: UNCCD; desertification; dryland degradation; drought; monitoring and assessment; sustainable land management; knowledge management; Dryland Development Paradigm; integrated assessment modelling

INTRODUCTION

The United Nations Convention to Combat Desertification (UNCCD; UN General Assembly, 1994) defines desertification as '. . .land degradation in arid, semi-arid and dry subhumid areas resulting from various factors, including climatic variations and human activities'. To avoid controversies about the meaning of the term 'desertification' (Swift, 1996; Toulmin, 1995) we refer to this phenomenon as 'dryland degradation' in the remainder of this paper and throughout this journal issue, except when specifically referring to the UNCCD's usage of the term.

The UNCCD does not confine itself to improving the quality of just the physical and biological condition of drylands. The first preamble in the text of the Convention asserts '. . .that human beings in affected or threatened areas are at the centre of concerns to combat desertification and mitigate the effects of drought'. Integrating the monitoring and assessment of human and environmental parameters poses major methodological challenges, however. Progress on this challenge has been hindered by deficiencies in communication mechanisms between the scientific community and UNCCD bodies (Bauer and Stringer, 2009; Grainger, 2009). As a result, UNCCD member nations have found it difficult to agree on simple, effective measurements and protocols for the monitoring and assessment (M&A) of desertification. These inadequacies in turn have made it difficult to generate financial and other necessary support for pursuing the UNCCD's objectives.

To improve the flow of scientific information into its deliberations and decisions, the UNCCD's supreme decision-making body, the Conference of the Parties, established a

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Scientific Conference mechanism (UNCCD, 2007). The Conference of the Parties decided that the first such Scientific Conference should focus on '. . .biophysical and socio-economic monitoring and assessment of desertification and land degradation to support decision-making in land and water management'. The UNCCD First Scientific Conference took place during 22–24 September 2009 as part of the official agenda of the ninth session of the Conference of the Parties, in Buenos Aires, Argentina.

This special issue of *Land Degradation & Development* presents 12 analytical perspectives emanating from the deliberations of three working groups established to organise the First Scientific Conference. The recommendations of the UNCCD First Scientific Conference are presented and elaborated in the Conclusions section of this opening editorial.

OVERVIEW OF PAPERS

Vogt *et al*., 2011 analyse the information needs of different stakeholders in relation to M&A, concluding that dryland management decision-makers are typically most interested in some or all of the following:

1. the types of dryland degradation, their spatial extent, severity, and trends over time (e.g. stable, worsening, improving);
2. the risks of dryland degradation occurring in areas currently not affected;
3. the causes of dryland degradation, including both human/institutional as well as bio-physical drivers;
4. actions to counter dryland degradation, and their outcomes and impacts and
5. the benefits relative to costs (both monetary and non-monetary) of preventing or correcting dryland degradation, as well as the benefit/cost consequences of inaction.

They describe the conceptual challenges encountered in defining the processes and drivers to be monitored and assessed. Different approaches to these challenges lead to the current fragmentation of dryland degradation M&A practice around the world. A new vision for overcoming this fragmentation through an integrated M&A approach is introduced.

Reynolds *et al*., 2011 describe the scientific concepts underlying such an integrated approach, and formulate a synthetic framework for understanding the functioning of dryland systems (Dryland Development Paradigm; Reynolds *et al*., 2007). Breaking with past approaches that tended to separate human from environmental analysis, the Dryland Development Paradigm calls for their integration, arguing that they are tightly co-dependent and co-evolving aspects of ecosystems. Integrated assessment models can objectively evaluate tradeoffs and reveal synergies and other dynamics between human and environmental domains in support of decision-making.

Sommer *et al*., 2011 discuss ways to translate the Dryland Development Paradigm into useful indicators for M&A at different scales. They consider the search for a universal, small, simple set of indicators to be unrealistic in view of the complexity and context-specificity of dryland degradation. To accurately reflect the condition of the land being observed, indicator systems must be flexible enough to allow tailoring to different settings. Stratification of dryland degradation situations into pertinent classes is necessary, followed by the selection of indicators that are meaningful with respect to those classes. Nesting of local indicators within more generic indicators at larger scales can enable the logical, verifiable aggregation of data to a scale appropriate to a decision-maker's responsibility domain.

Verstraete *et al*., 2011 advocate that these methodological objectives be met through the establishment of a Global Drylands Observing System. With a prime aim of serving the needs of the UNCCD community, the Global Drylands Observing System should also be harmonised with similar systems that serve the UN Framework Convention on Climate Change, the UN Convention on Biological Diversity, and related multilateral environmental agreements, for the cost-efficient and complementary operation of all.

In addition to monitoring the degradation of drylands, UNCCD stakeholders wish to document progress in *combating* that degradation. Schwilch *et al*., 2011 make a case for monitoring and assessing sustainable land management (SLM) actions intended to prevent or reverse dryland degradation. They describe the evolution of global M&A concepts and initiatives for SLM. Sustainable land management must be monitored and assessed in relation to the goals and objectives of land users, as well as in relation to the ecological and bio-physical capability and resilience of the land. These factors in turn are influenced by the management capacities of those who use the land, reflecting once again the Dryland Development Paradigm concept of closely coupled human–environment interactions.

Dryland degradation and SLM are place-based phenomena, so geo-referencing the observations and analysis adds significantly to the power of M&A. Buenemann *et al*., 2011 discuss the power of geospatial approaches to improve the M&A of dryland condition. Because of the complexity of land degradation and SLM, single indicators are usually insufficient to define an area of land as 'degraded' or 'sustainably managed' (as also noted by Sommer *et al*., 2011). Overlays of different types of geospatially-referenced data (including social/human as well as biophysical information) enable the coincidence of multiple indicators in particular locations to be observed, strengthening the power of analysis. Trends and cause–effect relationships can also be inferred from geospatial patterns; models using such data enable 'what-if' analyses of the consequences of different possible scenarios of land use to be carried out. What-if analyses are especially useful for decision-

makers because they enable them to foresee the possible consequences of different choices.

Social, economic and policy dynamics are often the main underlying causes of changes in land condition. Nkonya *et al*., 2011 discuss means for monitoring and assessing social and economic influences on SLM and integrating that information with geo-referenced biophysical information in M&A regimes. In-depth case studies are often required to fully elucidate these influences, and difficulties usually arise in extrapolating their findings to large scales. Large-scale surveys can help in such extrapolation, but are costly. Most countries routinely carry out socio-economic household surveys though, so costs could be managed by piggybacking onto those exercises to additionally collect data on social, economic and policy forces that affect land condition.

Cowie *et al*., 2011 highlight the scientific connections between the UNCCD, the UN Framework Convention on Climate Change and the UN Convention on Biological Diversity. They explain that land management, carbon management and biodiversity (focal topics of the three Conventions) are fundamentally interdependent. In actual land management settings, social, economic, ecological and other pressures result in decisions involving tradeoffs as well as synergies between the objectives of these Conventions. To improve the efficiency and effectiveness of all three Conventions these interactions need to be understood so that relevant SLM parameters can be monitored and assessed in a harmonised way.

Reed *et al*., 2011 focus on how SLM decisions are made at different levels by different stakeholders (e.g. land users, local and national policy makers). They note that differing priorities and sources of knowledge often influence the perspectives of these different groups. An approach that hybridises these different knowledge sources/types is proposed in order to more effectively integrate M&A practice, in accordance with the Dryland Development Paradigm principles of closely coupled human–environment systems and interactions across scales. They also argue that the purpose of M&A should not be limited to gathering and assessing data on land condition and trends; it should also be structured in a way that stimulates and enables the efforts of stakeholders to *combat* desertification.

Requier-Desjardins *et al*., 2011 argue that since policy decisions can be strongly influenced by costs versus benefits of alternative land management choices, cost–benefit analysis should also be included in M&A. They note that many ecosystem services are often overlooked in valuation exercises or are assumed to be cost-free, or are difficult to evaluate in financial terms. They describe different approaches and methods for overcoming these challenges. Better awareness of costs and benefits through improved M&A can help the public gain an appreciation of the value received from protecting the land, and could help stimulate innovative financing mechanisms to combat dryland degradation.

Inter-institutional and inter-disciplinary collaboration and knowledge sharing are essential for monitoring and assessing the multiplicity of factors that determine dryland degradation. The UNCCD, UN Framework Convention on Climate Change and the UN Convention on Biological Diversity as well as different agencies at national levels recognise this need yet have not been able to achieve sufficient collaboration among themselves on M&A. Chasek *et al*., 2011 discuss the constraints to inter-institutional knowledge-sharing at different scales (local, national, international). Differences between institutional cultures, perspectives and priorities, typical disciplinary organisation of agencies (e.g. water, agriculture, social welfare, etc.) and a lack of integrating mechanisms all impede knowledge-sharing. The integration of local knowledge with formal institutional knowledge has been particularly inadequate. Different measurement techniques and database structures also present obstacles. Clearing-house, coordination, harmonisation and other boundary-straddling mechanisms are needed.

Akhtar-Schuster *et al*., 2011 examine the difficulties encountered in integrating policies to combat dryland degradation into core national and international development initiatives ('mainstreaming'). Obstacles exist in the institutional, financial, legal, knowledge and policy realms. Inter-agency bodies could help to overcome these obstacles. A parallel situation exists in the international science arena. International scientific institutions that address topics relevant to dryland degradation should create mechanisms to formulate and mainstream collective effort on those topics. The M&A of dryland degradation and of SLM could be one such effort, enabled by an inter-institutional mechanism endorsed by, but independent from the UNCCD. Such a mechanism would require formal recognition in the deliberations of the UNCCD and of other multilateral environmental agreements in order to mainstream its influence.

ELEVEN CONFERENCE RECOMMENDATIONS

The 12 papers described earlier reflect the deliberations that emerged from the working groups that were formed in preparation for the UNCCD First Scientific Conference. The working groups submitted 11 recommendations to the Conference of the Parties for improving the monitoring and assessment of dryland degradation in support of decision-making in land and water management (UNCCD, 2009a). Decision 23 by the Conference of Parties noted the recommendations and requested a subsidiary body, the UNCCD Committee on Science and Technology to study them and advise the Conference of Parties on actions needed (UNCCD, 2009b). The 11 recommendations are as follows, edited slightly for readability:

1. Desertification, dryland degradation and drought as defined by the United Nations Convention to Combat

Desertification results from dynamic, interconnected, human–environment interactions in land systems (where land includes water, soil, vegetation and humans) and requires a rigorous scientific framework for M&A, which has so far been lacking.
2. To be sufficiently realistic and insightful in light of this complexity, M&A must make use of a wide range of analytical methodologies, and distil their lessons into forms useful for decision makers through integrated assessment modelling.
3. Public land-use and land-management decisions are mainly taken at national and sub-national levels, and so a UNCCD global M&A strategy should be designed to be compatible and synergistic with these levels.
4. Sustainable land management is imperative to address the UNCCD core mission to combat desertification; therefore SLM should be fully integrated into dryland degradation M&A.
5. Monitoring and assessment of dryland degradation and SLM should include the collection of information relating it to climate change and biodiversity, and to other land-related issues that are the focus of other multilateral environmental agreements.
6. To aid decision makers in setting priorities, M&A should collect information on the economic, social and environmental costs of dryland degradation, and the benefits of SLM. The potential role of economic modelling should be explored to develop policy mechanisms that can facilitate sustainable land management decisions.
7. Monitoring and assessment should capitalise on knowledge management to stimulate valuable synergies between different sources of expertise across different spatial and temporal scales and levels, social settings, institutions, scientific disciplines and development sectors.
8. Sharing of local and scientific knowledge, tools and methods will enhance M&A and strengthen human and institutional capacities.
9. Coordination and dissemination of new knowledge and methodologies for integrated approaches to dryland degradation/SLM require the establishment of an independent, international, interdisciplinary scientific advisory mechanism which would include (but not be limited to) M&A, with clear channels for consideration of its advice in UNCCD decision-making.
10. In order to propel principles into action, regular M&A of global dryland degradation/SLM and early warning mechanisms should be organised and implemented based on agreed standard protocols and open data access policies, to harmonise with other efforts worldwide and to minimise duplication of effort.
11. The UNCCD community would benefit from a science networking mechanism so that the large yet dispersed body of dryland degradation/SLM knowledge and expertise worldwide could be more effectively accessed, used and shared.

CONCLUSIONS

A range of powerful scientific methodologies is available that could considerably improve the accuracy, precision and insightfulness of monitoring and assessment of dryland degradation and sustainable land management in support of the UNCCD mission. Their use, however, is currently constrained by inadequate institutional protocols and formats within the UNCCD and within the global scientific community for collaborating on the use of scientific knowledge.

The global scientific community lacks a mechanism for distilling and communicating its knowledge in ways that are relevant to and easily understood by non-scientific communities such as the political decision-makers that are engaged in the UNCCD. Scientists widely perceive current UNCCD communication channels as bureaucratic and time-consuming with unclear outcomes, limiting scientists' interest in participation (Bauer and Stringer, 2009; Grainger, 2009). Observing the UNCCD's complex political protocols, scientists harbour concerns that scientific advice would be subordinated to political considerations in UNCCD deliberations and actions. UNCCD mechanisms must ensure scientific independence and the effective use of scientific knowledge in support of the UNCCD mission if they are to attract wide participation from the scientific community, and support from funding agencies.

The launching of the UNCCD Scientific Conference mechanism in 2009 begins to address these communication shortcomings, but is only a starting point. Conferences are well-suited for exchanging knowledge and generating new ideas and awareness, but continuous engagement is required for activities such as an M&A regime. Papers discussed in this journal issue explore ideas for mechanisms of engagement, such as a Global Dryland Observing System (Verstraete *et al.*, 2011 building on Recommendations 1 and 10 in the previous section), a scientific body such as a panel to distil and communicate M&A findings to the UNCCD Conference of Parties (Akhtar-Schuster *et al.*, 2011 building on Recommendation 9), and a global network of dryland scientists committed to supporting the UNCCD's objectives (Akhtar-Schuster *et al.*, 2011 building on Recommendation 11).

Since weaknesses in the formal science-policy interface currently hamper coordinated action, efforts to catalyse such mechanisms might at first be pursued by both communities separately while sharing ideas and progress informally in mutually supportive ways that avoid a 'power struggle'. The scientific community could develop mechanisms for global scientific participation and balance as needed for political acceptance by the UNCCD, while the UNCCD community could develop protocols that assured scientific independence

and mainstreamed scientific input into UNCCD deliberations and decisions. As each community improved its capacity to interact in ways that meet the needs of the other, collaboration would become easier. Neither community can overcome dryland degradation without the other; science and society must work in concert if they are to succeed.

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