**Concept Note for a Global Study on the Economics of Land Degradation**
**(*Prepared by United Nations University- Institute for Water, Environment and Health***

## Introduction

Land is the key natural resource in many developing economies. More than 70% of rural populations worldwide depend directly on land-based production activities; agriculture, livestock, fisheries, forestry, mining and natural resources-related manufacturing play a major role in national economies, employment, and foreign exchange earnings (FAO 2002). It is estimated that environmental capital accounts for 26% of the total wealth in low income countries, 13% in middle income countries and only 2% in industrialised or OECD countries (Steele 2006) yet many ecosystem services provided by the land are not captured by GDP or Standard National Account System (SNA) - or - for instance, the soil receives and delivers all fresh water resources , not only for crops but for municipal and industrial supply, but this is not captured by conventional macro-economic indicators . Many countries with poor growth records still have a relatively large share of national GDP coming from the agricultural sector - over 20 per cent in most African nations (Awokuse 2009). Economic growth in developing economies, especially broadly based growth in the rural economy, is essential for reducing poverty and hunger, meeting the MDGs, and sustainable development (World Bank/IFPRI, 2006).

Worldwide, land degradation is one of the biggest threats to sustainable development and poverty reduction. Land degradation is a long-term reduction of the capacity of land to supply benefits to humanity. It is the result of combination of social, economic, cultural, political, and biophysical forces operating across a broad spectrum of temporal and spatial scales (Daily 1995) but essentially arises from bad land management that encourages soil erosion by wind and water, bad irrigation management leading to salinization, overgrazing of rangeland, and, more widely and insidiously through a loss of soil organic matter, acidification and loss of biodiversity (UNEP 2007; Acharya and Kafle 2009). These problems are further aggravated due to a combination of market, policy and governance failures, such as insecure property rights, distorted market prices for inputs and outputs, imperfect competition, and perverse incentives, which affect the farmer's perception of the costs and benefits of controlling land degradation (Barbier, 1996). Setting aside cyclical climatic variability, production has been declining over one quarter of the land surface over the last quarter century; 42-47 per cent of degrading land is forest, and 18 per cent cropland; all biomes, every continent and every region is affected (Bai and others 2008, 2010) but the economic and social effects are most severe in marginal lands in developing countries (Scherr 1999).

According to the Millennium Ecosystem Assessment (2005), biophysical processes like irregular and infrequent rainfall are direct drivers of land degradation; indirect drivers include: local population growth and population movements, local and global market trends, local and regional land tenure policies. When integrated action is not taken to combat both the direct and indirect drivers there is degradation of land resources and ecosystem services in some cases this loss is irreversible. Land degradation has been shown to have a greater drag on developing economies that are heavily dependent on the agricultural sector. Unfortunately, environment ministries in many countries have focused on the major international conventions of biodiversity and climate change that figure on international agendas and this focus has often made them less aware of pressing national problems such as land degradation (Steele, 2006).Several studies have reported an increase in migration to marginal lands in developing countries following a rapid increase in population (Leiwen and others 2005, Ericson and others 1999, Findlay 1996).

The economic costs of land degradation and full costs of the loss and degradation of ecosystem services are difficult to measure (MA 2005, Coxhead 1996) but all the available information demonstrates that they are substantial and growing. There have been several attempts to quantify the costs of soil erosion and a few other studies have undertaken the valuation of ecosystem services ranging from the global to the micro level. However, few economic assessments take account of indirect and off-site effects. The significance of land degradation has been highlighted as a major economic problem in estimates of the costs of soil erosion on cultivated land, especially in drylands (Dregne, 1992; Berry, 2003; Bojo and Cassels, 1994; Sutcliffe, 1993; FAO, 1986; Grohs, 1994; Norse and Saigal, 1992; Stocking, 1986; Bojo, 1991; Convery and Tutu, 1990); for instance, the annual nutrient loss on farmlands in Mali is estimated to cost US$7.4 million (Bishop and Allen, 1988). Further, it has been argued that the annual cost of land degradation in sub-Saharan African countries is more or less equivalent to their mean agricultural growth, thereby limiting the scope of rural development (Requier-Desjardins 2006). A regional south Asian study estimated that the region is losing at least US$10 billion annually as a result of land degradation, equivalent to 2% of the region's GDP or 7% of the value of its agricultural output (FAO 1994). It is estimated that about 12-13.5% of the global agricultural output has been lost in the past five decades as a result of soil degradation (Jie and others 2002). Each of these studies has demonstrated that land degradation holds back the living conditions and economic development of developing economies and jeopardises food and water security (Barbier and Bishop 1995).

Recently, significant improvements have been made in the ecological understanding of land-based ecosystem services and monetary valuation methods but there is still uncertainty about values for ecosystem services. Most services emanating from the land are unaccounted for, un-priced, and therefore remain outside the domain of the traditional market. Economic techniques have been used mainly to evaluate the direct use value of land resources-based (Hecht1999); no past studies have attempted to assess the total economic costs of land degradation such as those services related to maintaining water quality and flow, regulating water storage and recharge, flood attenuation, nutrient cycling and purification, etc. (CSFD 2007). Externalities generated through market failure, institutional failure and information failure are key challenges to combating land degradation. The main barriers to market-based approaches to land management include a lack of well-grounded studies on the economics of land degradation, high uncertainty over the attributes and values of land-based ecosystem services when they are assessed, a high degree of inter-dependency among ecosystem services and the consequent difficulty of trying to allocate a value to each service, lack of a critical mass of buyers and sellers, and difficulty to define and enforce ownership of ecosystem services (LSE/UNEP 2005). Given the potential magnitude of the problem and the dire need for mobilizing resources for combating land degradation, the gaps in current knowledge about the social costs of land degradation are remarkably large.

Markets fail to reflect the externalities arising from the off-site costs of land degradation; and the lack of well grounded economic studies of the externalities means that the magnitude of this global problem is under-valued in decision-making. This, in turn, leads to continuance of actions that result in land degradation, and hold back economic and social development. The MA provides significant scientific knowledge with regard to linkages among land degradation, ecosystem services and human well-being; however, these findings need to be supported by credible, legitimate and scientific studies that feed directly into the policy-making process. A broader economic analysis of land degradation provides a way of measuring and comparing the various benefits of ecosystems; this can prove to be a powerful tool to improve land use policy and management. As the economic and environmental impacts of land degradation are felt globally, there is a need for a robust analysis on the economic and environmental costs of land degradation, as well as research into avenues for generating financial resources through both non-market and market-based approaches to sustainable land management.

A recent paper authored by independent international of experts and presented to the high-level segment of the 9th Conference of Parties to the UN Convention to Combat Desertification in Buenos Aires in September 2009 highlighted the need for the land degradation equivalent of the Stern Report on Climatic Change (Adeel and others, 2009). The report advocated a strong macro-economic approach to radically change how development decisions are made while accepting that this may present serious methodological problems (Stocking, 1987).This concept note follows up their proposal. A rigorous valuation of natural capital and assessment of the cost of unsustainable use of land-based resources, and evaluation of the economic costs of land degradation at the regional and global levels would address the methodological issues and would raise awareness and contribute to better decision-making to reduce the vulnerability and enhance the livelihoods of people directly dependent on natural resources, and contribute significantly to global food and water security (GEF, 2009).

**Objectives**

The proposed multi-disciplinary study of the global economics of land degradation, modelled on the Stern Report, seeks to enhance awareness and develop new strategies to combat land degradation and desertification. The specific objectives are to:

- Develop appropriate valuation methodologies to assess the global costs of land degradation while recognizing that bio-physical and economic conditions are not all the same across different regions;
- Develop regional (and/or country) level case studies;
- Undertake a multi-disciplinary, global assessment of the economic costs of land degradation and the costs and benefits of different actions and responses (including costs of inaction);

- Develop a policy brief for national and international policy makers.

**Methodology**

Valuation techniques have been applied in the past to change in productivity, cost of illness, replacement costs, travel costs, hedonic pricing, contingent valuation, and choice modelling (Pagiola and others 2004). The proposed study will builds on the Total Economic Value (TEV) approach to valuation of the environment but take a more systematic approach to the assessment of the global costs of land degradation (IUCN/TNC/The World Bank 2004). Land-based ecosystem services contribute to economic welfare through income generation and well-being, and prevention of damages that inflict costs to society (DEFRA 2007). It is crucial that both should be accounted for in policy appraisal. . *Direct methods* of valuation determine the physical effects of variations in the environment on economic activities and measure the monetary value of the damaged ecological function. *Indirect methods* assign a monetary value to the physical damage caused by land degradation; they are not based on the actual behaviour of economic agents but it is assumed that environmental quality is a production factor affecting the prices of the products. A very important component of the economic valuation of ecosystems is non-use value **(**Arrow and others, 1993) that captures *willingness to pay* (WTP) simply to guarantee that the resource will continue to exist even though an individual does not expect to use it or see it at any identifiable point in the future (Hecht, 1999). Another type of non-use value is known as the *option value*: the willingness to pay of individuals who have the option of seeing a particular resource at any undetermined point in the future. A deviation of this is the *quasi-option value*; this is based on the assumption that in the future, the value of the option of seeing the resource will increase as a result of the growing scarcity of the resource (Hecht, 1999). A final component of non-use valuation is *bequest value*; that is, the amount an individual is willing to pay to ensure that future generations are also able to benefit from the particular resource (Hecht, 1999). Table 1summarizes the main economic valuation techniques which will be considered in this study. The multi-disciplinary or holistic approach of the proposed study marries economic valuation with equally rigorous bio-physical understanding of the processes and the available management methods and approaches and a pragmatic appreciation of the policy options.

Table 1. Ecosystem valuation techniques

| Methodology | Approach | Applications | Data requirements and methods | Limitations |
|---|---|---|---|---|
| **Revealed preference methods** | | | | |
| Market price | Peoples' actual ***willingness to pay*** | Direct consumable, commercial goods obtained from an ecosystem | • Costs to buy or sell a good or product<br>• Collect market data on prices<br>• Estimate quantity consumed/sold<br>• Multiply price x quantity | • Market price not always available, distorted market signals incorrect prices ecosystem goods |
| Production function | The economic contribution of ecosystems to other production and consumption activities<br><br>***Market value as an input*** | Any impacts that affect health (e.g. air or water pollution) | • Determine contribution of good/service to related source of production<br>• Specify relationship between changes in good/service and changes in related output<br>• Relate change in provision of good/service to physical change in output<br>• Estimate market value of change in production | • Data on change in service and consequent impact on production often lacking |
| Travel costs | How much people spend to use or benefit from using ecosystems for recreational purposes<br><br>***Peoples' implied willingness to pay*** | Recreation services | • Identify area from which visitors come and divide into zones of equal travel costs<br>• Sample visitors in each zone for travel costs and socio-economic characteristics<br>• Obtain visitation rates for each zone<br>• Estimate travel costs<br>• Carry out regression of trips against other variables<br>• Construct demand curve and calculate consumer surplus | • Limited to recreational benefits; hard to use when trips are to multiple destinations |
| Hedonic pricing | Difference in (property or wage) prices that can be ascribed to the existence or level of nearby environmental goods and services | Air quality, scenic beauty, cultural benefits | • Prices and characteristics of goods | • Limited where markets are distorted, choices are constrained by income, information about environmental conditions is not widespread and data are scarce.<br>• Requires vast quantities of data; very sensitive to specification |
| **Cost-based methods** | | | | |

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| Replacement costs | The costs of replacing an environmental good or service<br><br>***A minimum estimate of money saved*** | Specific natural ecosystem functions or assets with man-made production processes | • Ascertain benefits associated with good/service<br>• Identify most likely alternative to provide equivalent level of benefits<br>• Calculate costs of installing and running replacement | • Relies heavily on the assumption that replacing the original good or service is worthwhile and that the benefits generated by the investment in doing so outweigh the cost of replacement |
| Mitigative or avertive expenditure | The costs of mitigating or averting the effects of the loss of an environmental good or service<br><br>***A minimum estimate of money saved*** | • Watershed protection benefits of selected harvesting regimes<br><br>• Coastal marshes and mangroves | • Identify hazards arising from loss of good/service<br>• Locate area and population which would be affected<br>• Obtain information on peoples' responses and measures taken to cope with effects of loss<br>• Cost the response | • Potential cause of overestimation (cost of preventing or defending against degradation of the environment) |
| Damage cost avoided | The costs avoided from desertification and land degradation or loss of biodiversity<br><br>***A minimum estimate of money saved*** | Land-use options | • Identify protective functions of good/service<br>• Identify damages caused by loss of different degrees of protection<br>• Locate infrastructure, output or population that would be affected<br>• Obtain information on likelihood and frequency of damage occurring<br>• Costs damages associated with given loss of good/service | • Assume that expenditures to repair damages or to replace ecosystem services are valid measures of the benefits provided. However, costs are usually not an accurate measure of benefits |
| **Stated preference method** | | | | |
| Contingent valuation (CV) | The amount people would pay/accept under the theoretical condition that biodiversity could be bought and sold<br><br>***People's stated willingness to pay*** | Any service | • Ask respondents their WTP / WTA for good/service<br>• Draw up frequency distribution relating WTP / WTA statements to number of people making them<br>• Cross tabulate WTP / WTA responses with explanatory variables<br>• Carry out multivariate analysis to correlate responses to explanatory variables<br>• Gross up sample results | • Many potential sources of bias in responses; guidelines exist for reliable application |
| Conjoint analysis | Preferential analysis between various | Any service | • Obtain information on preferences between various alternatives of environmental goods | • Strategic biases |

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|---|---|---|---|---|
| | ecosystem goods and services | | and services, at different prices or cost. | |
| Choice experiment | Ask respondents to choose their preferred option from a set of alternatives with particular attributes | Any service | • Survey of respondents<br>• Present a series of alternative resource or use options, each of which are defined by various attributes including price. | • Similar to those of CV; analysis of the data generated is complex |
| **Others method** | | | | |
| Benefit transfer | Use results obtained in one context in a different context | Any for which suitable comparison studies are available | • Valuation exercises at another, similar site | • Can be very inaccurate, as many factors vary even when contexts seem "similar"; should be used with extreme caution |

After: IUCN/TNC/The World Bank, 2004

**Activities**

This study would include the following activities:

1. Scoping of existing valuation techniques and methods of relevance to land degradation
2. Review of existing information on the economic values of land management and ecosystem services and the costs of land degradation
3. Validation of the methodology and valuation models through country-level pilot (or regional) assessments and case studies. This includes development of case study publications and synthesis by a small study group leading to a series of published reports.
4. Global assessment of the economic costs of land degradation and the costs and benefits of different actions (including costs of inactions) including global ecosystem functions and services.
5. Report on the economics of land degradation, incorporating:
   - Integrated ecological and economic framework for valuation;
   - Relation between land degradation, ecosystems services and food security ;
   - Methodology (techniques) of economic valuation for land degradation;
   - Social dimensions of land degradation;
   - Research findings of the estimates of economic values of land degradation;
   - Quantitative assessment of the costs of land degradation and the loss of ecosystem services including the costs of action (or inaction);
   - Macroeconomic dimension of land degradation
   - Policy options

**Outputs**

The following outputs are planned:

1. An integrated ecological-economic framework based on a review of the processes of land degradation and available management approaches and techniques, land resource modelling and valuation techniques. Assessment of valuation techniques will include their data requirements and utility for different forms of land resource and management appraisal;
2. A set of robust and replicable methodologies for the analysis of the values of land and costs of land degradation;
3. National/regional case studies on the economics of land degradation along with the appraisal of the costs and benefits of different sustainable land management practices in these regions;
4. A Stern-type report on the economics of land degradation with consideration of practical management and policy options;
5. A synthesis report targeted to national and global policy makers.

This initiative might be a contribution towards the preparation of the 2$^{nd}$ Scientific Conference of the UNCCD which will be held during the special session of its Committee on Science & Technology (CST) in 2012, where the topic of the conference has been set out to be “Economic assessment of desertification, SLM and resilience” (Decision ICCD/COP (9)/L.27). It is envisaged that most of the work related to the economic assessment of land degradation will be carried out by co-opted top scientists in the field, with the policy brief being coordinated by, amongst others, the “Hamilton Group” of experts responsible for the paper on the UNCCD (Adeel and others 2009).

**Budget**

The total budget for this initiative will be US$ 1 million.

**Team**

The team will consist of renowned scientists in the field; some targeted experts have been part of the MA assessment and TEEB initiative. The potential participating institutions would be UNEP, UNDP, OSS, ISRIC, ASEI, and the Global Mechanism of the UNCCD. ~~UNU-INWEH will be responsible for organizing the project team activities and meetings.~~

**Timeline**

The study will be completed within 18 months. The final product will be prepared to be presented at the 2nd Scientific Conference of UNCCD to be held during the special session of the CST in 2012.

Workplan

| **Activity** | **Time Frame** |
|---|---|
| Inception/planning phase | 1-3 months |
| Review of valuation models | 3-5 months |
| Develop valuation tools | 5-6 months |
| Develop cuntry/regional case studies | 6-10 months |
| Undertake global assessment | 10-13 months |
| Report and policy brief | 13-18 months |
| Dissemination | |

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