Economics of Land Degradation (ELD) Initiative

A Global Initiative to Raise Awareness of the Economic Losses Arising from Land Degradation

Interim Report: A Summary
Prepared by UNU-INWEH
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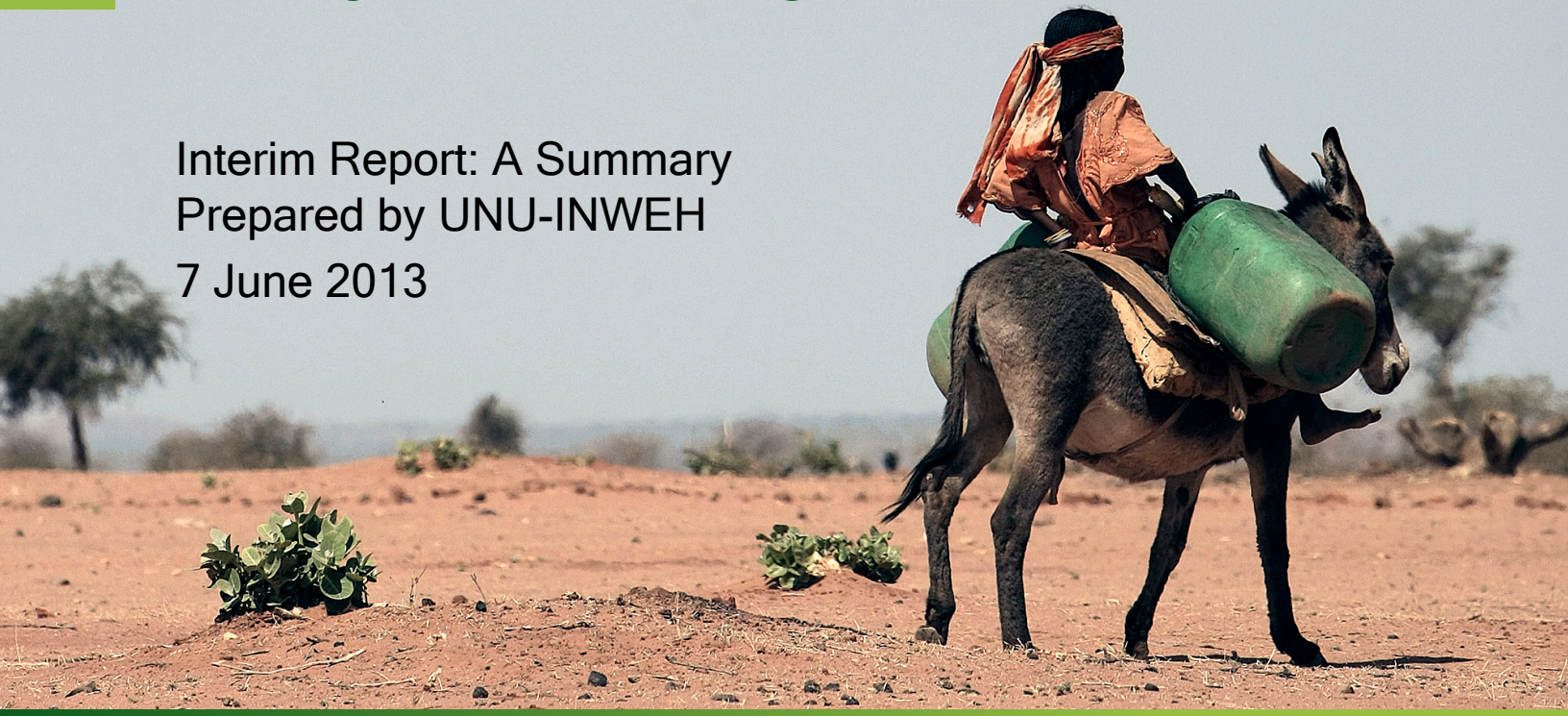

What is the ELD Initiative?

The ELD Initiative is a global awareness study focused on raising political and public awareness of the impacts of land degradation and importance of land-based ecosystems, from an economic perspective. Initiated in 2010, the ELD Secretariat is based in Bonn, Germany, while the ELD Scientific Coordinators are based at the United Nations University – Institute of Water, Environment, and Health (UNU-INWEH) in Hamilton, Canada. The aims and objectives of the initiative are:

Economic:

To prepare and present a cost-benefit analysis in the context of land degradation, in order to enable decision-makers in politics and business to take the necessary measures for better rural development and food security and promote sustainable land management.

Scientific:

To systematize scientific studies on the economics of land degradation, reach agreements on methodological standards, and provide reliable data and application-oriented tools that are urgently needed as a basis for policy-making and investment decisions. In addition, data and practical examples will provide important material for media and public awareness work.

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Our Vision is to transform the global understanding of the value of land and to create awareness of the economic case for both market and non-market values in sustainable land management in order to prevent the loss of natural capital, preserve ecosystem services, combat climate change, and address food, energy, and water, security.

The ELD Initiative is open to partnership and contributions from governments, foundations, development organizations, the private sector, and multilateral/bilateral donors. The initiative also actively encourages the participation of NGOs, farmers, agricultural associations, universities, research institutions, and international and local businesses in its endeavours.

Please see http://eld-initiative.org for further information.

What is Land Degradation and Why is it Important?

Land degradation is a human-induced reduction of the biophysical capacity of land, which in turn negatively affects the ability to operate at its sustainable, full productive potential and provide ecosystem services. Effects of degradation include desertification, declining crop yields, increasing soil erosion and loss of soil fertility, diminishing water supplies and quality, etc.

Land degradation threatens fertile land throughout the world. The consequences are alarming: food insecurity, poverty, reduced availability of clean water, increased vulnerability of affected areas to climate change, and much more. It is estimated that 1.5 billion people in all parts of the world are already directly negatively affected by land degradation. A recent study has found that degradation has already reduced the productivity of the world's terrestrial surface by about 25% from 1981–2003 (Nachtergele et al. 2010), despite the need for agricultural crop yields to actually increase by as much as 70% before 2050 in order to meet the food demands of an rapidly growing world population (FAO 2006). The resultant increasing demand for alternative land management products continues to intensify competition for the scarce resources of healthy soil and water.

According to recent studies, land degradation has negative effects on both economic and social development in affected countries. However, many decision makers in both developing and developed countries continue to discount the impact of land degradation on land system productivity. As a result, there is an urgent need for concise data that provides the answers to questions about the socio-economic costs of land degradation, and the benefits of investment in sustainable land management and alternative livelihoods.

Key Terms

Land degradation: Reduction in the economic value of ecosystem services and goods derived from land as a result of anthropogenic activities or natural biophysical evolution.

Ecosystem services: Benefits to humans from nature, which can form the basis of economic activities. These benefits usually occur as a "flow".

Ecosystem good: A stock of ecosystem services.

Sustainable land management (SLM): Knowledge-driven programmes that are focused on integrating the management of land, water, biodiversity, and environmental resources to meet human needs while sustaining ecosystem services and thereby livelihoods derived from land use.

Total economic value (TEV): The full value of a piece of land to society as a whole. Includes use value (direct and indirect) and non-use value.

Direct use value: The economic value of services and goods provided directly that are easily and often measureable by their market price (i.e., agricultural income).

Indirect use value: The economic value of services and goods provided by land and land-based services that are not commonly accounted for when measuring their economic values. Includes ecosystem services and provisioning (i.e., flood regulation, nutrient cycling).

Non-use value: The economic value of services and goods that are not used. Includes the economic value of keeping options opened for future use, existence value, bequest value and stewardship value.

Why are the Economic Benefits of Land Degradation and Sustainable Land Management Important?

Land and its productivity potential have been taken for granted and undervalued by civilizations past and present, despite warnings of the need for careful land stewardship found throughout ancient writings. Today, the pressure on land has reached such a critical point that serious doubts have been raised on the capacity of land to meet the demands of a human population rapidly increasing to 9 billion (Beddington 2010), and provide bio-fuel production, climate regulation (including carbon sequestration), food and water security, and spiritual, aesthetic, and recreational activities. With misperceptions of plentiful food production, large food stocks in Europe, open land frontiers, relatively cheap subsidised food, low land prices, abundant energy and water resources, and mainly drought-related famines, complacency over sustainable land use has been prevalent during the last 20 years.

The realization that the land has actually been neglected is belatedly beginning to gain traction. Global estimates of degraded areas amount to at least 10-20% of usable land, with an estimated total economic loss of $40 billion USD per year (FAO, 2006). This includes a startling loss of grain worth $1.2 billion USD yearly. By 2050, at least a 70-100% increase in food production from existing land resources may be needed in order to be able to feed current and future generations (FAO 2006, Godfray et al. 2010). In reality, declining trends are actually being observed in crop yield increases. Even if agricultural land productivity remains just at its current levels, an estimated 6 million hectares of land (roughly equivalent to Norway) will need to be brought into usage every year until at least 2030 to satisfy this growing demand. Efforts to raise awareness of the seriousness and extent of land degradation are gradually reversing what has amounted to a discounting of its impacts on both economic and social development in affected countries. Increasing land prices and the proliferating rush of foreign investors seeking to buy or lease land are signals that the world is waking up to the threats from land degradation and closing frontiers. Despite this active global interest in land, levels of investment remain far below those needed to meet the rising demands for land-related products and services. Agricultural investments to the order of US$30 billion per year are needed to feed a globally growing population (FAO 2006).

Market prices for land are generally based on the direct productive potential (e.g., the market value/retail price of timber, crops, etc.). However, it is recognized that these prices do not accurately reflect the full value of land. This is especially the case when land value is comprehensively analysed to include the four types of ecosystems services it provides, which involves not only the products used for food, fibres, and shelter, but also water quality and quantity, and the maintenance of biodiversity (summarized in Box 1). When these additional indirect values are factored in, the value of land can increase by 100% or more. The need to fully value land has become urgent in response to the aforementioned increase of foreign investment in land. Sometimes called 'land grabbing', as much as 80 million hectares globally may already be leased or otherwise negotiated with foreign investors. Water is also often included in these land deals, but rarely accounted for or valued despite its importance (e.g., Rulli et al. 2013). Under these types of conditions, better economic valuation of land can pro-

vide a basis for fairer financial compensation for countries and their citizens, particularly if the latter are displaced from or dispossessed of land that they have traditionally used.

Ecosystem services (Millennium Ecosystem Assessment 2005)

Provisioning: goods provided such as food, water, fibre and fuel
Supporting: primary production, soil formation, and nutrient cycling
Regulating: benefits from process regulation (i.e., climate regulation, water/nutrient cycling)
Cultural : non-material benefits such as spiritual, aesthetic, recreation, and education

Increasing competition for land demonstrates that an assessment of the total economic value of land is urgently required so that land is not undervalued or undersold. This will allow concerned parties to make the most of all of their potential economic opportunities. Unfortunately, the total economic value is so far perceived as too complicated and/or too costly to estimate, or its results not considered appropriately in decision-making processes.

Policy and decision makers are faced with a multitude of demands on limited resources, and thus require a common metric to compare options. These metrics usually work on monetary terms, and so it is important that land is given its full economic value, as measured from the point of view of society as a whole, so that appropriate policies and finances can be directed towards land stewardship, sustainable land management (SLM), and risk management.

As part of discussions focused on the post-Rio+ 20 sustainable development goals, the UNCCD has set a target of zero net land degradation. In order to attract the necessary investments to prevent and/or reverse land degradation, this goal will require a focus on the value of land and economics of land degradation. The provision of solid numbers reflecting these assessments are extremely valuable tools when presenting SLM options to policy/decision makers and potential investors. For example, closing yield gaps and reaching 95% of potential maximum crop yields (assuming the adoption of SLM practices) could create an additional 2.3 billion tonnes of crop production per year (Foley et al. 2011), equivalent to $1.4 trillion USD. Furthermore, when the numerous indirect values of land are added in, it becomes quite clear that there are huge investment opportunities waiting for those who are committed to achieving improved land management that does not result in environmental degradation.

Why Value Nature (and Not Price It)?

"Nowadays people know the price of everything and the value of nothing"

- Oscar Wilde, The Picture of Dorian Gray [1890]

Like Oscar Wilde, economists make a clear distinction between price (either financial or market) and value. The economic value of a good or service reflects the preferences that society as a whole has for (and therefore allocates to) this good or service. A price is determined by the market as the result of interaction between demand and supply. However, markets do not always exist for certain products, even if the "products" themselves exist. For example, simply because one cannot buy a litre of clean air on the market does not mean that clean air does not have a value. Furthermore, markets that do exist may be imperfect and have prices that do not reflect the economic values perfectly to society as a whole. When this is the case, economists refer to it as market failures.

By adopting the perspective of society as a whole, economics can help decision-makers decide between alternative options (e.g., development vs. conservation), set up a more equitable process that avoids social tensions, and set up new markets.

Is Sustainable Land Management Economically Worth Adopting?

The economics of land degradation focuses on the costs and benefits of conserving and maintaining lands, as opposed to land management that is not inclusive of long-term outcomes, and thus loses productive potential. Land management decisions are primarily based on the value of land resources, so without a complete idea of the full value of land, unsustainable land use options are easily chosen. Thus, the value of ecosystem services provided by land and the economic cost of land degradation should be used as a rationale for policy making and policy changes.

Methodology: The ELD Approach for the Assessment of Potential Economic Improvements; *Using and Expanding on a Combination of Existing Approaches and Frameworks*

The ELD initiative draws from existing frameworks and approaches of environmental economics, expanding them to include features that are specific to land management. The questions these frameworks and approaches attempt to address include:

- From an economic perspective, how can one decide whether it is worth taking action or not?
- Why and how should the economic value of land and land-services be estimated when they do not have market prices?
- How is complexity reduced to estimate the economic value of land and its services?
- To compare against the cost of action, should the costs of inaction or the benefits of action be estimated?
- How is the best economic option for (in)action chosen? What criteria can be used?
- What kind of economic solutions can be adopted for given problems?
- What are the necessary conditions for economic action to be successful?

Methodology: Cost-benefit Analysis

Previous studies estimate the costs of land degradation at $40 billion USD per year (FAO 2006). This is a high cost to pay for land degradation, but it also begs the question of whether or not the potential benefits of reversing land degradation are worth acting upon. Will the adoption of SLM practices or alternative land uses lead to greater benefits than costs? A cost benefit analysis is a powerful tool that helps to answer this question.

A cost-benefit analysis is a tool derived from accounting that compares the costs of undertaking an action or a project (in this case, of adopting SLM practices) to the benefits derived from it. The costs of SLM practices can be obtained relatively easily but the full economic benefits are often missing or only partially known. This information gap exists either because changes to the land have not yet occurred and thus cannot be measured in practice, or because only a fraction of the economic benefits are being translated into market prices. When this is the case, the missing values of economic benefits can be estimated by using economic valuation methods.

In this context, a cost benefit analysis will compare the benefits of adopting SLM practices (or alternative land uses) to the associated costs of taking such action. The costs and the benefits of adopting SLM practices and alternative land uses depend upon the level of action taken and change achieved, which in turn depends

on the causes of land degradation and the processes driving it. Once both the costs and benefits derived from action have been estimated, one can then estimate a net economic benefit from action that will be equal to the benefits minus the costs of action.

One of the advantages of a cost-benefit analysis is that it quantifies everything in "money", either through market prices or economic values. Everything being expressed in the same unit of measurement allows for direct comparisons, and also provides an idea of the scale of implementation (i.e., from a village marketplace exchange to international trade). This can be helpful in identifying which economic incentives or policy instruments to set up and how large they should be. Cost-benefit analyses also allow simulations of the introduction of such instruments, and/or the removal of existing incentives that have adverse economic, environmental, and/or social consequences for land management.

Additionally, cost-benefit analyses help identify the most economically efficient practice for a given scientific, political, legal, cultural, or social context. Long-term change requires that the chosen practice is identified as having the greatest net benefit (from the perspective of society as a whole) that is not associated with non-economic barriers (scientific, political, legal, cultural, or social) to ensure the practice is actually implemented. If there are other barriers to adoption, then successful implementation requires the removal of these other barriers.

The Ecosystem Services Framework: Independent Service Valuation, followed by Value Aggregation

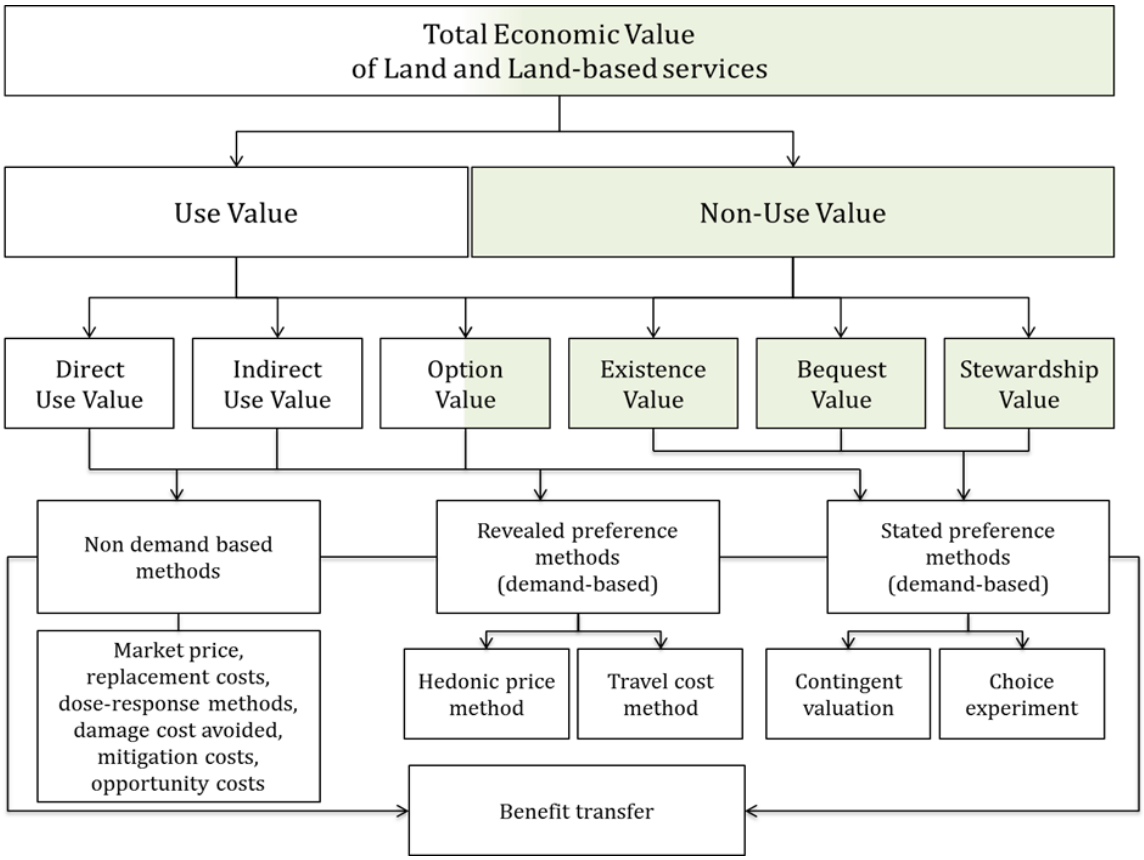
Estimating the true economic value of land may not be easy, since land provides society with so many different services. The intent here is therefore to deconstruct these services into independent categories so that they can be valued separately without duplicating the value of a single service across categories. The total economic value of the land is then calculated as the sum of the values of the identified individual services.

Decision-makers can use the Ecosystem Services framework that was developed in the Millennium Ecosystem Assessment (2005) to identify a compete a list of services provided by land that have an economic value to society as a whole. There are four general types of services: provisioning (food, timber, minerals, etc.), regulating (filtration of pollution, carbon storage, etc.), cultural (as experienced through tourism, religious practices, etc.) and supporting (nutrient cycling, etc.). This framework has been used in initiatives complimentary to the ELD, such as the Economics of Ecosystems and Biodiversity (TEEB) initiative and the UK National Ecosystem Assessment.

These four ecosystem services provide the basis of human well-being and economic welfare. In such a context and seen from an economic perspective, land

degradation is the loss or reduction in services provided by land to society as a whole. This definition includes the reduction of areas on which these services are based, even if the flow of services themselves are maintained through time. In other words, the ecosystem services derived from land ("flows") may be sustained for a while, but will only last for so long if total land capacity ("stock") is depleted in the process. The reduction of-natural capital threatens the long-term sustainability of current methods of exploitation.

Most valuation studies in dryland areas have focused on estimating the use value of agricultural production of food and to a lesser extent, raw materials. This is in accordance with concerns for food security, but fails to consider economic use values that could be derived from converting land from agriculture use to alternative economic activities, such as tourism and mining. It also ignores the non-use value of land-based services. Collectively, this means that the true economic value of land and land-based services in drylands is underestimated. There are two consequences of this: (i) decision-making based on use-value estimates will not reflect values to society as a whole and could generate more ``losers`` than ``winners``, and (ii) not measuring the non-use value leads to missed opportunities in setting up new economic activities, which could capture at least some of this non-use value. An ideal picture would show more balance between the different methods used. A more comprehensive approach to the total economic value of land involves combining both use and non-use values, and is deconstructed in the image below.



The above figure shows possible valuation methods that can be used for each subcomponent of the total economic value (adapted from Bertram and Rehdanz 2013).

A range of tools have been released for mapping ecosystem services, such as the Natural Capital Project's Integrated Valuation of Environmental Services and Tradeoffs (InVEST) tool or the ARtificial Intelligence for Ecosystem Services (ARIES) modelling platform. These tools aim to help map ecosystem service provision, model their evolution with time, associate them to an economic value, identify scenarios, and help decision-makers assess trade-offs between these scenarios for informed decision-making. These tools are still in development stages and the ELD initiative aims to build upon them.

Most people confuse the costs of inaction with the benefits of action, but they sometimes correspond and sometimes do not. The costs of inaction have been considered by previous and on-going studies such as the Stern Review on Climate Change (2007), The Economics of Ecosystems and Biodiversity (TEEB) (2010), the UK National Ecosystem Assessment (UK NEA) (2011), and the Germany Centre for Development Research (ZEF)'s Economics of Land Degradation. However, discussions between economists tend to favour focusing on the benefits from action rather than the costs of inaction. Since the costs of inaction are always equal to or greater than the benefits from action, using the costs of inaction as the primary focus may lead to overestimations of the actual benefits from action. Organizations that consider land degradation and sustainability options, like the ELD initiative and the Offering Sustainable Land Use Options (OSLO) consortium, therefore tend to give more weight to the benefits from action rather than the costs of inaction. This approach also theoretically gives a better estimate of actual economic benefits and associated money flows that will occur after action, and allows for the consideration of partial land restoration.

There is often not just one option, but several possible alternatives for action. For instance, investments could be made to improve productivity or alternative livelihoods (such as arts, crafts, and eco-tourism), or to simply carry on with no change at all. From an economic perspective, the option that leads to the greatest economic benefit should be the top choice.

There are further economic approaches that adopt a slightly different but complementary perspective to a cost-benefit analysis. These include:

- **Shadow Interest Rate:** The return society as a whole can derive from beneficial sustainable management of natural resources.
- **Multi-criteria Analysis:** A ranking of options to identify the preferred choice for society as a whole. It does not involve any monetary valuation.
- **Macro-economic Approaches based on National or Regional-scale Accounting:** The UN System of Environmental-Economic Accounting (SEEA) describes stocks and changes in stocks of environmental assets, and the Wealth Accounting and the Valuation of Ecosystem Services (WAVES) global partnership provides a method for natural capital and ecosystem accounting for national accounts.

Future work

The ELD is addressing the issue of land degradation and economic valuation through several key projects. With funding support from its partners, new case studies focused on these issues will be funded by the ELD initiative. Research was selected based on scientific merit and the ability of the project to address the following identified knowledge gaps:

Knowledge Gaps

Technological

1. Overall costs/benefits of different land management interventions (trade offs with focus on livestock and rangelands)
2. Understanding of drivers of changes (case studies)
3. Relationship between population density and land degradation
4. Identify system tipping points for land degradation

Environmental evaluation

5. Lack of harmonized methodology (scales, discount rate)
6. Lack of information on social costs of land degradation
7. Lack of information on mapping ecosystem services
8. Lack of information on non-market values of ecosystem services
9. Lack of robust low cost methods applicable by affected countries in short term
10. Limited understanding of value of ecosystem services to local livelihoods

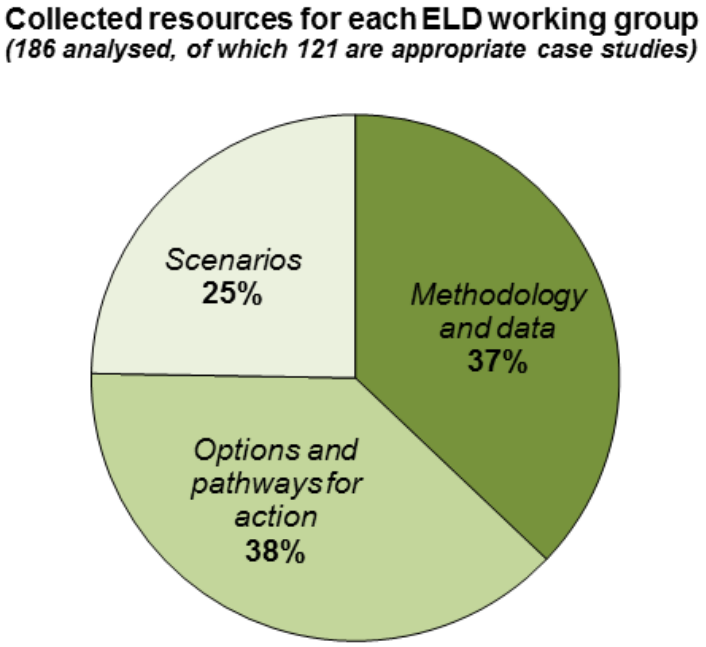
Policy gaps

11. Lack of plausible scenarios
12. Lack of monitoring and evaluation for total ecosystem assessments
13. How can policies promote sustainable land management

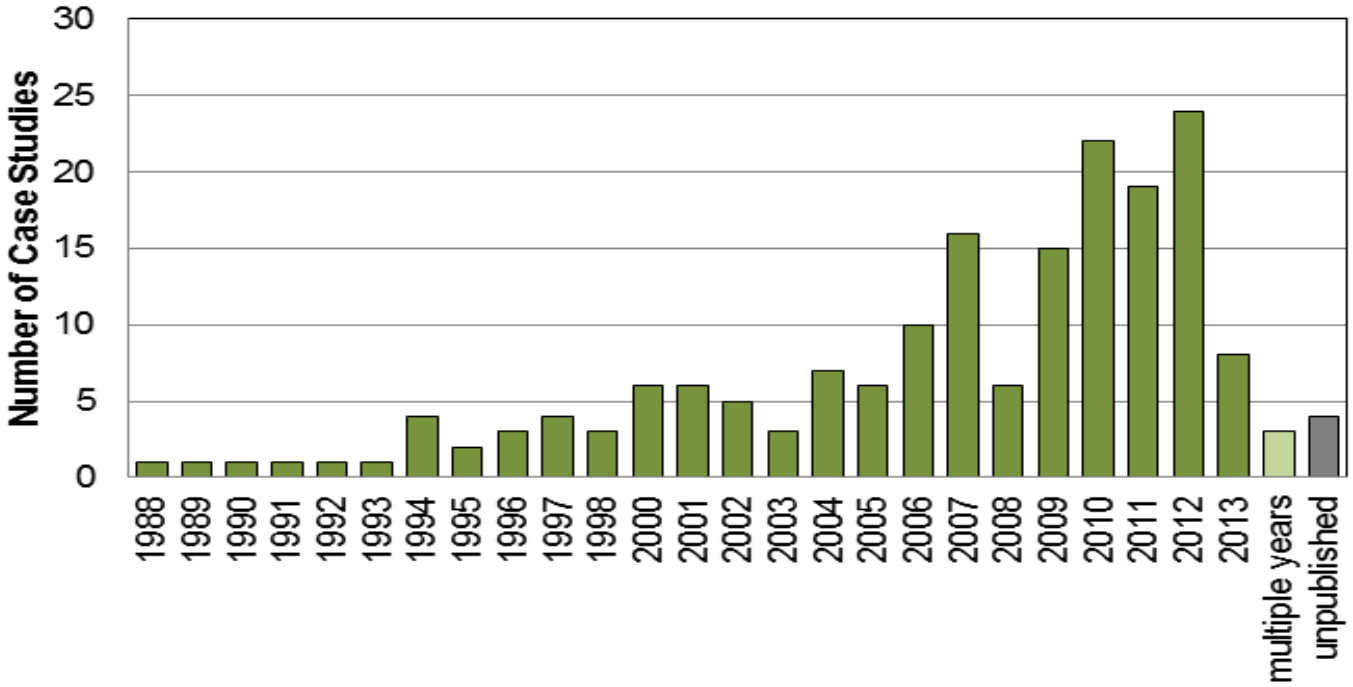
Institutional and private sector

14. Lack of incentives for sustainable land management
15. Greater interdisciplinary approaches (incentives)
16. Lack of knowledge management

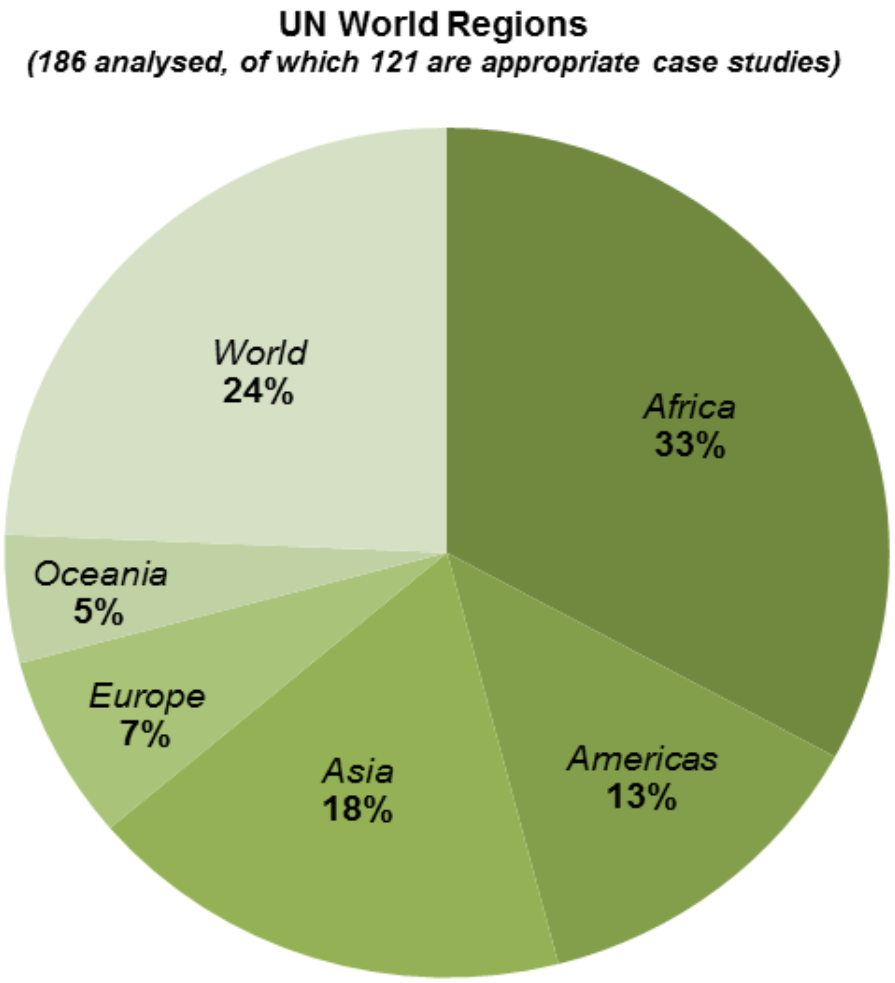
Additionally, the ELD initiative is actively collecting and creating a referential database of existing case studies, to analyse the status of work in the economics of land degradation that has already been performed. These case studies are divided into the 3 main working groups of the ELD initiative (Scenarios, Methodology and Data, and Options and Pathways for Action). A few diagrams from the preliminary descriptive analyses are shown below:



Resources collected and analysed so far are fairly equitably distributed across the 3 working groups.



Most research related to the economics of land degradation has taken place over the past 5 years. This coincides with the first food price spikes and pioneering use of economics for global assessment of environmental action by the Stern Review on Climate Change (2007).



Case studies were further broken down into their world region, in order to determine if there were particular zones that were being analysed for the economics of land degradation more than others. Most studies either focused on Africa, Asia, or had a global context, whereas the Americas, Oceania, and Europe had relatively few studies by comparison. This demonstrates a global focus on developing regions.

Unfortunately, there is not yet a complete set of methods that are simple to implement and lead to robust estimates of the total economic value of land. Moreover, there is no unique method to measure the total economic value, and there are no studies to date that estimate the full economic value of a piece of land based on the range of provided services. Valuations are thus always only partially complete, making comparisons between sites difficult, if not impossible, as different aspects of land and ecosystem services can be measured in very different ways.

Pursuant to the core value of capacity building and knowledge sharing, all of the information regarding this repository of relevant case studies is in the process of being mapped and made available for public reference on the ELD website.

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THE ECONOMICS OF LAND DEGRADATION

The current scientific and political partners of the ELD Initiative are the United Nations Convention to Combat Desertification (UNCCD), the German Federal Ministry for Economic Cooperation and Development (BMZ), the European Commission (EC), Korea Forest Services (KFS), the International Food Policy and Research Institute (IFPRI), the Stockholm Environment Institute (SEI), the Global Mechanism (GM), United Nations University - Institute for Water, Environment, and Health (UNU-INWEH), and the Centre for Development Research (ZEF) at the University of Bonn .

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