Globalands

Resource-Efficient Land Use – Towards A Global Sustainable Land Use Standard

Towards a definition of global sustainable land use?

A discussion on theory, concepts and implications for governance

GLOBALANDS Discussion Paper AP 3.1

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on behalf of

Umwelt Bundes Amt
Für Mensch und Umwelt

funded by

Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit

Berlin, January 2014

Recommended citation:

Kaphengst, Timo (2014): Towards a definition of global sustainable land use? A discussion on theory, concepts and implications for governance. Discussion paper produced within the research project "GLOBALANDS – Global Land Use and Sustainability". http://www.ecologic.eu/globalands/about

Introduction

"Sustainability" or "sustainable development" are omnipresent terms, appearing in every single policy and economic sector and prevalent in our every-day life, at least in the Western world. Fair trade, green economy, sustainability reporting and strategies, green innovation etc. are all terms whose use range from global politics to specific marketing strategies and basically originate from the fundamental idea of sustainable development. Their success also displays the weakness of the concept, since "sustainability" and most of its associated terms are poorly defined and automatically lead to a myriad of different interpretations in different contexts. If everything can be seen as "sustainable" depending on the perspective, the meaning of the concept is weakened, thereby giving room for a mere strategic use in order to increase ones own benefits (or profits).

Against this backdrop, when talking about "sustainable something", a definition of what is understood in the respective context is desperately needed for an informed and constructive discourse. In the GLOBALANDS project, new governance approaches for a sustainable land use at the global level should be developed to foster a targeted discussion on ways how such approach can be implemented. While academic debates on "sustainable agriculture" or "sustainable forestry" have been exhaustive, a more integrated definition that takes the numerous demands from and practices applied in different sectors into account hardly exists—not to mention the inclusion of the various side and leakage effects (e.g. ILUC).

This discussion paper is an attempt to frame a definition of "sustainable land use" in a pragmatic way. The paper starts with a short overview on prevalent sustainability theories, discussing "the battle" between a strong and a weak concept of sustainability and explaining the role of "natural capital" and "reproduction" in the context of land use.
After that, some of the few concepts on sustainable land use will be presented and discussed in the context of their applicability for the purposes of the GLOBALANDS project. Where possible, the discussion will unveil, whether these concepts could be subordinated either under the strong or rather the weak sustainability concept.
The paper ends with some concluding remarks on crucial components for a definition of sustainable land use at global scale and upcoming challenges for land use governance.

Sustainability theory and the implications to land use

The very origin for defining "sustainable development", which is commonly quoted in any texts referring to sustainability as a framework, is the definition of the Brundtland Commission of the United Nations from 1987, saying "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." From a theoretical viewpoint, there are mainly three implications stemming from this definition:

- Living human beings do have obligations towards future generations
- There is both an inter- as well as intra-specific dimension of justice
- Sustainability must be seen as a process rather than a status (development perspective)

From the Brundtland definition a plethora of theoretical discussions, for example on what kind of obligation we have for future generations (which "state of the world" do we have to leave behind) were unfolded. In 2005 on the World Summit on Social Development, a concept was established, which still dominates most strategies and activities referring to sustainability: the three pillars of sustainability consisting of the social, environmental and economic dimension. The general idea behind the three pillars is that with sustainable development, neither the social, environmental nor

the economic dimension can be compromised, but synergies between the three should be found. Some argued that activities under the three pillars can and should be mutually reinforcing leading to an integrated and balanced perspective to human activities.
Many critiques however responded that this concept actually paved the way for the various and often misleading interpretations of sustainable development, because it implies no prioritization between the three pillars and does not indicate a minimum level of achievement. Hence, an activity or strategy, which somehow considers social, environmental and economic issues can in principle contribute to a certain idea of sustainable development, even if no bottom line and overarching target was formulated, if no timeline for achieving a target was defined or if potential trade-offs between the three pillars were not specified. The three-pillar concept was modified in different ways. The German government's renewed strategy for sustainable development, for example, acknowledges planetary boundaries as an absolute limit to human activities and specifies four dimensions of sustainability: intergenerational justice, life quality, social inclusion and international responsibility (Bundesregierung 2012).

Another branch of the debate, to some degree resulting from the controversies about the three-pillar concept, is the differentiation between strong and weak sustainability. Mainly based on an economic viewpoint, the most important distinction between strong and weak is the question, if and to which extent natural capital can be substituted by other forms of capital such human and man-made. While advocates of strong sustainability reject the possibility of diminishing natural capital at the expense of technologies (as an example for man-made capital) or knowledge (human capital), others arguing for weak sustainability do see the potential to do so as long the overall amount of capital remains constant. The concept of strong sustainability builds on the assumption that the economy is a subsystem of the environmental system rather than a separate one (see Daly 1999). Thus, nearly all economic activities rely on the extraction of (finite) natural resources, which directly bonds economic growth to a their further depletion. Consequently, a constant natural capital rule (CNCR) needs to be applied which sets specific limits to economic development in the first place.
Advocates of weak sustainability tend to be more optimistic. Not acknowledging the incorporation of the economic sphere in the environmental, they would accept a further reduction of natural capital as long as this leads to an increase (by investing) in knowledge, capacities, and more efficient technologies etc. They would not reject nature conservation, but would see them as measures for increasing overall human benefits rather then a required investment in natural capital.
Such distinction has a wide range of implications, which cannot be discussed here in detail. However, the following table outlines some of the differing consequences implying a vote for strong or weak sustainability.

Table 1: Selected conceptual differences between weak and strong sustainability

Issue	Weak sustainability	Strong sustainability
Economic growth	Quantitative growth (Growth optimism)	Limits in economic growth (Growth pessimism)
Rule for capital maintenance	Overall capital constant	Overall and natural capital constant
Natural capital	Can be substituted by human capital	Cannot be substituted by human capital or only very limited
Strategies	Increasing efficiency through technology, growth and markets	Stop in growth; sufficiency and efficiency gains by individuals and intervening policy making
Problem perspective	Rather economic (saving rates)	Rather ecological (physical indicators)
Nature	Mainly seen as production factor, source for human welfare	Mainly seen as basis for human survival

Neither the description above nor the table give an indication about the quality of natural capital to be maintained under the two concepts. However, for a definition of sustainable land use it seems crucial not only to determine the amount of natural capital to be maintained and to what extent it can be replaced by other forms of capital, but also about the qualitative state of the natural capital.

In general, strong sustainability is more sensitive for the quality of natural capital than weak sustainability, because its perspective draws on indicators of the physical environment rather than understanding natural capital as a mere stock, which provides a continuous flow of services to humans. In the literature, natural capital is often differentiated in stocks and funds (see for example Faber and Manstetten 1998).[1] According to Georgescu-Roegen (1971) stocks can be consumed, which means that their use implies their depletion in the long run (such as oil or coal but also fossil water basins). Funds, however, have the ability to replenish, which means that their use by human beings might harm their functionality but does not necessarily lead to their depletion. Funds are further differentiated in living and non-living funds. Soil is an illustrative example for a non-living fund as we can use it ever again as long we do not destroy its ability to regenerate. The same is actually true for living funds such as a certain species, which can be used as long its reproduction is ensured.

Talking about capital (stocks) leads to the question, how to invest in capital in the long run, at least for human capital (e.g. education) or man-made capital (e.g. investments in technology development) it is quite clear. For natural capital, investments have not been sufficiently clarified by sustainability theory (see Döring and Ott 2001). According to Daly (1997), investments in natural capital are mainly associated with omissions, in other words: not doing anything, which undermines the maintenance of natural capital or the ability to replenish, probably best applied by nature conservation. In addition, restoration of degraded ecosystems and their services, as it is demanded by the CBD Aichi target 15 and the EU Biodiversity Strategy 2020[2], can be interpreted as a more active investment in natural capital.

Putting the so-called “constant natural capital rule” (CNCR) imposed by the strong sustainability concept in the context of sustainable land use leads to the conclusion that the functionality of living on non-living funds need to be maintained. In a strict sense, this rule has to be applied consistently, which means that under the CNCR there is little room for compensation (destroying natural capital in one place by restoring it at another), especially when the destruction is likely to be irreversible. The question, how the ability to regenerate can be maintained is not anymore a theoretical issue but a scientific one. It should be noted, that no implications on social aspects of land use such as equity, access or distribution of benefits can be derived from the CNCR. In the context of global biomass production, Kaphengst (2009) therefore suggested to widen the theory towards the global justice concept (mainly building on Pogge 2001), which, building a bridge between theory and practice, critically analyses the casual relationship between global institutions (mainly regulative frameworks, institutional bodies and power distribution) and the circumstances, under which people live worldwide.

Criticizing ‘natural capital’ as being too disruptive between the human and the natural sphere and neglecting the inter-temporal dimension of nature, which should be seen as a process rather than a stock, Biesecker and Hofmeister (2009) suggest the term ‘nature (re-)productivity’. They argue for a unity of and at the same time the distinction between production and reproduction in the economic process. For managing natural systems that would imply a stronger focus on a maintenance of all natural entities rather than the separation between used and protected ones. From societal perspective, the (re-)productive economy highlights reproductive work (mainly conducted by women when e.g. raising children and doing “housework”) as a crucial, yet underestimated, element of the functioning of our economy (Biesecker and Hofmeister 2010). Both the natural and the societal view of (re-)productivity could contribute significantly to a definition of sustainable land use. It widens the scope from mere (natural) capital, whether being replaceable or not, to processes and functions in all natural (land use) systems to be maintained and highlights the gender aspect in land use with women having a prominent role in land care, most importantly in developing countries.

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[1] A concise overview (in German language) on the concept of natural capital provides v. Egan-Krieger (2009)

[2] Both policies set a target of 15 % restoration of degraded ecosystems until 2020

While providing valuable insights on key aspects to be considered, this section has shown that a definition of sustainable land use cannot easily be derived from mere theory, a view to already existing concepts of sustainable land use seems crucial.

Finding major components for a concept of sustainable land use

While concepts exist for sustainable agriculture, forest (management) or biomass use, there are surprisingly few concepts dealing with sustainable land use as a whole. The complexity of applying sustainability to land use pose significant challenges, which already appear for a specific sector such as agriculture. Panell and Schilizzi (1999) for example recognize that a core unresolved question when talking about sustainable agriculture is "Sustainability of what?". This question has multiple facets (adapted from Panell and Schilizzi 1999):

- **Consistency between scales**: How do land use decisions on a local scale effect the national or even global scale and how should this be evaluated?[3]
- **Difficulty of measurement:** Made evident by the current struggle by the European Commission[4] and others to find adequate indicators for sustainable land use that provide sufficient data and measurability.
- **Competing objectives:** Is, for example, maximizing carbon sequestration always compatible with increasing biodiversity while at the same time land rights are preserved and cultural values are maintained?
- **Uncertainty:** One could argue, that uncertainty is a common companion of most decisions. However, land use decisions depend on a wide range of variables with a comparably high degree of uncertainty and are often long-term and irreversible (especially in the forest sector).

To overcome these challenges existing concepts often restrain their approach to a list of certain (guiding) principles, which can be further adapted to different scales or specific conditions. In recent times, many suggestions for principles for sustainable land use derived from standard initiatives and certification schemes targeting a sustainable use of biofuels. Often contested for being inadequate, too vague or hardly possible to implement, many of these principles and criteria provided at least an understanding on the diversity of issues to be considered in sustainable land use. Moreover, with the establishment of certification schemes, they were also made operational and had to proof in practice.

Schlegel et al. (2008) assessed the various standard and certification schemes for sustainable biomass use such as the Roundtable on Sustainable Biofuels (RSB), the Roundtable of Sustainable Palmoil (RSPO) but also more sector-specific ones such as Forest Stewardship Council (FSC) and the Sustainable Agriculture Standard (SAS). Based on this analysis, they extracted a possible selection of eight principles and criteria. They pointed out that these principles can be found for all kinds of biomass use, regardless of whether it is in agriculture or forestry, or whether biomass is produced for energy purposes, food, fodder or material usage (Schlegel et al. 2008).

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[3] Or to formulate it more ethical and provocative way (in Chrispeels and Mandoli 2003): „Is the health of rural communities in developed countries and the desire to please certain consumers more important than the food security of millions in developing countries?"

[4] The EU Commission intends to put forward a Communication on land use in 2014, which, among others, should promote the development of the scientific knowledge-base on land-use effects and trends.

Conserve biodiversity
- Avoid damage to or destruction of biodiversity.
- No production on areas of high conservation value.
- Protect land adjacent to cultivated land and of high natural value by establishment of buffer zones.
- Prohibit endangered and threatened species from being held in captivity.

Reduce greenhouse gas emissions (GHG)
- Maintain positive GHG balance along production chain and application.
- Conserve below- and above-ground carbon stocks (e.g. forests and rainforests, peatlands, humus, etc.).

Efficient use of inputs
- Avoid contamination and depletion of water resources.
- Protect water bodies from pollution.
- Increase productivity per unit of fertiliser and pesticide applied.

Soil conservation
- Improve soil health.
- Prevent degradation.

Avoid air pollution
- No burning for land clearance, harvest or waste disposal.

Ensure fair labour conditions
- This principle covers a wide range of aspects which include for instance working hours, wages and payment, child labour, forced labour, discrimination, working contracts, and health and safety. Criteria and benchmarks have to be created for these issues according to national and regional conditions, and in compliance with international standards defined by the International Labour Organisation (ILO).

Respect land rights
- Ensure that land ownership and land rights, including traditional or informal rights, are documented and recognised.
- Involve local people in planning processes concerning land-use changes.

Boost local benefits
- Assure contribution to well-being of communities, workers and rural populations.
- Ensure participation processes are a substantive part of every enterprise affecting land use and local population.

More recently, the Global Bioenergy Partnership (GBEP) came up with a comprehensive list of 24 sustainability indicators for bioenergy after an intensive consultation process (GBEP 2011). For each of the three pillars of sustainability, different themes are defined for which a set of indicators was found. Although focusing on bioenergy, most of these themes also reflect on land use in general. GBEP points out explicitly, that the set of themes and indicators do not provide answers or correct values of sustainability, but rather present the right questions to ask in assessing the effect of modern bioenergy production and use in meeting nationally defined goals of sustainable development. The following list provides an overview of the themes relevant for general land use.

Table 2: Themes relevant for land use identified by GBEP (2011)

Environmental	**Social**	**Economic**
Greenhouse gas emissions	Price and supply of a national food basket	Resource availability and use efficiencies , conversion, distribution and end use,
Productive capacity of the land and ecosystems	Access to land, water and other natural resources	Economic development
Air quality	Labour conditions	Economic viability and competitiveness

Water availability, use efficiency and quality	Rural and social development	Access to technology and technological capabilities
Biological diversity	Access to energy	Energy security/Diversification of sources and supply
Land use change, including indirect effects	Human health and safety	Energy security/Infrastructure and logistics for distribution and use.

The overlap to the Schlegel et al. (2008), at least for the environmental and social dimension, shows that a general idea does exist about the components a concept of sustainable land use should comprise. However, it has to be recognized, that basically all of these themes do not specify any targets, thresholds or values. Also the indicators proposed in GBEP (2011) merely suggest how changes occurring in the different themes can be measured and monitored. They do not provide orientation at which value or threshold a land use practice passes sustainability and becomes "unsustainable". Furthermore, to which extent rural and social development has to be enhanced, how serious human health and safety should be maintained or how much land use change is still acceptable, cannot automatically derived from this framework. Such principles and themes can give an orientation. What has to be considered is the fact that they clearly lack a spatial and temporal dimension. Moreover, they do not depict societal values, which might differ significantly between regions and cultures. As a result, an allocation to either strong or weak sustainability is not feasible, because so much depends on their implementation in a specific place and time.

A slightly different approach was chosen by the FESLM Working Party based at the FAO in providing practical guidance how to evaluate land use management in terms of its sustainability (FAO 1993).
It says that sustainable land management (SLM) combines technologies, policies and activities aimed at integrating socio-economic principles with environmental concerns so as to simultaneously:

- maintain or enhance production/services (Productivity)
- reduce the level of production risk (Security)
- protect the potential of natural resources and prevent degradation of soil and water quality (Protection)
- be economically viable (Viability)
- and socially acceptable (Acceptability).

These five objectives are seen to be the basic 'pillars' of SLM, against which its findings must be tested and monitored. Each objective is complex in itself (see FAO 1993):

Productivity: the return from SLM may extend beyond material yields from agricultural and non-agricultural uses to include benefits from protective and aesthetic aims of land use.[5]
Security: management methods that promote balance between a land use and prevailing environmental conditions, reduce the risks of production; conversely, methods that destabilize local relationships increase that risk.
Protection: the quantity and quality of soil and water resources must be safeguarded, in equity for future generations. Locally, there may be additional conservation priorities such as the need to maintain genetic diversity or preserve individual plant or animal species.
Viability: if the land uses being considered are locally not viable, the use will not survive.
Acceptability: land use methods can be expected to fail, in time, if their social impact is unacceptable. The populations most directly affected by social and economic impact are not necessarily the same.

[5] See also second section on sustainability theory.

Unlike the aforementioned concepts from Schlegel et al. and GBEP, the FESLM approach recognizes the diversity of land use and the possibility to set different priorities for sustainability due to local conditions. It also acknowledges the **multifunctionality** of land use, which includes cultural and aesthetic aspects that go far beyond mere food and material production[6] and highlights in more general terms that negative social impacts to local populations have to be avoided. Interestingly, the implementation of this concept seems impossible without a certain authority ("land use manager"), which is able to decide on land use at a certain governance level. In other words, land use management implies a person, institution or regularity, which oversees land use activities beyond farm scale, as the rules only apply to the interplay between different land users. This presumption is not trivial and essentially counts for every attempt to define sustainable land use. Sustainable land use cannot be defined and applied by isolated actors only but necessitates collective decision making processes and joint implementation. This leads automatically to the question of adequate forms of governance, for which it is at least questionable, if these can be part of a definition of sustainable land use.

Towards a framework for a global sustainable land use

As highlighted above, one of the major challenges in this context is the consistency between scales. While the concepts described so far could provide guidance for sustainable land use on specific sites and to some extent also at regional level, they cannot give a vision on how land use should take place at global scale. The discussion on sustainable land use at global scale raises several new questions than those tackled by the described concepts, for example:

- The ratio of fertile land available in a country and the demand of land based products and related to this context: the unequal distribution of land footprints between industrialized and developing countries (e.g. Lugschitz et al. 2011)
- Role of and rules for international trade of commodities from agriculture and forestry
- Leakage effects, not only in terms of land taking in other countries to meet domestic demands but also the "export" of negative social and environmental impacts to other countries and the import of virtual water (e.g. European Commission 2013)
- The question of foreign investment in land and the consequences for land access, ownership and distribution (land concentration) (e.g. HLPE 2011, Cotula et al. 2009)

A further deepening of these questions would automatically lead to several normative assumptions and implications. Apart from its complexity, this is probably the main reason why suggestions for a comprehensive approach for a global sustainable land use are so scarce. In 2009, Rockström et al. introduced nine **planetary boundaries** showing in particular different critical thresholds for human survival, which have partly been exceeded or are near trespassing before potentially leading to abrupt or irreversible environmental changes. One boundary shows the level of conversion of forests, wetlands and other vegetation types to agricultural land. Rockström et al. (2009) propose that no more than 15% of the global ice-free land surface should be converted to cropland. Unlike some of the other boundaries, the land boundary is not associated with a global tipping point but is rather coupled with other boundaries such as water, biodiversity, nitrogen, phosphorus and climate. This example highlights a critique raised against the planetary boundary concept: the lacking consideration of interdependencies between the different boundaries (see e.g. Table 1.1-2 in WBGU 2012). It was also acknowledged by Rockström et al. that limiting the rate of land conversion does not include the numerous qualitative aspects regarding function, quality and spatial distribution of

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[6] Especially in agriculture, the concept of multifunctionality has been widely applied as a kind of operationalisation of sustainability, more recently by the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), which created a profound alternative vision for global agriculture in contrast to the „green revolution" model.

land. It is therefore needed to apply the land boundary at various levels through a „fine-grained global land architecture“ (Turner 2009 quoted in Rockström et al. 2009) that

(i) reserves the most productive land for agricultural use,
(ii) maintains high conservation-value forests and other ecosystems in their current states, and
(iii) maintains carbon-rich soils and ecosystems in their undisturbed or carefully managed condition.

These requirements strongly remind of the environmental principles and themes outlined in the above-described concepts by Schlegel et al. (2008), GBEP (2011) and FESLM (1991). However, it is not entirely clear, how land use practices at local or regional scale considering these requirements do correspond to the global overall cap of 15 % conversion to agricultural land. This again is a question of the right mix of (multi-level) governance. However, it has to be noted, that the ceiling of land conversion suggested by Rockström et al. is the first nearing point towards a global land use, which considers the CNCR under the concept of strong sustainability.
In contrast, the more recent attempt by the UNCCD Secretariat to endorse a **zero net land degradation goal** (UNCCD 2012) under the renegotiated Sustainable Development Goals (SDGs) does not provide for quantitative cap in land conversion. The central idea of such a goal is to agree at a multilateral level to halt overall land degradation by avoiding degradation, where possible and to restore land where degradation cannot be avoided (off-setting). While the land restoration component might resemble the investments in natural capital, which is a key aspect in strong sustainability, the possibility to compensate for a loss in natural capital with degradation in one place and restoration in another objects to CNCR in two ways: Firstly, a full substitution of the quality of natural capital is assumed and secondly, the amount of natural capital was not increased. In principle, a zero net degradation goal could be compatible with strong sustainability as it implies a certain amount of natural capital (undegraded land), which has to remain constant. However, within the concept it is not yet clear, when a piece of land can be considered "degraded" or "restored" and where a respective reference point could be set. Hence, for determining if natural capital is kept constant under the zero net land degradation goal, a desired reference condition for the land worldwide would have to be defined. Moreover, it has to be considered that degradation is a relative term describing a process rather than a status, which implies a temporal dimension. How, for example, should a process be judged, in which a piece of land faces (a certain level of) degradation over a certain period of time, when it is left for regeneration at a later stage – not to mention the huge effort of measuring and balancing such processes across the globe. Last but not least, the spatial dimension of compensation and the integrity of ecosystems have to be taken into account. To bring it to the point: The goal is obviously not achieved, if 20.000 ha of logged rainforest in one country is compensated by 20.000 ha of (re-)planted trees in another. So the question remains, at which scale compensation has to take place and which level equality in terms of ecological (and social) endowment needs to be fulfilled by the newly established ecosystem.

Another conceptual approach, which has gained international attention, is the global Human Appropriation of Net Primary Production (HANPP), which is first and foremost, a physical measure of human intervention into the biosphere. Measured in giga tones carbon per year, analyses show that HANPP has doubled in the 20th century[7], while human population has grown fourfold and economic output 17-fold (Krausmann et al. 2013). The main reasons behind this discrepancy are efficiency gains in biomass production and enormous yield increases in the last decades. However, the authors also point out, that the latter could not be achieved without substantial ecological costs, such as fossil energy inputs, soil degradation, and biodiversity loss.
HANPP is only one indicator currently used to measure drivers and trends of global land use and land use change. Another example is the Land Flow Model created by IIASA, which estimates how many

[7] Which coincides with 13% to 25% of the net primary production of potential vegetation (Krausmann et al. 2013)

hectares of land are directly or indirectly associated with different consumption patterns by tracing commodity flows from primary production, via intermediate products and trade, to final use.[8]

Together with other land footprint indicators (see e.g. Giljum et al. 2011) both approaches do not only provide substantial knowledge on how land is and has been used worldwide, but also on who consumes which share of the globally available land resources (at least which country). For the purpose of defining a global sustainable land use, the question arises, what exactly could be derived from such measures. Obviously, normative implications, for example on thresholds for consumption in industrialized countries, cannot be automatically derived from physical measures applied in the different models, nor do they allow for direct conclusions on a suitable governance framework. However, their role in nearing an understanding of how a sustainable use of land at global scale could look like, should not be underestimated. At any rate, once agreed on possible thresholds for consumption in industrialized countries – assuming that such an agreement would determine a (global) policy for sustainable land use – indicators as briefly presented here are crucial for monitoring progress on respective targets, thereby responding directly to one of the challenges outlined by Panell and Schilizzi (1999) (see above). Consisting of physical measures, these indicators could be associated with strong rather than weak sustainability, the latter orientating much stronger on economic measures (see table 1). Hence, while these concepts and indicators can arguably not be part of a definition of sustainable land use, they can help in the implementation of targets derived from such a definition.

Concluding remarks

As the discussion showed, no comprehensive definition or framework for a sustainable land use at global scale exists to date and the question remains whether it is generally possible. However, some crucial components for a definition could be derived from the discussed theories and concepts.

1. A **general cap for the conversion of land to agricultural area** seems necessary. Otherwise, the ongoing loss of forests and other ecosystems will not be stopped, even if the agricultural area would be managed sustainably. Such a cap can only be operational if applied at a national or even regional level. Moreover, it should be discussed, whether other forms of land conversion (for example for settlements or transport infrastructure) should also be capped as currently discussed in the European Union.
2. Based on such a cap, **principles and criteria could be applied within a general framework for a sustainable land use** (not only for agriculture and forestry but also for mining, infrastructure, settlement etc.) taking the interplay between different land uses (at landscape level) into account. Principles and criteria should emphasise both on social and environmental issues and should be based on the concept of multifunctionality.
3. Commonly agreed criteria and principles could form a framework, which will have to be adjusted to regional and local conditions respectively through **consultation and decision-making processes**, ensuring a high level of participation from relevant stakeholders and the public.

It is mainly the cap suggested under point 1, which favours a decision for a strong theory of sustainability. While the first two points can draw on what has been discussed before, the third might deserve some further discussion, because the governance implications can be substantial. Rather than locating the question of sustainable land use in environmental, sustainability or climate policies, point three in its most far reaching interpretation would focus much more on social rights for land users as basically the key pre-condition for sustainable land use decisions. This could imply radical decentralization of land use decisions, which might be detrimental to the idea of a global land use governance currently discussed under the SDGs, within the UNCCD and others and would bear

[8] For further information see IIASA's website: http://www.iiasa.ac.at/web/home/research/modelsData/LANDFLOW.en.html

risks of inconsistency between scales (see above). Hence, from a governance perspective, the question of matching “sustainable land use” between site, local, regional, national and even global level seems to be the most crucial as well as challenging one.
Despite the difficulties outlined above, an attempt for a definition for a global sustainable land use could be as follows:

A global sustainable land use serves the needs (for food, energy, housing, recreation etc.) of all human beings living on earth today and in the future, respecting the boundaries and the resilience of ecological systems.

Pointing towards ecological boundaries, this suggestion can be assigned to a strong concept of sustainability. It should be regarded as yet another starting point for further discussions on the complex issue of how to ensure a sustainable land use at global level.

Acknowlegements

I thank Almut Jering, Anne Miehe, Jens Günther and the Globalands Team for helpful comments to this paper.

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