

The concept of Sustainable Land Management: a comparative discussion (at a global scale)

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Synopsis: The paper seeks to initiate a discussion about the concept of sustainable land management in an internationally comparative perspective, based on experience from a German research funding measure. To enable exchange and mutual learning, it will particularly focus on the variety of definitions and main contents like governance approaches towards the solution of land use conflicts with regard to main drivers for land use demands and with regard to different multi-level governance frameworks and modes.ⁱ

1. Sustainable land management – diversity of terms and contents

What is "sustainable land management"? What is behind this term and what does it mean? Is it all just "old wine in new bottles"? Or - on the contrary - a new paradigm with different overall concepts, objectives, action principles and implementation forms? Is it a new type of cooperation between science and practice, or a greater focus on the effectiveness of action approaches? Up to now there is no definitive and generally accepted definition for the term in scientific literature and communities of practice.

Mankind has influenced landscape for centuries and created different types of land use. With regard to the development of land use in Europe, main drivers of currently increasing influence comprise changes in values (e.g. sustainability), economic and social trends (e.g. globalisation, demographic change), technological innovations and political priorities (e.g. in climate and biodiversity policy). A high variety of institutional arrangements and regulatory schemes on several policy levels (EU, national, regional, local) has been initiated in order to deal with these land use demands and resulting land use conflicts. Examples include European agricultural policy (e.g. cross-compliance rules) and water policy (Water Framework Directive), national development procedures (e.g. spatial planning in Germany, Austria and Switzerland), regional development schemes (e.g. in the UK) or local planning and building schemes.

Land management questions and activities vary considerably, with the usage of the concept of sustainable Land management being related to different understandings and governance approaches, depending on the geographical area and policy context (Weith et al. 2013). The German funding measure "Sustainable Land Management", financed by the German Federal Ministry of Education and Research (BMBF), comprises 13 joint projects within Module B, working on the development of innovative system solutions for sustainable land management in different regions in Germany. Due to the high variety of involved actors and complex interactions one main aspect of research refers to handling complexity by inter- and transdisciplinary methods (Klein et al. 2001). Public actors, companies or civil society actors are seen as starting points, nuclei, and development partners for the implementation of sustainable solutions in land management. In that context, all projects seek to combine contents of governance in a synergetic way. Examples include the combination of water management with waste management, water management with energy supply, settlement development with mobility aspects or housing and energy consumption. However, these approaches are

mainly embedded in and adjusted to the German and EU policy context. Enhanced international exchange on the understanding and concept of sustainable land management and a comparison of approaches will thus enable researchers and practical experts to benefit from each other.

Even the subject area, "land", is open to various interpretations. It would be easy to associate it with slightly simplistic limitations, such as restricting it solely to non-water-covered areas outside the city (city *and* land). Recent works (e.g. HABER ET AL, 2010) make it clear, however, that this definition is too narrow. The focus is rather on the struggle for land use in the human-environment system, with a variety of competing and sometimes conflicting utilization claims and the natural capacity of ecosystems and their compartments.

The use of land, or in this context, soil, is always in a tension field between conservation, development and the restoration needs of the functions of a public good (e.g. habitat function, groundwater replenishment function) due to its different capabilities (e.g. development potential, ecological functions) and utilization opportunities in connection with assigned property rights. The differentiation of *land values* by DAVY in to *exchange value*, *use value*, *territorial value* and *existence value* (2012: 89ff.) reflects this and also highlights the need for an explicitly spatial view. Reflecting this spatial focus, approaches to further include material and energy flows when considering land use questions in terms of spatial use structures have existed since at least the late 1980s (see e.g., HOFMEISTER/HÜBLER, 1990). Balancing concepts for resource flows, such as urban metabolism, were developed as early as the 1960s (e.g. WOLMAN, 1965).

The concept of sustainability in sustainable land management refers to a diverse and long-running dispute over the direction of societal action. For all the ambiguity and diversity involved in defining the term precisely, the definition contained in the Brundtland report is often mentioned as a general starting point. It contains the formulation, "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (WCED 1987). Resolutions from the Rio Conference of 1992 are referenced just as often in social discussions. This is accompanied by a claim to validity which can be characterized by the key words, global, inclusive, future-oriented and anthropocentric (JÖRISSEN 2005). The key aspects are intragenerational and intergenerational equity and the three-dimensional approach (the ecological, economic and socio-cultural dimensions).

The management concept refers to anthropogenic activities in different contexts. The existence of terms, such as city management, regional management, site management or water management, highlights the fact that limiting the meaning to functional and process-oriented, business-related actions would fall significantly short. The concept of governance, a term often used in social-scientific spatial research, as "coordinating and controlling regional processes in complex structures" (BENZ 2003:505) opens up many possibilities for subject-related discussions and clarification. A key aspect of such refocusing is the lack of a central manager. Rather, it is interactions between the different stakeholders that can lead to readjustments in social structures (control systems) as well as physical and material aspects (BURNS 2006). Influencing stakeholders' behaviour or actions (also inaction) always raises the question of the need for transformation or innovation processes.

Even common management literature refers to a central challenge in such constellations: dealing with complexity (STAEHLE 1999: 43). Therefore, systemic thinking can be considered

crucially important to understanding the interdependencies between the various system elements.

2. Explicit use of terms

Having already discussed various regulatory aspects in Agenda 21, as part of the World Conference of the United Nations in Rio in 1992, which have a close relation to sustainable land management (statements on re-use of land, urban development, agriculture, forestry, etc.), the term *sustainable land management* was explicitly used for the first time in an FAO document (SMYTH ET AL.1993) entitled "FESLM: An international framework for sustainable land management", reaching a wider expert audience. The aim of the authors was to create a basis for evaluating "sustainable land management" as an accepted harmonization of the economic and ecological aspects of food security. The underlying understanding of the term was based on discussions at a series of workshops at the beginning of the 1990s in various countries (Thailand, Kenya, USA, Canada). The workshops were organized by the International Board for Soil Research and Management (IBSRAM) and the University of Lethbridge, Alberta, Canada (SMYTH ET AL, 1993). In 1996, in a separate document with a similar focus, the United Nations (UN) described land management as process-oriented resource management in the context of ecological and economic perspectives (UN 1996: 13). However, the social dimension is not considered here.

In consequence it is obvious, that the term "sustainable land management" or "sustainable land management" is often used with a specific bias in the context of development policy. In addition to the FAO, other United Nations sub-organizations and programmes (e.g. UNEP/UNU, UNDP), the World Bank, the Latin American Development Bank, the European Commission and the German development agency, GIZ, use it in their work. The focus is on dealing with the problems of soil protection. In this context, the term is also normatively used for demands for participation, rights of access to land, sustainable marketing and reforestation (World Bank/Global Environmental Facility) and combating urban poverty (access to resources).

In its "Rural Strategy", the World Bank refers to investment opportunities to increase agricultural growth and reduce poverty. Sustainable land management is also seen as a possible solution here, whereby both increases in productivity and ecosystem services are addressed (WORLD BANK 2008: 3). According to the perspective of the World Bank, knowledge as a resource is equally important to be able to integrate different management areas, "Sustainable land management [SLM] is a knowledge-based procedure that helps integrate land, water, biodiversity, and environmental management (including input and output externalities) to meet rising food and fibre demands while sustaining ecosystem services and livelihoods. SLM is necessary to meet the requirements of a growing population. Improper land management can lead to land degradation and a significant reduction in the productive and service functions." (World Bank 2008, quoted according to the World Bank 2006).

For some years now, an explicit use of the term has also found its way into discussions at European level. One example is the work conducted by the EU-funded URBACT programme, a city network promoting sustainable development. In contrast to development aid, the working group of the LUMASEC project (Land Use Management for Sustainable European Cities) with its completely different framework conditions and initial situations, such as the differentiated institutional systems of spatial and environmental development, uses the term to mean the *process management of land use and development*. The focus is on *coordinat-*

ing the spatial, sector and temporal aspects. The different functions of land and related conflicts should be considered as part of sustainable land management (ENGELKE/VANCUTSEM 2010: 70).

The discussions mentioned draw explicitly and implicitly on statements made in scientific publications. Works by HURNI (2000) and HABER ET AL. (2010) are worth particular mention here. HURNI bases his deliberations on the target parameters of sustainable land management. This includes not only an integration perspective by linking ecological with socio-economic and political aspects, but also an intertemporal dimension taking account of intergenerational equity. In addition, HURNI'S approach is a "multi-stakeholder perspective", stressing the importance of considering a wide range of stakeholders in sustainable land management (HURN2000: 85). HABER ET AL see sustainable land management in the context of climate change, as well as a possible answer to reducing associated problems (HABER ET AL. 2010: 378). In order to implement objectives in connection with the issue of sustainability, they are based on a broad understanding of management which includes "technological, political and legal measures and activities" (HABER ET AL 2010: 379). In addition, reconfigurations of the instrument set are important in influencing land (HABER ET AL 2010: 378).

Few countries use the term, "sustainable land management", explicitly as part of national policies and programmes. In addition to the identically worded German research programme yet to be implemented, it is worth mentioning that both Australia and New Zealand formulate this as part of a government programme concerned with climate change. In Australia, an environmental protection perspective is of central importance, "sustainable land management means managing land without damaging ecological processes or reducing biological diversity"ⁱⁱ. In neighbouring New Zealand, the government has followed a "Sustainable Land Management Strategy" since 1996. The focus here is on the land users. They should be shown better ways to use the land employing cooperative control mechanisms, especially with regard to stakeholders from the service sector.ⁱⁱⁱ

In Germany, sustainable land management has been politically anchored alongside development support as a topic of the BMBF Framework Programme, "Research for Sustainable Development" (*Forschung für nachhaltige Entwicklungen*, FONA) since 2009. The following key aspects were identified as part of the "Sustainable Land Management" funding measure of which this discussion paper is also a part (BMBF 2008):

- Considering land use, land-use change, impact of land-use change and land-use decisions
- Considering complex interrelationships, interdependencies between land-use options (conflicts, synergies, etc.) and cross-sector action
- Regional approach (regional value-added networks, regional energy and material flows, considering urban/rural relationships)
- Interdisciplinary and cross-disciplinary project orientation
- Developing innovative concepts and strategies:
 - Innovative value-added networks to strengthen sustainable regional economic development
 - Technologies/methods and forecasting tools to make informed assessments of adaptation needs for land-use systems and the need for innovation
 - Services to promote sustainable land-use systems
 - Information and knowledge management in added-value networks, strengthening cooperation and communication among stakeholders

- Concepts for decentralized supply including renewable energies
- Resource-efficient and low-emission urban development
- Efficient and sustainable use of resources for production and energy generation
- Integrated use of land and water resources, paying special attention to regional supply and disposal services
- Adjusting land use and infrastructure facilities and associated services to allow for a sustainable attenuation of extreme events
- Adapting technical infrastructure systems whilst taking account of overlapping and multiple uses.

3. Interim conclusion

The lines of discussion mentioned include various dimensions that are important for sustainable land management. The following table lists these in an overview and outlines a very ambitious claim for the governance of land use. At the same time, it shows there is no fully coherent picture. Conflicts are to be expected, especially when fleshing out the content of the different dimensions.

| Dimensions | |
|------------------------------------|--|
| Subject area | |
| | Human/environment relations |
| | Land |
| | Land use |
| | Material and energy flows |
| | Regional added-value |
| | Land-use conflicts |
| Setting normative objectives | |
| | Sustainability |
| Relation to activities and impacts | |
| | Management/governance (especially coordination) |
| | Integration |
| | Conflict minimization, conflict resolution, synergies |
| | Complexity |
| | Transdisciplinarity |
| | Situational, structural and systemic aspects |
| | Change and innovation |
| | Information and knowledge |
| Spatial reference | |
| | Region |
| Time reference | |
| | Intergenerational equity |
| Stakeholder reference | |
| | Politics, administration, business, civil society, science |
| | Interdisciplinarity and transdisciplinarity |
| | Participation |

Table1: Summary of the aspects shown; Own compilation (based on sources mentioned above)

"Sustainable land management" defined in this way cannot be seen as a static concept. Rather, it represents an approach to further develop existing conceptual ideas to influence land use (cf. GAASCH & WEITH 2011), some of which are developed evolutionary (e.g.

stakeholder reference, process design, the evaluation process), but in some cases also require innovative damage (e.g. in the governance of differentiated sector policies).

4. Discussions in the context of research

As indicated, depending on the definition of the term and its understanding in scientific discourse, various lines of discussion are indicative of sustainable land management. Without going into detail here, the authors recognise growing awareness of the issue. On the one hand, this is because of the development of explicitly scientific networks, such as the "Global Land Project", and also because publishers and journals are devoted to the topic, as the establishment of the magazine "land" shows. On the other hand, European or European-wide public funding have increased in this area (EU 7th Research Framework Programme, funding of the European Spatial Planning Observation Network ESPON, cooperation in ERA-Nets like WoodWisdom and RURAGRI).

Research initiatives and departmental research are particularly important for Germany since both support obtaining application-oriented knowledge and promoting implementation activities. In addition to the institutional and programme and project-based approaches by the German Research Foundation, the Leibniz Association, the Helmholtz Association, the Fraunhofer Society and the Max Planck Society, the activities of the BMBF are worth particular mention, which, in advance of the current funding measure, have considered and are still considering some aspects of sustainable land management. These are:

- Sustainable Forestry,
- REFINA (about governance of settlement and infrastructure development),
- Megacities,
- KLIMZUG (about climate change adaptation)
- and overall approaches as part of socio-ecological research.

There are also indications of new lines of discussion among professional societies, e.g. in surveying. A document by the International Federation of Géomètres (FIG) from 1999 emphasized that sustainable land use should be achieved on the basis of a variety of data about effective land management (FIG 1999). In the mean time, references have been made by surveyors to the explicit diversity of lines of discussion. "Others are doing land management too!" (MAGEL, 2006: 156).

5. Action fields for sustainable land management

The described lines of discussion show a high variety of political action fields that are of relevance to sustainable land management. At the same time, they point to the need for large-scale change processes setting framework conditions and new social challenges to adequately reflect content and procedures. Economic globalisation, climate change, global food security, biodiversity, water supply, migration, demographic change processes, and the world's growing energy needs are key here. They lead to changes in land use in almost all major regions (WBGU 2011, FÜRST & MÄDING 2011).

The energy transition has established different demands on spatial use, particularly in Germany. In addition to the space required, e.g. for wind energy or photovoltaic systems, significant areas need to be established for infrastructure development, both for transmission routes and for new decentralised system types. At the same time, new priorities are being set within existing types of land use, such as agriculture, and e.g. the cultivation of food is being replaced by the cultivation of energy crops.

It should also be noted that a considerable number of land-use changes leading to land-use conflicts have been discussed politically and scientifically for decades. It is worth mentioning, in particular, the processes of land use for housing and transport purposes in the context of complex urbanization and suburbanization, and more urban/rural interactions (see REPP ET AL, 2012).

This leads, in part, to new and old rivalries between different land-use claims. A differentiation should be made between arising (1) conflicts *between* types of land use (e.g. agriculture versus development and infrastructure) and (2) conflicts *within* one type of land use (agricultural food production versus energy crops). In Germany these developments run, in part, parallel to processes of regional differentiation between growing versus shrinking regions with an increase in spatial disparities.

6. Current policies relating to sustainable land management

The above statements show that sustainable land management concerns itself with key societal challenges and, at the same time, also discusses, at least part, required changes to current policies. What specific policies might this affect? In line with the character of this article, a first overview should be made of current political activities which reflect or flesh out important land-use related content. According to the focus of the core content of the module, "Innovative System Solutions" (Module B) of the described funding measure, this will be limited to the European dimension and the strategic-instrumental debate in Germany embedded therein. All forms of land use (particularly settlement, infrastructure, open space with agriculture and forestry, nature conservation, water) are addressed here.

6.1 EU policies

At first glance, the term "sustainable land management" currently plays no important role in core EU policy agendas. This applies to the Lisbon Agenda^{iv}, the sustainability strategy/Gothenburg Strategy^v, and its revised version from 2006 (COUNCIL OF THE EUROPEAN UNION, 2006b), the Territorial Agenda/Leipzig Charta - Towards a More Competitive and Sustainable Europe of Diverse Regions (BMVBS 2007) and the Europe 2020 Strategy: A strategy for smart, sustainable and inclusive growth (EUROPEAN COMMISSION 2010). However, both the Gothenburg Strategy and the Territorial Agenda/Leipzig Charta address some significant aspects of sustainable land management. Consequently, terms such as *sustainable forest management*, *sustainable resource management*, *coastal zone management* and *risk management* are used in the revised EU Sustainable Development Strategy.

The aspects of sustainable land management play a very important role in specific land use-related EU policies. In accordance with the responsibilities of the Directorates-General, the activities of regional policy, environmental policy, agriculture, rural development and maritime policy are worth mentioning explicitly.

Regional policy includes the action fields of sustainable infrastructure development, eco-innovation, implementation and reuse of brownfields, reduction of urban sprawl, and protection against natural hazards (see COUNCIL OF THE EUROPEAN UNION, 2006a). For the Environment Directorate-General, in addition to activities on climate policy, and, in particular, the introduction of Impact Assessment Tools (EIA/SEA), reference should be made to the ongoing discussion about the "Soil Framework Directive" (EUROPEAN COMMISSION, 2006a) and the "Roadmap to a resource efficient Europe" (EUROPEAN COMMISSION, 2011) from 2011.

Another important field of work is the international network of nature protection areas, NATURA 2000.^{vi}

In agricultural policy, new regulations were recently adopted for managing agricultural areas (i.a. for greening). Cross-compliance obligations and payments for ecosystem services have been in existence for some time. Also aspects of process management, such as the LEADER approach should be mentioned here, which provides strong local commitment and bottom-up initiatives as the basis for regional development. The objective of the EU's Forestry Strategy from 1998 was sustainable forestry. It includes the elements of multi-functionality, an increased use of wood and non-forest products and the development of rural areas (Council of the European Union 1999). The EU Forest Action plan (2007-2011) calls for the management, protection and sustainable development of all types of forests and it supports long-term development prospects. Dialogue processes at all levels play a central role in this (EUROPEAN COMMISSION, 2006B). The European forest policy reflects international lines of discussion for sustainable forest management which is represented, for example, by the International Forest Panel at the UN. Activities to store CO₂ as part of the implementation of REDD+ strategies are becoming increasingly important here.^{vii}

6.2 Action approaches in Germany

The adoption of the Sustainable Development Strategy 2002 (GERMAN FEDERAL GOVERNMENT, 2002) marked a new cross-sectional policy approach on the part of German federal policy which also included aspects of sustainable land management. As a result, in the *quality of life* section, the formulation "Maintaining a vibrant city - developing rural areas" was included as an aspect of its guiding principle. The indicators mentioned here include *resource conservation, land utilization, climate change, renewable energies, biodiversity, mobility and nutrition*.

The political significance of this federal policy approach, which also continues diverse policies that have been pursued for decades, was already clearly demonstrated a year earlier by the establishment of a Council for Sustainable Development in the German Federal Government and was afforded further political and social import by the establishment of the State Secretaries' Committee on Sustainable Development. In particular, the Council for Sustainable Development promotes discourse on sustainability objectives and processes and thereby contributes to a constant presence of the topic in public debate.

Meanwhile, there are many reports on the state of sustainable development. An overview of core sustainability indicators are, for example, periodically listed in the Progress Report of the Federal Government along with an assessment of their development. The Progress Report of 2012 (GERMAN FEDERAL GOVERNMENT, 2012) points out some areas still requiring considerable change and action for today's most important land-management indicators, such as *land utilization, biodiversity, landscape quality and land management*.

In addition to this approach, some aspects of sustainable land management, now with a close interdependence on European discussions, have been part of various policy fields of action for decades.^{viii}

Particularly important in the authors' view are^{ix}:

- Regional spatial planning, with the basic objective of sustainable spatial development, diverse content and procedural components and currently with a wide variety of approaches for adapting to climate change
- Urban development, with the sub-aspects

- Plans (particularly land-use plans and development plans)
- Site management and recycling (reduction of land utilization)
- Informal concepts/re-urbanization processes
- Environmental planning, with its statutory legal definition and various implementation forms (landscape planning, strategic and project-specific environmental impact assessment, (major) nature conservation projects)
- Agricultural policy, with the sub-sections
 - Land cultivation, i.e. agricultural policy with cross-compliance and greening
 - System of property ownership/land consolidation/soil management^x with approaches for the necessary segregation of usages (intensively managed versus extensively/non-managed areas)
- Forest policy with continued discussion about agricultural and forestry management tools to include more aspects of biodiversity and forest management, multi-functionality and the integration of regional economic aspects^{xi}
- Water management with its content and procedural realignment after the adoption of the European Water Framework Directive.

7. Particular challenges for sustainable land management

Assuming the existing policies, structures and dynamics of land use can not be called sustainable and that changes in land management towards *sustainability* can be, at least generally, interpreted as a rational problem-solving process, in the view of the authors, there are special challenges in steps to *define the problem* and in *alternative developments* and their *governance-related implementation*.

7.1 Problems and problem diversity

Current and future land uses are influenced by a variety of factors. They range, as outlined, from global developments such as climate change, water shortages or the loss of biodiversity, to local influencing factors such as individual entrepreneurial decisions. In the scientific context, only partial correlations and clear cause/effect relationships, in particular, have been analysed to date. This becomes particularly evident in the area of demographic change. Only limited direct interdependencies have been established here so far (BEHRENS ET AL, 2012).

If an explicitly transdisciplinary approach is pursued in land management, variety of perceptions of problems will grow bigger. But not all stakeholders have the same resources to position their views, like influential lobby groups will do (e.g. agriculture, food industry, landowners, etc.). Simultaneously, the formulated problems are also often subjected to a dynamic process of change and adaptation, so that recursive problem formulation processes should be implemented repeatedly.

7.2 Control and management: diversity of options

Difficulties in problem analysis and assessment subsequently lead to open questions regarding the possible need for necessary changes and opportunities for influencing forms of land use. In addition, there are a large number of control tools (planning, financial incentives, information systems, etc.), whose affect is often only partially known due to a lack of evaluation results. At the same time, these management approaches influence each other so unintended interactions occur. In part, the policies contradict each other. As a result, spatial planning over many years tries to reduce suburbanization processes supported by economic incentives (promotion of home ownership, commuting allowances etc.). In this context,

"innovative" approaches should come into play, i.e. change existing tools to further increase the complexity of assessing possible consequences.

With a view on the cross-disciplinary focus, it is significant that, in addition to the variety of existing management instruments mentioned, the full involvement of the different rationales of the stakeholders (politics, administration, business, civil society) must be taken into account.

8. Approaches of joint projects in the "Innovative system solutions for sustainable land management" module (Module B)

The joint projects promoted as part of the Sustainable Land Management funding measure in Module B have each found independent ways of developing solutions in the key areas they deal with (energy and land use, water and land use, etc.). An initial evaluation of project activities shows many differences and similarities between the enforced eligibility criteria that could serve as initial evidence of further development of the term "sustainable land management" (see also WEITH ET AL, 2010.)

- The early and simultaneous involvement of politicians, the government, business representatives and civil society
- The combination of different thematic fields of action, such as water management, the restoration of wetlands and biomass production
- The linking of governance of flows and governance of space and place, such as combining water management, fuel wood production and the protection of open spaces
- The combination of several strategic action principles, such as resource efficiency, adaptation and energy/material cascade utilization
- Combination instruments, such as linking regional planning and economic incentives with modelling and evaluating project-related impacts.

The further progress of the project and, in particular, the findings gained in the cross-disciplinary context promise continuative results.

9. Outlook

Discussions conducted as part of the described funding measure and beyond about changing problems and the need for action in the context of "land management" still highlight some "blind spots", in the authors' view. Although a wide range of issues and approaches are discussed and further developed, the following issues remain ignored up to now:

- An up-to-date political and, in particular, ethical debate about equitable land use in the context of developed countries (generational equity, distributive equity) which has a long tradition in the old German Federal Republic (e.g. social obligation of property)
- The interrelations and impacts between local and global changes in land use, as reflected in discussions about footprints (see WACKERNAGEL, 1994)
- The inclusion of the discussion about systemic risks, which in the context of the discussion about GMOs or the financial crisis, has lead to important impulses for better understanding of and dealing with the challenges (see WBGU, 1999)
- The discussion about new forms of transfer (e.g. via social networks; see ZSCHEISCHLER ET AL, 2012) and new forms of stabilizing launched initiatives, such as the efficiency of an early and targeted involvement of civil society stakeholders.

The authors believe the term "sustainable land management" also needs to be further developed, not only to provide an overview of sources, but to increasingly involve the practical experience of individuals and groups. This could provide more information about the action orientations realised in practice.

Endnotes

- ⁱ This paper includes parts of an article published in a former version in the Discussion paper Weith et al. 2013 in German language.
- ⁱⁱ Australian Government – Department of Sustainability, Environment, Water, Population and Communities (2009): <http://www.environment.gov.au/land/management/index.html> (accessed: 26 February 2013).
- ⁱⁱⁱ New Zealand – Ministry for the Environment (2010): <http://www.mfe.govt.nz/issues/land/soil/strategy.html> (accessed: 27 March 2013).
- ^{iv} EUROPEAN COUNCIL, 23 and 24 March 2000: http://www.europarl.europa.eu/summits/lis1_de.htm (accessed: 8 February 2013).
- ^v EUROPEAN COUNCIL, 15/16 June 2001: http://ec.europa.eu/agriculture/envir/cap/index_de.htm (accessed: 8 February 2013).
- ^{vi} EUROPEAN COMMISSION 2013: <http://ec.europa.eu/environment/nature/natura2000/> (accessed: 8 February 2013).
- ^{vii} UN UNITED NATIONS (o.J.): About REDD+: <http://www.un-redd.org/AboutREDD/tabid/102614/Default.aspx> (accessed: 11 March 2013).
- ^{viii} An explicit analysis and evaluation is desirable, particularly in conjunction with ongoing joint projects.
- ^{ix} The federal government, *Länder*, regions, local government and individual organizations/businesses are seen as main stakeholders.
- ^x The Centre of Land, Water and Environmental Risk Management at the Technical University of Munich (2013): <http://www.landentwicklung-muenchen.de/> (accessed: 19 March 2013).
- ^{xi} J. BAUHUS, What can modern silviculture do? (2010) Paper presented at the "Waldstrategie 2020" conference on 19 and 20 April 2010 in Berlin: <http://www.fnr.de/waldstrategie/> (accessed: 19 March 2013).

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