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Integrated land use and regional resource management – A cross-disciplinary dialogue on future perspectives for a sustainable development of regional resources

Christine Fürst [a,*], Katharina Helming [b], Carsten Lorz [c], Felix Müller [d], Peter H. Verburg [e]

[a] Centre for Development Research, Dept. Ecology and Natural Resources Management, Rheinische Friedrich-Wilhelm University Bonn, Walter Flex Str. 3, 53113 Bonn, Germany
[b] Leibniz Centre for Agricultural Landscape Research, Eberswalder Straße 84, 15374 Müncheberg, Germany
[c] Forest Pedology, Geology and Site Ecology, University of Applied Sciences Weihenstephan-Triesdorf, Woods and Forestry, Hans-Carl-von-Carlowitz-Platz 3, 85354 Freising, Germany
[d] Institute for Natural Resource Conservation, Department of Ecosystem Management, Christian-Albrechts-Universität zu Kiel, Olshausenstr. 75, 24118 Kiel, Germany
[e] Institute for Environmental Studies, Dept. Spatial Analysis and Decision Support, VU University Amsterdam, De Boelelaan 1087, 1081 HV Amsterdam, The Netherlands

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ABSTRACT

Our paper introduces objectives and ideas of the special issue "Integrated land use and regional resource management – A cross-disciplinary dialogue on future perspectives for a sustainable development of regional resources" and provides an overview on the contributions of the single papers in the special issue to this topic. Furthermore, we discuss and present major challenges and demands on integrated land use and regional resource management and we come up with an analytical framework how to correspond these demands.

1. Integrated land use and regional resource management – introduction and objectives of this special issue

Land is one of our most important and most limited resources to provide essential goods and services to society. The degree of freedom to change the land use pattern or to intensify land use by innovative land use strategies that increase the provision of natural resources is governed by legal and administrative regulations, land ownership rights, socio-cultural conditions and natural restrictions arriving from climate or edaphic conditions (Irwin and Geoghegan, 2001; Krausmann et al., 2003). The provision of natural goods and services from the land cannot be studied by only looking at single ecosystems in isolation, without understanding their interplay in a specific regional context. Furthermore, complex interactions that characterize socio-ecological systems to which integrated land use planning refers, lead to great uncertainty in predicting their evolvement, taking ecosystem and human responses to climate change as an example (Mohamed et al., 2000).

Therefore, a precondition for sustainable regional resource management as main task of regional planning is an integrative viewpoint on land use. Spatial planning at country level (=state regional planning) addresses explicitly different scales in decision making and knowledge integration. Regional planning, that has to break down policy objectives from state regional planning in spatially explicit manner, faces the problems (a) to bring together the local knowledge on land use and related management practices, and needs of society as a whole to (b) provide requested resources and services while ensuring private property rights at the same time.

Concepts such as ecosystem services (MEA, 2005), land use functions (Perez-Soba et al., 2008) or landscape services (Temorshuizen and Opdam, 2009) provide a framework to translating characteristics of the land system relevant to human well-

* Corresponding author.
E-mail addresses: cfuerst@uni-bonn.de (C. Fürst), helming@zalf.de (K. Helming), carsten.lorz@hswt.de (C. Lorz), fmueller@ecology.uni-kiel.de (F. Müller), peter.verburg@vu.nl (P.H. Verburg).

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being into more aggregated terms that can be communicated and used in integrated land use planning. Furthermore, benefit might arise from using these concepts in so far as they help to identify and consider also those services and potential future threats in their provision, which are not of current interest for the planning actors. Examples are regulating or cultural ecosystem services that are often neglected in planning due to more urgent pressures such as ensuring food-security or enabling economic development (see e.g. Gómez-Baggethun and Barton, in press). Operationalizing the concepts of ecosystem services, land use functions or landscape services in the context of integrated land use planning requires the inclusion of aspects and planning objectives that are relevant to a specific regional context (Koschke et al., 2012).

The papers in this issue originate from the conference Regio-Resources 21-2011 that started a cross-disciplinary dialogue on how to ensure the sustainable provision of natural resources at regional scale.

Objective of our special issue is to provide examples of operational methods and approaches that are tested and applied in integrated land use planning in diverse national or regional planning contexts.

We intend to present different perspectives on the contribution of integrated land use planning approaches to overcome menacing resource scarcity, taking conflicting topics such as enhanced use of renewables for energy provision and food security or irrigation in arid areas for agriculture and provision of drinking water as examples.

2. Challenges of integrated land use planning

A problem when making use of the ecosystem services concept or comparable approaches for integrated land use planning is that existing monitoring or survey networks are not prepared to deliver information that is requested to assess and monitor the provision of services (Chapman, 2012). Related is the question of the selection and interpretation of suitable criteria and indicators which enable an integrated assessment of ecosystem and land system processes and their impact on services provision (Koschke et al., 2012).

Besides, knowledge on ecosystem interactions and how these contribute to performance of land systems in providing resources and services for society is so far limited. Processes in ecosystem compartments couple back with processes at global scale, taking global warming and GHG emission from permafrost soils an example (VijayaVenkataRaman et al., 2012). Abundance of rare species and species diversity are dependent from the existence and quality of specific habitats, but also of their spatial context and connectivity (Nagendra et al., in press). Regional water availability is impacted by land use at the scale of management planning units, but also by the share of land use types, and the spatial and temporal land use pattern as a driver of the evapotranspiration in the regional and transregional water cycle (Giertz et al., 2005).

In addition, also temporal dynamics within the single ecosystems cause a high variability in the delivery of ecosystem services. Taking agricultural land use as an example, especially arable farming can react intra-annually on altered environmental or economic conditions that force to switch, for instance, to other crops and crop rotations (Olesen et al., 2011). Sealing of open areas or waste land in vicinity to urban systems can even happen on a daily time scale (EC, 2012). In contrast, changes in stand structure and tree species composition in forests might take decades and centuries, and once made decisions cannot easily be revised within short term (Fürst et al., 2010). Interactions between such different ecosystems are therefore also time dependent and in consequence demanding to be assessed by suitable monitoring or survey approaches.

Beyond, integrated land use planning has to involve stakeholders in a multi- and transdisciplinary manner. These stakeholders refer to different scales and have therefore conflicting or incompatible interests. Concerned land owners argue from micro-economic point of view. Actors such as water providers might address catchments as spatial entities. Nature conservation organizations might have both scales in their mind, the rare habitat at micro scale or the unique character of a landscape at meso scale. In all cases, the prior use or protection interest of a party limits the success of each other party to accomplish their land use interests (e.g. Pravat and Humphreys, in press). Increasing demands for public goods such as recreation, scenic beauty and experiencing nature add additional conflicts in integrated land use planning decisions (see e.g. Rakodi, 2001). All these aspects make it difficult to answer simple questions, such as 'whose and which demands to consider primarily at the interwoven spatial scale levels?'.

3. Corresponding to the challenges

If we try to figure out how to conceive an analytical framework for addressing at least partially the described challenges, we can identify a number of basic requirements (Fig. 1).

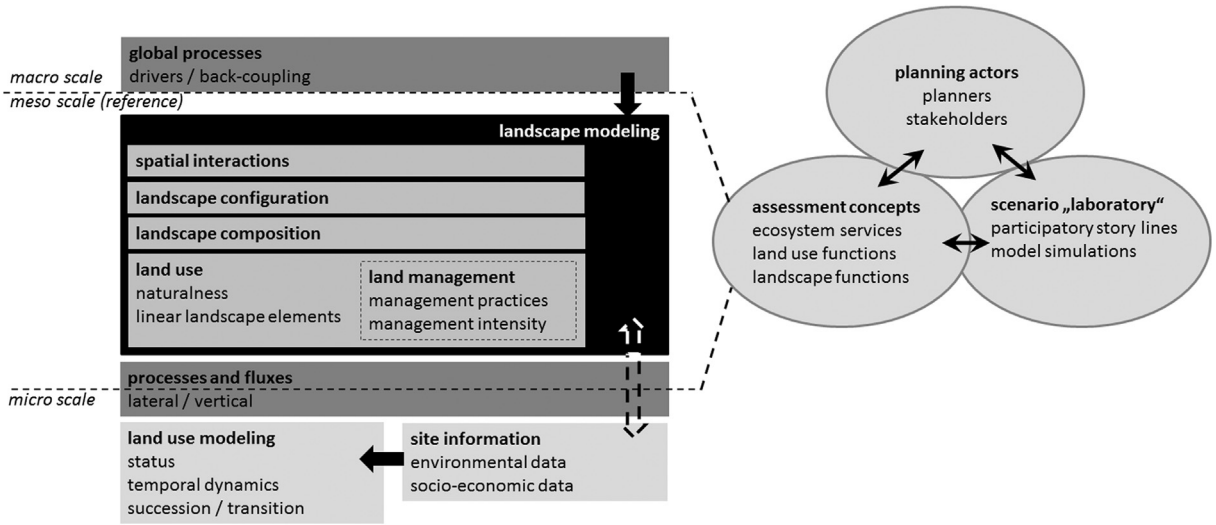

Fig. 1. Scheme – analytical framework for integrated land use planning.