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Joint problem framing in sustainable land use research Experience with Constellation Analysis as a method for inter- and transdisciplinary knowledge integration

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ABSTRACT

Land use is an important field of interest regarding sustainability transformations. Research projects which deal with the multiple dimensions of sustainable land use usually apply an inter- and transdisciplinary design and are confronted with challenges of integrating heterogeneous knowledge.

In this paper we refer to experience we had during the ELaN project, which followed a systemic approach by linking research on water and land management. Due to this relatively uncommon approach it was necessary to bring together scientists and practical actors as well as distributed knowledge from different areas of expertise. Considering the heterogeneity of the actors it was of great importance to establish a shared understanding of the research problem the project was to deal with during the initial phase. For this step the method of Constellation Analysis (CA) was applied: a visualisation and analysis tool which aims at joint problem framing by focusing on the dominant elements of a social-ecological problem and their relations in a discursive process. Due to the size of the project team and the necessity to involve a broad range of actors, a group of scientists led the iterative process and prepared CA drafts which were validated by practitioners. This design can be categorised as 'consulting' rather than 'participatory' transdisciplinarity. Proceeding this way can be seen as a compromise between more intense forms of transdisciplinary exchange and forms that are manageable when considering time and resource constraints in third-party funded projects.

CA has proven to be a suitable tool for organising processes of mutual understanding between heterogeneous actors and fostering social integration in inter- and transdisciplinary research groups. In ELaN the main benefit of the process was an adjustment and enrichment of problem framing which was formulated in the project proposal thus contributing to integrated system knowledge as a basis for the interdisciplinary project consortium and involved practitioners. The insights gained during this process led to changes in the design of some of the sub-projects as well as the targeted end products. This experience confirms the importance of a structured process of joint problem framing in inter- and transdisciplinary projects, especially for thematic fields of such high complexity as land use research.

1. Introduction

Land use research exemplifies the challenges that have arisen from the sustainability paradigm. While monitoring and modelling of the ecological impacts of land cover change prevailed in the past, currently, a more integrative understanding that moves beyond the limits of disciplinary knowledge and sectoral perspectives is being pursued (Zscheischler and Rogga, 2015). Land is central in human-nature interactions. But its functions, such as land-based production (food and non-food), space for recreation and the provision of ecosystem services, are being greatly threatened by current trends such as climate change, globalisation, demographic changes and energy politics (Pérez-Soba et al., 2008; Zscheischler and Rogga, 2015). To be able to deal with these complex and uncertain socio-ecological problems and challenges usually demands an inter- and transdisciplinary research design that enables integration of knowledge from different disciplines as well as experience from practice. This so called "mode 2" research supplements the traditional disciplinary "mode 1" research and implies that socially robust knowledge for solving socially caused, complex problems is increasingly being co-produced by scientific researchers, policy makers, stakeholders and private actors (Brand, 2000; Gibbons

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et al., 1994; Hinkel, 2008; Hirsch Hadorn et al., 2008; Tress et al., 2006; Tress et al., 2007).

In general, transdisciplinarity is a particular type of co-production of knowledge which is able to contextualize scientific and real world knowledge (Scholz et al., 2000: 478) by ideally producing three types of knowledge: system, target and transformation knowledge (ProClim, 1997: 15). While a commonly shared definition of transdisciplinarity is still lacking, some aspects of research practice can be seen as common ground: transdisciplinary research deals with complex real-world or societal problems and it is conducted in cooperation between scientific research and society, which are ideally envisioned as being enabled to mutually learn from each other (Jahn et al., 2012; Scholz et al., 2000; Zierhofer and Burger, 2007; Zscheischler and Rogga, 2015). Integration can be seen as one of the most important challenges of transdisciplinary endeavours, as due to their very nature, such projects have to cope with thematic as well as problem- or product-oriented integration of knowledge and social integration of scientists and practitioners (Bergmann et al., 2012; Hinkel, 2008; Scholz et al., 2000; Zierhofer and Burger, 2007). The involved scientific and practical experts usually are driven by different rationalities and logics of action and locate problems in their particular "world of relevance" (Limoges 1993). Scavarda et al. (2006) point out that every expert has his or her own mental causal map, representing his or her beliefs about the causes of a problem, its main drivers and possible solutions. This diversity in perspectives must be taken into account while identifying and structuring a problem and while developing and testing means to deal with it. Several authors agree that the first step in mutual learning and integration is to acknowledge the diversity of perspectives and to explore and clarify their differences (Giri, 2002; Loibl, 2006; Tress et al., 2006; Schäfer et al., 2010).

Both knowledge integration and mutual learning often occur more or less implicitly in the process of inter- and transdisciplinary research projects. Usually it is taken for granted by funding agencies as well as researchers involved in such projects. Zierhofer and Burger (2007) conclude from an evaluation of 16 inter- and transdisciplinary projects that problem oriented integration of different knowledge is rarely approached systematically and often is not even recognized as a methodological challenge. Truffer (2007) and Hunecke (2011) point out that knowledge integration is more than simply a technical or organisational problem but is also an active social process of negotiation and construction which has to be planned, designed and organized in an active manner and with appropriate methods. Several authors agree that a broad and coherent debate on the methodology of integrated knowledge production is still lacking (Bergmann et al., 2012; Defila and Di Giulio, 2015), although a number of compilations of methods of integration have been produced during the last years (Niederberger and Wassermann, 2014; Bammer, 2013; Bergmann et al., 2012).

Various authors have pointed out that inter- and transdisciplinary research projects should aim at knowledge integration from the very beginning and throughout the entire research process (Bergmann et al., 2012; Lang et al., 2012). Ideally, within the initial phase of a project, the leading questions and common research goals should be defined and a shared view about the system and its dynamics generated so that the various participants can focus on "one and the same problem and [. . .] synthesize the information sampled in an effective manner" (Scholz, 2000: 16). Joint problem framing,[1] which integrates complementary aspects of system knowledge and gives an impression of the range of different perspectives involved, seems to be an ideal starting point for a transdisciplinary research process (Pohl and Hirsch Hadorn, 2008b). Tress et al. (2007) refer to the main barriers for knowledge integration in land use research and identify joint problem formulation as a crucial step for integrative research. Jahn et al. (2012: 5) point out that arriving at a shared understanding of a problem in a reflexive, methodically-guided process is the only way that (diverging) expectations among participants (both from science and society) regarding desired research outcomes can be managed successfully.

This paper seeks to take up the gap in the literature regarding how processes of knowledge and social integration can be facilitated by applying specific methods and to reflect upon the potentials and difficulties of such endeavours. It focuses on the first step of structuring real-world problems within interdisciplinary and transdisciplinary cooperation. We refer here to experiences we had during the ELaN[2] project, which dealt with questions of integrated water and land management. To obtain a problem formulation which could be shared by the scientific and practical partners involved, Constellation Analysis (CA) was applied. CA is a visualisation and analysis tool which facilitates dialogue between actors with different backgrounds. Feedback regarding the difficulties and benefits of this process was obtained by workshop evaluation via questionnaires and qualitative interviews with participants, thus allowing reflection on the added value of this methodological step.

The paper is structured as follows: After a brief introduction of the ELaN project (Section 2) and the CA method (Section 3), the results of carrying out CA during the project are presented (Section 4). Section 5 discusses the suitability of the method for knowledge integration and the quality of the transdisciplinary process. The paper closes with conclusions for inter- and transdisciplinary research processes as well as for sustainable land use research (Section 6).

2. The ELaN project: sustainable land management in Northeastern Germany

ELaN combined two thematic areas which have thus far rarely been dealt with together: water and nutrient management, on one side, and land use on the other. In doing so it sought to take up the challenge of adopting a systemic view on sustainable land use in the face of climate change. One of the main strands of the project was examining the current German practice of discharging treated waste water into rivers and surface water, which has negative consequences in terms of regional loss of water and nutrients as well as eutrophication of rivers and oceans. As part of ELaN, scientists from a variety of disciplines (e.g. hydrology, soil science, limnology, agriculture, regional planning, sociology, economy, political science) were investigating whether the use of treated waste water has the potential to serve as one element of sustainable water and land use management. A central question was to estimate the risks of using treated waste water for irrigation of specific sites with regard to the subsequent quality of the soil and ground water. Parallel to exploring different options of water management, land use options adapted to different ground water levels were also analysed. These investigations were embedded within consideration of

[1] The terms problem framing (Rossini 2009), problem structuring (Scholz et al., 2009; Pohl and Hirsch Hadorn, 2008a,b) and problem formulation (Bergmann et al., 2005) are used with a rather similar meaning in the literature on transdisciplinary research processes. 'Joint' and 'shared' problem framing are also used as synonymous terms.

[2] The ELaN project – Entwicklung eines integrierten Landmanagements durch nachhaltige Wasser- und Stoffnutzung in Nord-Ostdeutschland (Developing an integrated land management scheme for sustainable water and nutrients use in Northeastern Germany) – was funded from 2011 to 2015 by the German Federal Ministry for Education and Research. For further information see: <www.elan-bb.de>.