



The need for transdisciplinary social-ecological biodiversity research

More a lack of knowledge rather than a lack of action

Summary

Despite various policy and management responses, biodiversity continues to decline worldwide. We must redouble our efforts to halt biodiversity loss. The current lack of policy action can be partly linked to an insufficient knowledge base regarding the conservation and sustainable use of biodiversity. Biodiversity research needs to incorporate both social and ecological factors to gain a deeper understanding of the interrelations between society and nature that affect biodiversity. A transdisciplinary research approach is crucial to fulfilling these requirements. It aims to produce new insights by integrating scientific and non-scientific knowledge. Several measures need to be taken to strengthen transdisciplinary social-ecological biodiversity research: Within the science community: firstly, scientists themselves must promote transdisciplinarity; secondly, the reward system for scientists must be brought into line with transdisciplinary research processes; and thirdly, academic training needs to advocate transdisciplinarity. As for research policies, research funding priorities need to be linked to large scale biodiversity policy frameworks, and funding for transdisciplinary social-ecological research on biodiversity must be increased significantly.

Zusammenfassung

Aktuelle Forschungsergebnisse zeigen, dass die Ursachen für den fortschreitenden Verlust der biologischen Vielfalt vor allem in fehlendem oder unsicherem Wissen über die komplexen Verbindungen zwischen Natur und Gesellschaft liegen. Wissenschaftler empfehlen daher, die Biodiversitätsforschung stärker als bisher transdisziplinär auszurichten.

Trotz einer Vielzahl nationaler und internationaler Initiativen und Programme, wie etwa die Ratifizierung nationaler Biodiversitätsstrategien, die Ausarbeitung von Aktionsplänen im Rahmen der Vertragsstaatenkonferenzen des Übereinkommens über die biologische Vielfalt (CBD) oder die Einrichtung von Schutzgebieten, schreitet der Biodiversi-

tätsverlust weltweit fort. Um den Verlust der biologischen Vielfalt zu stoppen, müsste der bisherige Aufwand verdoppelt werden. Dabei ist es wichtig, eine breitere Wissensbasis zu schaffen, denn es fehlt vor allem an Handlungswissen.

Hier ist ein transdisziplinärer Forschungsansatz entscheidend, wenn es darum geht, wissenschaftliche Erkenntnisse und praktische Erfahrungen zu integrieren und damit neues Wissen zum Schutz der Biodiversität zu generieren. Mit diesem transdisziplinären Forschungsmodus ist es zudem möglich, Nutzungsdynamiken von Biodiversität in den Blick zu nehmen, wie beispielsweise Konflikte, die entstehen, wenn verschiedene Interessengruppen unterschied-

liche Nutzungsansprüche an Ökosystemleistungen haben. Hierfür müssen neue Bündnisse zwischen den Disziplinen (Natur- und Sozialwissenschaften) geschaffen sowie wissenschaftliches mit nicht-wissenschaftlichem Wissen verbunden werden. Die Einbeziehung von lokalem Wissen über Biodiversität sowie die Integration von gesellschaftlichen Partnern in den Forschungsprozess ist dabei unerlässlich. Innerhalb der Forschungsgemeinschaft, aber auch in der Forschungspolitik müssen daher Maßnahmen ergriffen werden, um die transdisziplinäre sozial-ökologische Biodiversitätsforschung zu stärken und zu etablieren:

Forschungsgemeinschaft

► Bisher wird die wissenschaftliche Leistung unter anderem über die Anzahl der wissenschaftlichen Publikationen bewertet. Dieses Anreizsystem muss für WissenschaftlerInnen, die transdisziplinär arbeiten, überdacht und angepasst werden. Denn transdisziplinäre Forschung erfordert einen höheren Aufwand für Kooperationen und gemeinschaftliches Arbeiten wie CO-Design, Co-Production und Co-Dissemination.

- NachwuchswissenschaftlerInnen müssen als transdisziplinäre ExpertInnen ausgebildet werden können. Hierfür müssen entsprechende Karrierepfade sowie Bildungsangebote zur Verfügung gestellt werden.
- WissenschaftlerInnen müssen die Bewusstseinsbildung für die Bedeutung transdisziplinärer Forschung stärker vorantreiben, indem das Selbstverständnis der Biodiversitätsforschenden gestärkt wird.

Forschungspolitik

- Die Prioritäten der Forschungsförderung müssen stärker mit nationalen und internationalen Biodiversitätszielen, wie sie im Strategischen Plan für Biologische Vielfalt, im Übereinkommen für Biologische Vielfalt (CBD) oder in der EU-Biodiversitätsstrategie verankert sind, in Einklang gebracht werden.
- Transdisziplinäre sozial-ökologische Biodiversitätsforschung muss finanziell deutlich gestärkt werden. Im Interesse des internationalen Biodiversitätsschutzes sollte sektorübergreifend argumentiert und gehandelt werden.

Transdisciplinary social-ecological biodiversity research ...

- ... **is transdisciplinary** in its research mode: Different types of knowledge such as scientific and non-scientific (e.g. indigenous and local) are integrated into the research process in order to approach biodiversity loss.
- ... **is problem-oriented**: The focus of the research is on finding concrete and affordable solutions to specific problems with patterns of non-sustainable use of biodiversity and ecosystem services. Transformation knowledge is needed to address the question 'What can we do?'
- ... **is normatively focused** on the sustainable use and conservation of biodiversity: The overall aim is to help stop global biodiversity loss. Orientation knowledge is needed to address the question 'What should we do?'
- ... **is systemically conceptualised through social-ecological systems (SES)**: The underlying societal causes and effects of biodiversity change are addressed. The focus is on the social-ecological dynamics of ecosystem services and a critical analysis of the non-sustainable regulation and transformation of biodiversity use and protection. System knowledge is needed to address the question 'What can we do?'

Findings and recommendations

Transdisciplinarity in biodiversity is crucial as biodiversity research increasingly begins to address the underlying societal causes and effects of biodiversity change. What's needed is a social-ecological perspective on biodiversity research that is normatively focused on the sustainable use and conservation of bio-

diversity, as well as looking at problem-oriented ways of tackling the non-sustainable use of biodiversity and ecosystem services.

Various types of action in the fields of science and research policy are required to foster research into transdisciplinary social-ecological biodiversity:

The science community: scientists have a role to play

- ▶ *Reward system:* There is an urgent need to revise the reward system for scientists involved in transdisciplinary research processes. So far, scientific achievement has been measured mainly in rates of publication. This can be problematic for scientists involved in transdisciplinary research, which is far more focused on collaboration such as co-design, co-production and co-dissemination.
- ▶ *Academic training:* Scientific academic training must provide means and opportunities to train young professionals as transdisciplinary experts in collaborative work with stakeholders. Current educational and institutional frameworks need revising in order to provide such training and career opportunities.
- ▶ *Raising awareness:* Scientists must raise awareness about the importance of transdisciplinarity in biodiversity research. The biodiversity research community needs to reinforce its self-understanding and establish larger influential groups to better support decision making processes at national and European levels.

Research policy: transdisciplinary research cooperation must be strengthened

- ▶ *Policy framework:* In order to evaluate and improve biodiversity policy, research funding priorities should be linked to large scale biodiversity policy frameworks such as the adapted Strategic Plan for Biodiversity (2011–2020), the Aichi biodiversity targets of the Convention on Biological Diversity (CBD) and the adapted EU Biodiversity Strategy to 2020, as well as the national biodiversity policies.
- ▶ *Research funding:* In the interests of mainstreaming the biodiversity issue, ministers for the environment and for education and research should be more vocal in all sectors about the international biodiversity agreements. Environmental policy representatives at national and European level must open up to and interact with other sectors to advocate global biodiversity agreements more effectively and mobilise more funding for transdisciplinary social-ecological biodiversity research.

Global biodiversity continues to decline

The Global Biodiversity Outlook 4 (2014), a mid-term assessment of progress towards the implementation of the Strategic Plan for Biodiversity, provides serious indications that the pressures on biodiversity will continue to increase until 2020. At the same time, the status of biodiversity will decline. Despite ongoing policy and management responses, the impacts of current policy efforts are unlikely to result in any improvement to biodiversity by 2020. Reasons for this may be partly due to time lags between taking positive actions and seeing discernible positive outcomes. However, reaching these joint objectives will also require changes within society, including much more efficient use of natural resources as well as rethinking consumption habits.

The role of policy action

In response to this, key actions were identified at the Twelfth Conference of the Parties (COP) to the Convention on Biological Diversity (CBD); they included the streamlining of communication, the development and implementation of policy plans, the reduction of nutrient pollution, the expansion of the protected areas network, and the promotion of initiatives that support traditional and local knowledge of biodiversity. The CBD recommended measures that countries can take – de-

pending on national circumstances and priorities – to accelerate the implementation of the Strategic Plan for Biodiversity 2011–2020 and to facilitate the achievement of the Aichi Biodiversity Targets. COP 13 in Cancun, Mexico readdressed these key actions, and the ministers and heads of the delegation came up with the Cancun Declaration, which focused on the mainstreaming of the conservation and sustainable use of biodiversity for well-being. The subscribers committed to working at all levels within the respective governments but also across all sectors to mainstream biodiversity in areas such as agriculture, forestry or urban planning and not just in nature conservation.

However, despite these policy responses, biodiversity continues to decline. Many scholars claim that (policy) actions need to be redoubled if biodiversity goals are to be met by 2020, while others argue that it is more a case of a lack of knowledge than a lack of action.

More a lack of knowledge than a lack of action

The boundaries and barriers between knowing how to act and actually taking action need to be addressed. It is particularly crucial to analyse the factors responsible for a lack of action (such as lack of interest and motivation, or different priorities across key players). One can then consider how these relate to insufficient fi-

nancing or what capacities for more expedient processes are required. Consideration must be given to the respective economic, societal and political circumstances to enhance knowledge about the status of threatened species and initiate successful measures for their protection.

In attempting to bridge this lack of knowledge about how to handle the loss of biodiversity, it is necessary to deal with different kinds of knowledge: ignorance (for example about undetected species that might be relevant for medicine), contested knowledge (e.g. access to biodiversity and benefit sharing) and uncertain knowledge (e.g. trade-offs between using ecosystem services and any conflicts arising from such use). In particular, system knowledge (What is true?), orientation knowledge (What should we do?), and transformation knowledge (What can we do?) is needed (see Box 1). This complexity in biodiversity (i.e. the social-ecological definition that biodiversity is not only about the number and spread of species or habitats but is also related to human well-being and thus to society) always leads to uncertain or contested knowledge. And inactivity as a consequence thereof will result in yet more losses – an aspect that is covered by the precautionary principle. Given this kind of complex problem structure, there is an increasing consensus about the need to find new ways of producing knowledge.

Political decision makers have to deal with this complexity by carefully weighting the different trade-offs, whereas creating the evidence base for responsible decision making is the role of scientists.

Strengthening the science-policy interface: The Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES)

The IPBES was initiated in 2010. The aim is to strengthen the science-policy interface for biodiversity and ecosystem services to ensure the conservation and sustainable use of biodiversity. The platform is the intergovernmental body that assesses the state of biodiversity and ecosystem services for society. The IPBES aspires to create a new type of science-policy interface, since it is policy relevant but not policy prescriptive. The IPBES Conceptual Framework was developed especially for this reason. The framework intends to facilitate cross-disciplinary and cross-cultural understanding. It is a simplified model of the interactions between nature and human beings, and seeks to embrace not only different disciplines but also different knowledge systems such as scientific, non-scientific and indigenous knowledge.

In its early stages, the IPBES saw a lot of discussion about the lack of knowledge on biodiversity. However, this was very often focused on general knowledge gaps or biased towards natural science-based knowledge. There is still a considerable need to improve the knowledge base for the conservation and sustainable use of biodiversity and ecosystem services. It is important to gain a better understanding of the economic, societal and political conditions surrounding conservation efforts, and this should represent a major topic for social sciences and integrated transdisciplinary research dealing with biodiversity issues.

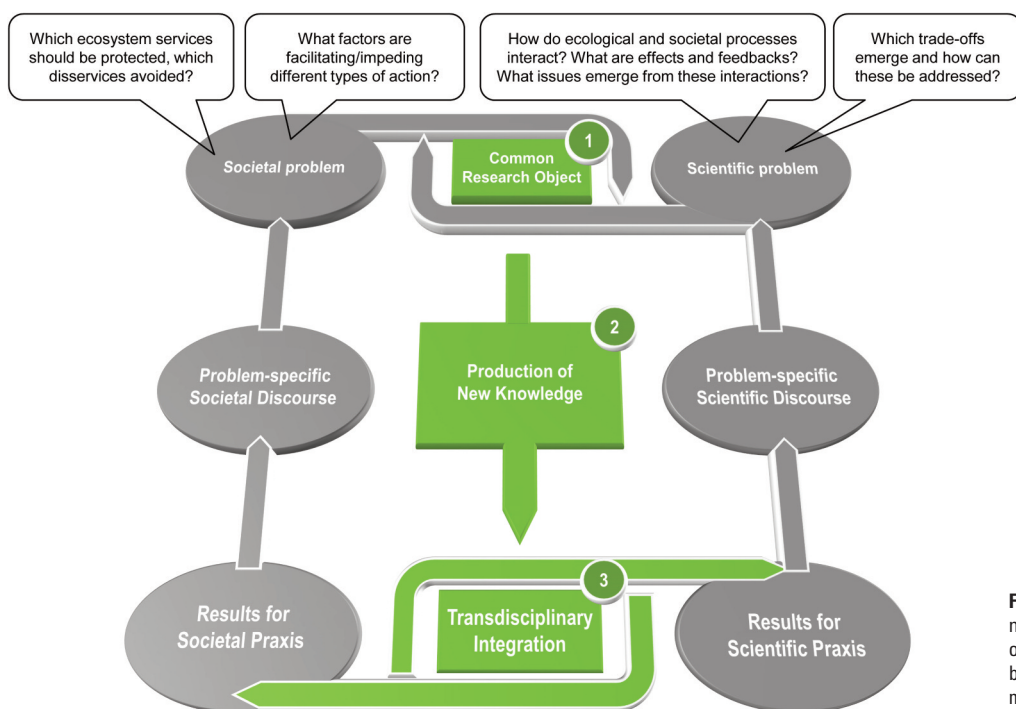


Figure 1: The role of transdisciplinarity in producing different types of knowledge in order to approach biodiversity loss (Jahn et al. 2012, modified in Mehring et al. 2017)

Assets of transdisciplinary research

Transdisciplinarity can provide adequate answers to these challenges, since it seeks to produce new knowledge by integrating different scientific insights and non-scientific knowledge (Figure 1). Transdisciplinary research is conducted at the interface of society and science. A major characteristic of transdisciplinarity is its reference to real-world problems such as sustainable development or the use of natural resources. Generally speaking, an ideal transdisciplinary research process consists of three consecutive steps (Figure 1): (1) identification of a common research object by scientific and societal stakeholders, which translates the real-world problem into a scientific issue; (2) production of new knowledge by means of interdisciplinary collaboration, and (3) evaluation of the new knowledge in terms of its contribution to societal and scientific progress.

Transdisciplinarity in biodiversity is critical as biodiversity research increasingly addresses the underlying societal causes and effects of biodiversity change. Transdisciplinary biodiversity addresses biodiversity

loss as an all-embracing issue requiring the attention of different disciplines from the natural and social sciences as well as the humanities. Seeking to integrate different types of knowledge, transdisciplinary biodiversity research facilitates mutual learning between science and society. Added values comprise 1) a better exchange of knowledge between different stakeholders on the use and conservation of biodiversity, 2) better interlinking of different knowledge types, and 3) increased acceptance of the results.

However, there is an urgent need for scientific careers to include means and opportunities to train transdisciplinary experts. Working in a transdisciplinary research mode requires expertise in specific methodologies (such as integration methods) or the ability to work in a collaborative setting with diverse stakeholders. So far, for example, the scientific curricula and the prevailing reward system are very much based on producing output in terms of publications instead of stimulating and enhancing transformation pathways towards sustainability as happens in transdisciplinary science.

References

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- ▶ Jahn, Thomas/Matthias Bergmann/Florian Keil (2012): Transdisciplinarity: Between mainstreaming and marginalization. *Ecological Economics* 79, 1–10
- ▶ Mehring, Marion/Estelle V. Balian/Angelique Berhault/Engelbert Schramm (2012): *Transdisciplinary Research on Biodiversity – Steps towards Integrated Biodiversity Research*. ISOE/EPBRS, Frankfurt am Main, Germany/Brussels, Belgium. 32 pp
- ▶ Marion Mehring/Barbara Bernard/Diana Hummel/Stefan Liehr/Alexandra Lux (2017): Halting biodiversity loss: how social-ecological biodiversity research makes a difference, *International Journal of Biodiversity Science, Ecosystem Services & Management*, 13(1): 172–180, DOI: 10.1080/21513732.2017.1289246

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