SOCIAL-ECOLOGICAL SYSTEMS INSTITUTE
ANNUAL REPORT 2021

SESI
Social-Ecological Systems Institute

FACULTY OF SUSTAINABILITY
LEUPHANA UNIVERSITY OF LUENEBURG
GERMANY

LEUPHANA
UNIVERSITÄT LÜNEBURG

FOREWORD

Last year's report of the Social-Ecological Systems Institute started with 'The year 2020 posed many challenges around the world'. One year later, we could start this foreword with exactly the same sentence and list the same social-ecological challenges. It might even seem that the situation in the world has not changed at all over the last year, and that social-ecological problems have only further intensified.

In 2021, the Social-Ecological Systems Institute at Leuphana University of Lueneburg has worked hard to understand and respond to diverse social-ecological challenges by addressing a range of research topics, ranging from understanding social-ecological interactions to uncovering leverage points that can mobilize sustainability and justice. The 2021 report synthesizes the work conducted across six research topics: biodiversity conservation, ecosystem services and nature's contributions to people, relational values, biocultural diversity, cross-scale governance, and leverage points and transformation.

The 2021 report also briefly elaborates on our *modus operandi*. We believe that an academic institute is more than a place where we create knowledge – rather, it should be a place where we foster transformation within the scientific system. With the intention of 'walking the talk', the Social-Ecological Systems Institute has flourished as a place of mutual support, collaboration, inclusiveness and creativity. We envision the institute as a place for 'care-full' academic practices.

Joern Fischer & Berta Martín-López

(Heads of the Social-Ecological Systems Institute)

Some of the social-ecological systems in Germany, Ethiopia, and Romania in which SESI researchers work.

TABLE OF CONTENTS

ABOUT THE SOCIAL-ECOLOGICAL SYSTEMS INSTITUTE (SESI)

The Social-Ecological Systems Institute (SESI) was founded in 2020. It is part of the Faculty of Sustainability at Leuphana University of Lueneburg, Germany. The institute provides a space for like-minded faculty members at Leuphana who are particularly interested in links between social and ecological phenomena. Among the key themes that SESI focuses on are biodiversity conservation, ecosystem services and nature's contributions to people, relational values, biocultural diversity, cross-scale governance of social-ecological systems, environmental justice, and leverage points for transformative change.

The SESI logo was inspired both by an unfolding fern leaf and by the Celtic double spiral – which symbolises the balance between opposing forces (e.g. change and preservation; or collapse and renewal). Arguably, many social-ecological systems are now on an unsustainable trajectory because they have lost this balance.

Leuphana University's central building.

VISION AND MISSION

OUR VISION

We envision a fair world where the benefits generated within social-ecological systems are shared sustainably with other species, both within and across generations. Solutions to sustainability challenges are developed collaboratively across diverse scientific disciplines, knowledge systems, and social interests.

OUR MISSION

To realise our vision, we recognise the need for transformative change. In pursuit of such change, we:

- Use place-based social-ecological systems thinking to understand and resolve sustainability challenges such as biodiversity loss and environmental injustice
- Bring together insights and approaches from the natural sciences, social sciences and the humanities in genuinely collaborative endeavours
- Integrate experiences, practices, and understandings from diverse knowledge systems
- Embed tools for transformative change into social-ecological systems thinking via a leverage points perspective
- Develop and apply methods to bridge multiple scales and governance levels
- Provide spaces for people sharing our vision to meet and exchange ideas.

RESEARCH THEMES

RESEARCH THEME: BIODIVERSITY CONSERVATION

An elephant (*Loxodonta africana*) in Namibia. Photo credit: Maraja Riechers.

Biodiversity conservation is central to the sustainability of social-ecological systems. In 2021, SESI published research in conservation science focusing on both the Global South and the Global North. Some examples are given here (see full list of publications from 2021 towards the back of this report).

In an invited perspective article, Jacqueline Loos reflected on the complex role of protected areas for biodiversity conservation in the Global South. In principle, such areas hold great promise for both biodiversity conservation and local livelihoods – yet in practice, reconciling these two objectives can be rather challenging. Drawing on an environmental justice framework, the perspective article concluded that progress could only be made by recognising a plurality of perspectives on how to live with nature.

The notion of living with nature is also central to collaborative work with Stellenbosch University that SESI has been engaged in, and which focuses on Namibia and Zambia. Here, Ruth Kansky (from Stellenbosch University) and colleagues study how rural communities manage to live side by side with wildlife. Work to date suggests that local governance arrangements are critical. Good governance in general terms can apparently encourage pro-wildlife behaviours, possibly more so than specific monetary incentives to live with wildlife.

SESI has also conducted much work in Ethiopia, where ERC- and BMBF-funded projects have taken a social-ecological perspective to investigate the intersection of food security and biodiversity conservation. In 2021, Patricia Rodrigues and colleagues published empirical work on mammals. They had camera-trapped mammals in the forests of southwestern Ethiopia for many months, and their work analysed how different future patterns of human settlement expansion would likely influence mammal communities. A synthesis paper led by Joern Fischer also appeared in 2021, which pulls together several years of conservation science in southwestern Ethiopia, and explicitly takes a social-ecological systems perspective.

Finally, some of SESI's conservation research has focused on butterflies in eastern Europe. Jacqueline Loos and colleagues studied a threatened butterfly species – *Colias myrmidone* – in Romania. They analyzed its larval development in relation to grazing patterns, and also investigated the social-ecological context of current land use practices. The species was found to be potentially sensitive to sheep grazing, and several possible improvements were identified for better landscape governance in the Natura 2000 sites where the species are found. Elsewhere in southern Europe – in a biosphere reserve in northern Spain – Berta Martín-López collaborated on a paper that investigated the knowledge and perceptions of social actors in order to improve conservation management.

EXAMPLES OF RECENT PUBLICATIONS

Protected areas and environmental justice:

Loos, J. (2021). Reconciling conservation and development in protected areas of the Global South. *Basic and Applied Ecology*, *54*, 108-118.

Human-wildlife coexistence in Namibia and Zambia:

Kansky, R., Kidd, M., & Fischer, J. (2021). Understanding drivers of human tolerance towards mammals in a mixed-use transfrontier conservation area in southern Africa. *Biological Conservation*, *254*, 108947.

Jiren, T. S., Riechers, M., Kansky, R., & Fischer, J. (2021). Participatory scenario planning to facilitate human–wildlife coexistence. *Conservation Biology,* 1-9*.*

Biodiversity conservation and food security in Ethiopia:

Fischer, J., Bergsten, A., Dorresteijn, I., Hanspach, J., Hylander, K., Jiren, T. S., ... & Shumi, G. (2021). A social-ecological assessment of food security and biodiversity conservation in Ethiopia. *Ecosystems and People*, *17*(1), 400-410.

Rodrigues, P., Dorresteijn, I., Guilherme, J. L., Hanspach, J., De Beenhouwer, M., Hylander, K., ... & Nimmo, D. (2021). Predicting the impacts of human population growth on forest mammals in the highlands of southwestern Ethiopia. *Biological Conservation*, *256*, 109046.

Conservation in Europe:

Cortés-Avizanda, A., Pereira, H. M., McKee, E., Ceballos, O., & Martín-López, B. (2021). Social actors' perceptions of wildlife: Insights for the conservation of species in Mediterranean protected areas. *Ambio*, 1-11.

Loos, J., Gallersdörfer, J., Hartel, T., Dolek, M., & Sutcliffe, L. (2021). Limited effectiveness of EU policies to conserve an endangered species in high nature value farmland in Romania. *Ecology and Society*, *26*(3).

RESEARCH THEME: NATURE'S CONTRIBUTIONS TO PEOPLE & ECOSYSTEM SERVICES

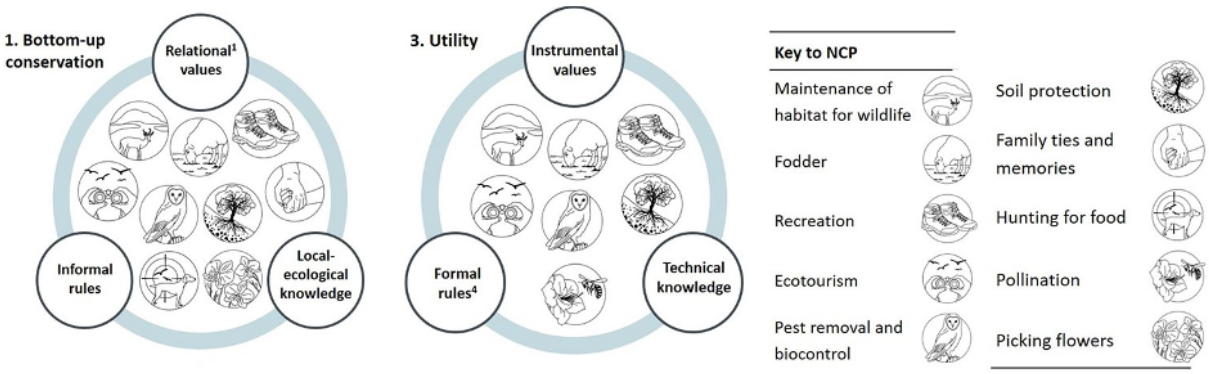


Illustration on how the paradigm of nature's contributions to people (NCP) was used in the Cape Floristic Region (South Africa) to understand how different farming decision-making contexts might lead to diverse sets of NCP.

Nature's Contributions to People are all positive and negative contributions of living nature to people's quality of life (Díaz et al. 2018). The paradigm was adopted by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) in an attempt to "provide space for the recognition of diverse and evolving culturally mediated ideas about what people derive from, and co-produce with, nature" (Hill et al. 2021). Therefore, transdisciplinarity, action-orientation, pluralism and inclusiveness are at the core of NCP.

The NCP paradigm includes the ecosystem services (ES) approach, while also allowing for approaches where human and nature are inseparable, connected for example through sacredness and spirituality. In 2021, SESI has used both paradigms to understand social-ecological dynamics. Below, we provide five examples of the use of both paradigms within the research at SESI.

By using a context-specific perspective to assess NCP, Emmeline Topp and colleagues explored how the decision-making context regarding the management and conservation of a critically endangered ecosystem in the Cape Floristic Region leads to different sets of NCP. They found that decision-making contexts based on relational values, informal rules and local ecological knowledge (see left side of the above figure) are related with diverse sets of NCP, while decision-making contexts that are based on instrumental values, formal rules and technological knowledge (middle diagram of the above figure) lead to a poorer set of NCP.

Arash Ghoddousi and colleagues presented NCP as an essential variable to monitor social-ecological interactions in order to evaluate protected area effectiveness. Their study shows that although many approaches for assessing NCP have been proposed, indicators derived from such assessments have rarely been included when evaluating protected area effectiveness.

To understand how human-ungulate interactions have been researched in the scientific literature, Roberto Pascual Rico and colleagues applied the generalizing perspective of NCP. The study recognizes the duality of human-ungulate interactions by identifying both the beneficial and detrimental NCP. For example, beneficial NCP from ungulates include hunting for food and fur, as well as the aesthetical enjoyment derived from viewing these animals. Examples of detrimental NCP include crop damage, disease transmissions to livestock, and traffic collisions.

To analyse the different mechanisms that modify people's access to ecosystem services provided by forests and farmlands in rural Ethiopia, Jannik Schultner and colleagues applied the framework of ecosystem services. The study finds five groups of ecosystem service beneficiaries and identifies a variety of access barriers mediating the flow of benefits. Important barriers were economic problems, shortage of land, damages created by wildlife, and labour shortage.

Thomas Schmitt and colleagues applied the ecosystem services framework for a different purpose, namely to understand the perceptions of farmers and citizens regarding grassland ecosystem services in southern Bavaria, Germany. Based on farm characteristics and environmental attitudes, the study finds two groups of farmers and three groups of citizens, respectively. These groups of actors present different perceptions of ecosystem services, which are also influenced by factors such as age and gender.

EXAMPLES OF RECENT PUBLICATIONS

Nature's Contributions to People:

Ghoddousi, A., Loos, J., & Kuemmerle, T. (2021). An outcome-oriented, social–ecological framework for assessing protected area effectiveness. *BioScience*.

Pascual-Rico, R., Morales-Reyes, Z., Aguilera-Alcalá, N., Olszańska, A., Sebastián- González, E., Naidoo, R., Moleón, M., Lozano, J., Botella, F., von Wehrden, H., Martín-López, B., & Sánchez-Zapata, J. A. (2021). Usually hated, sometimes loved: A review of wild ungulates' contributions to people. *Science of The Total Environment*, *801*, 149652.

Topp, E. N., Loos, J., & Martín-López, B. (2021). Decision-making for nature's contributions to people in the Cape Floristic Region: the role of values, rules and knowledge. *Sustainability Science*, 1-22.

Ecosystem services:

Schmitt, T. M., Martín-López, B., Kaim, A., Früh-Müller, A., & Koellner, T. (2021). Ecosystem services from (pre-) Alpine grasslands: Matches and mismatches between citizens' perceived suitability and farmers' management considerations. *Ecosystem Services, 49*, 101284.

Schultner, J., Dorresteijn, I., Manlosa, A. O., von Wehrden, H., Hylander, K., Senbeta, F., & Fischer, J. (2021). Ecosystem services from forest and farmland: Present and past access separates beneficiaries in rural Ethiopia. *Ecosystem Services, 48*, 101263.

RESEARCH THEME: RELATIONAL VALUES

Traditional farming landscape in Transylvania, Romania. Photo credit: Ágnes Balázsi.

Relational values are increasingly articulated by academics and practitioners to convey the importance of nature to decision-makers, especially in biodiversity conservation. In 2021, SESI has increased its focus on this new topic, which resulted in the publication of a number of papers and new working groups to synthesize empirical information gathered across SESI.

In an effort to combine the previously used concept of human-nature connectedness with relational values, Maraja Riechers and colleagues highlighted how both concepts are negatively affected by land use change. Here, they focused on an empirical example based on interviews conducted in Lower Saxony, Germany.

To broaden this discussion, another paper by Maraja Riechers and colleagues disentangled relational values based on questionnaires administered in three landscapes in Lower Saxony, Germany, and three landscapes in Transylvania, Romania. This paper was chosen to be on the cover of the Journal *People and Nature* in September 2021. Both studies give the conclusive result that landscape diversity and a diversity of relational values are connected. Further, the strength of relational values was linked to a positive attitude towards environmental conservation and time spent in nature – thereby showing ways to intervene and strengthen relational values.

SESI affiliate and doctoral student Emmeline Topp has published her work with Jacqueline Loos and Berta Martín-López in which she uncovers Nature's Contributions to People in the Cape Floristic Region, South Africa. Nature's Contributions to People includes the concept of relational values as immaterial and intangible preferences from relationships between people and nature.

To further test the hypothesis that landscape simplification can erode relational values, a new project led by the Institute of Ecology (by Vicky Temperton) and including a number of SESI staff who will elicit if relational values could be strengthened through restoration. This project has started in 2021, and data collection will start in 2022.

As the concept of relational values is rather new, SESI members initiated a SESI internal working group with researchers that have empirically worked with relational values. The working group has gathered synthesizing data and a manuscript is currently being prepared. Other SESI members working on relational values include the postdoctoral researcher Jasmine Pearson and the doctoral student Milena Gross who will focus on the relational values of tourists who have visited Mount Kilimanjaro, Tanzania. Data collection for this has started in 2021.

Another project led by the first SESI intern Hannah Wahler looks at relational values from sandy beaches through a hashtag analysis on Instagram. Data collection of that project finished in autumn of 2021.

EXAMPLES OF RECENT PUBLICATIONS

Riechers, M., Balázsi, Á, Engler, J-O., Shumi, G., & Fischer, J. (2021). Understanding relational values in cultural landscapes in Romania and Germany. *People & Nature, 3*(5), 1-11.

Riechers, M., Balázsi, Á., García-Llorente, M., & Loos, J. (2021). Human-nature connectedness as leverage point. *Ecosystems and People, 17*(1), 215-221.

Riechers, M., Martín-López, B., Fischer, J. (2021) Human-nature connectedness and other relational values are negatively affected by land use change: insights from Lower Saxony, Germany. *Sustainability Science*, 1-13.

Topp, E.N., Loos, J., & Martín-López, B. (2021). Decision-making for nature's contributions to people in the Cape Floristic Region: the role of values, rules and knowledge. *Sustainability Science*, 1-22.

RESEARCH THEME: BIOCULTURAL DIVERSITY

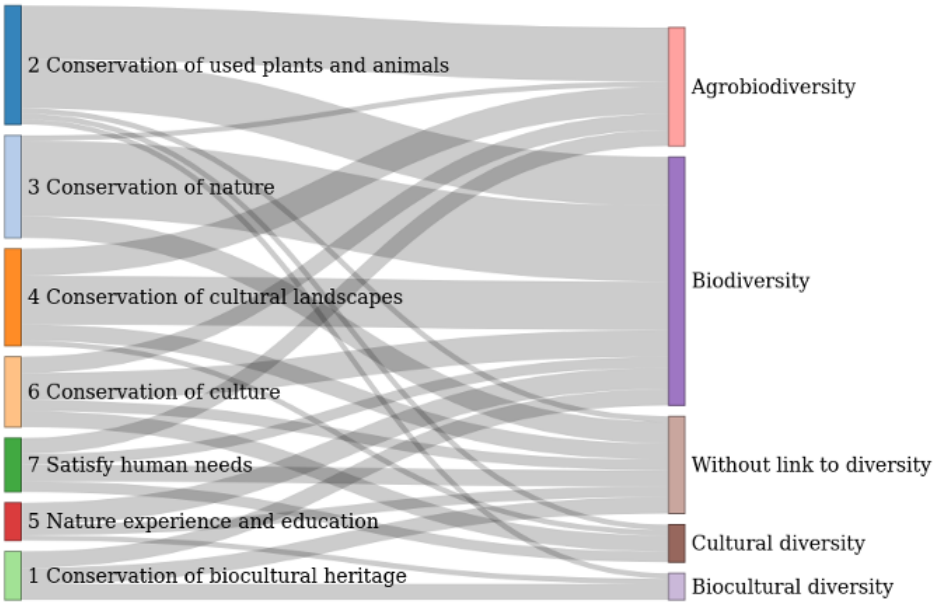
Word cloud representing the frequencies of different biocultural topics in 79 publications on biocultural approaches published in Spanish. In total, we found 122 different terms. The three most frequently used terms were biocultural diversity (mentioned in 42 articles), biocultural heritage (34 articles), and biocultural conservation (23 articles).

The concept of biocultural diversity embraces the richness and interdependencies of ecosystems and human cultures and is increasingly applied in global policy making, practice and academia. In order to understand its role in sustainability science, we are now reviewing the scientific literature written in Spanish after we had published a review on the English literature last year. Our findings so far show a wide range of applications of the concept across many different themes – spanning topics like biocultural heritage, biocultural tourism and biocultural ethics (see word cloud above).

The Spanish literature constitutes an important body of work since biocultural approaches are well embedded in Latin America, both in the academic as well as the non-academic world. Many grass-roots initiatives use this concept to fight for the rights of local people, to protect biodiversity and to counteract the loss of related knowledge, values and practices. In a recent publication, Stefan Ortiz and colleagues show how, for example, increasing commercialisation of wild fruits can threaten plant populations through overharvesting, but also how it offers opportunities to revitalise traditional knowledge and culinary practices.

While biocultural diversity is an important concept in Latin America, it is less well known in Germany. In 2021, we reviewed existing initiatives and projects in Germany and collected information on those linked to biocultural diversity. Out of 52 relevant initiatives only two

explicitly mentioned biocultural diversity and often only considered biological and cultural aspects in parallel but not their integration.



The diagram illustrates the results of a review of 52 initiatives and projects in Germany that were somehow related to biocultural diversity. Different goals of the initiatives link to different diversity aspects.

Finally, our work this year also focused on setting up transdisciplinary field work and data collection in Bolivia. The transdisciplinary work has been particularly challenging under the conditions of the ongoing pandemic. Together with other colleagues who are conducting empirical research in the Global South we published a reflection on the challenges and opportunities of this kind of work (Hermans et al. 2021). Most importantly, there is a particular need for adaptive and resilient research designs and funding strategies, a stronger dependence on remote and digital methods, and opportunities for more just and equitable involvement of practice partners and stakeholders.

EXAMPLES OF RECENT PUBLICATIONS

Journal publications:

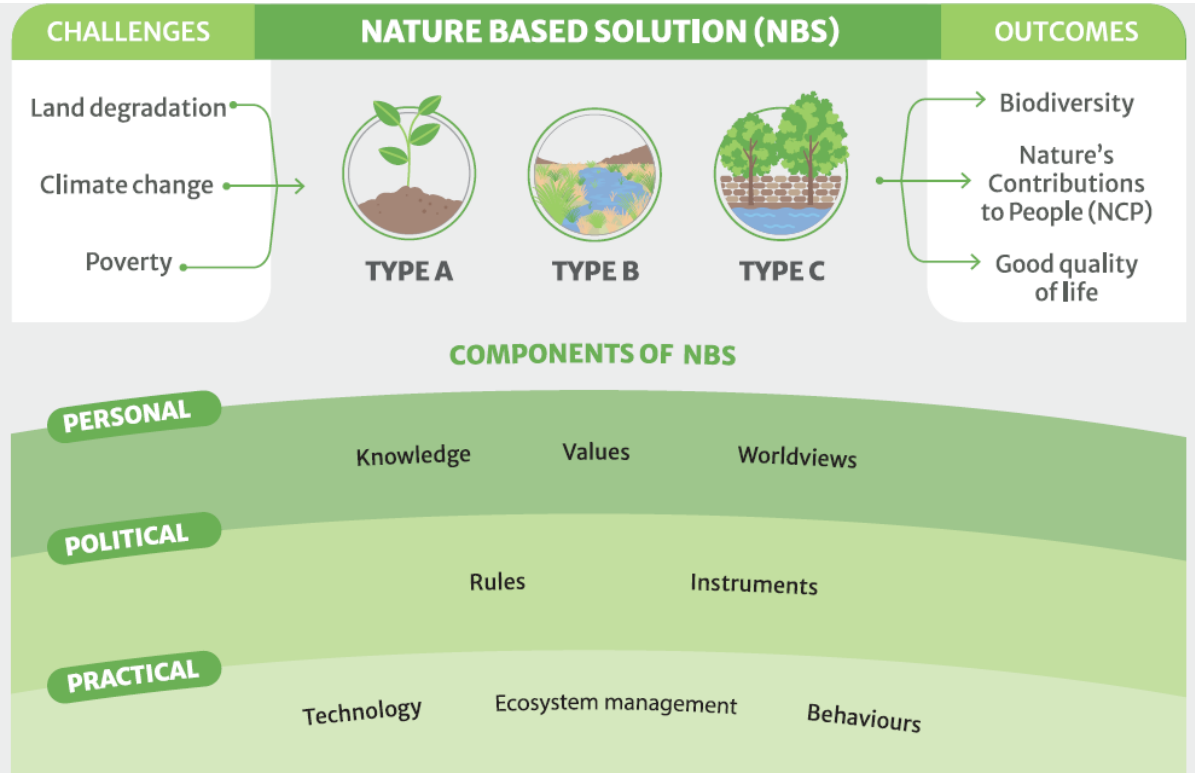
Ortiz-Przychodzka, S., Consuegra, C., van der Hammen, M. C., & Pérez, D. (2021). Perspectivas urbano-rurales sobre la circulación de dos frutos silvestres del Bosque Altoandino en sistemas agroalimentarios de Bogotá, Colombia. *Revista Etnobiología, 19*(1), 81-95.

Hermans, K., Berger, E., Biber-Freudenberger, L., Bossenbroek, L., Ebeler, L., Groth, J., Hack, J., Hanspach, J., Hintz, K.S., Kimengsi, J.N., Kwong, Y.M.C., Oakes, R., Pagogna, R., Plieninger, T., Sterly, H., van der Geest, K., van Vliet, J., & Wiederkehr, C. (2021). Crisis-induced disruptions in place-based social-ecological research - an opportunity for redirection. *GAIA - Ecological Perspectives for Science and Society, 30*, 72–76.

BioKultDiv blog:

Drews-Shambroom, A. (2021). How biocultural are initiatives in Germany? https://www.bioculturaldiversity.de/wie-biokulturell-sind-initiativen-in-deutschland/

RESEARCH THEME: CROSS-SCALE GOVERNANCE



Governance variables were at the core of the methodological framework suggested by Palomo et al. (2021) to assess the transformative capacity of nature-based solutions (NBS) in mountain environments. Figure: Palomo et al. (2021).

Under the research theme of cross-scale governance, SESI research seeks to understand how informal and formal institutions at different levels interact to define decision- and policy-making that lead to different social-ecological system realities. Research questions include: (1) How do collaborations among different stakeholders influence the supply and distribution of nature's contributions to people? (2) How do the (mis-) matches between policies and on-ground governance systems affect the sustainability of a social-ecological system? (3) Which formal and informal instruments can lead to environmental justice?

In 2021, members of SESI have conducted research on cross-scale governance to tackle different sustainability problems, such as how to effectively mitigate, adapt and prevent extreme events and how to ensure food security while protecting biodiversity. In addition, members of SESI have contributed to the assessment of governance instruments to promote nature-based solutions.

To deal with extreme events, such as wildfires, landslides or volcanic events, Simon Levin and colleagues explored approaches to prevention, mitigation and adaptation. Their study suggests four key considerations for effective governance in the face of extreme events. First, discussions of policy options would benefit from a careful assessment of the risks and benefits

of responses. Second, appropriate responses will require combinations of traditional planning and reactive responses, along with proactive governance that focuses on building capacities to anticipate responses. Third, mitigation and adaptation should account for interdependencies that may amplify or hinder the effect of a particular response. Finally, responses to extreme events must be coordinated at and across governance levels, including local, regional, and global.

Through an empirical study in a rural landscape of Ethiopia, Tolera Jiren and colleagues explored the governance challenges of navigating the interface between biodiversity conservation and food security. Some of the challenges found include those derived from the mismatches between the two policy sectors, that is, food security and biodiversity conservation. Notably, the study also found incoherence within the policies in individual sectors. Based on these results, the study concludes that there is an essential need for a more integrated and collaborative approach that pays attention to institutional interplay in order to guarantee the consistency across policy goals.

Finally, to analyse the effectiveness and transformative capacity of nature-based solutions in mountains, Ignacio Palomo and colleagues explored the role of informal rules, economic and legal instruments on protecting biodiversity and the flow of nature's contributions to people, as well as ensuring good quality of life (see above figure). In fact, the study found that governance aspects were essential to differentiate among types of nature-based solutions. Particular governance processes, such as broad participation, capacity building, and collaboration are central components determining the transformative potential of nature-based solutions in mountains.

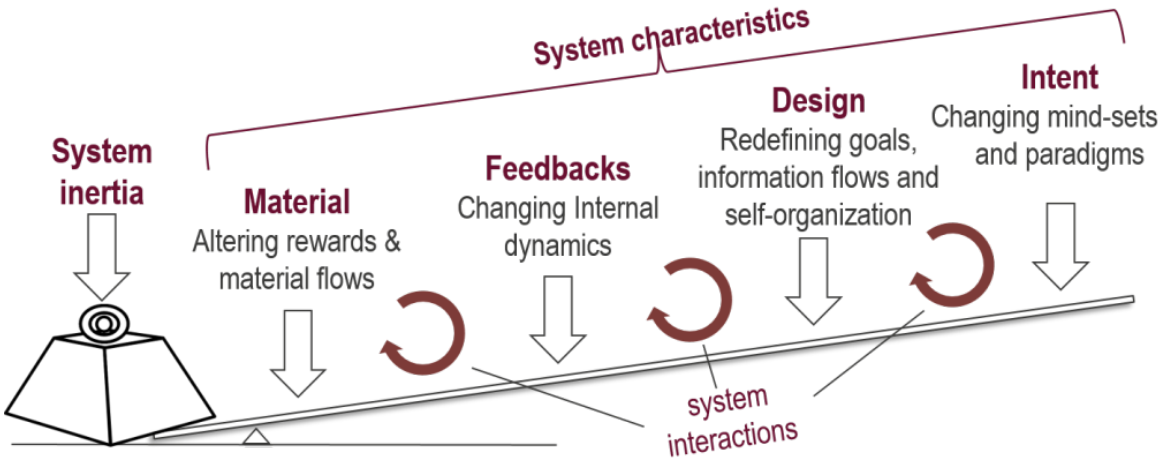
EXAMPLES OF RECENT PUBLICATIONS

Jiren, T.S., Leventon, J., Jager, N. W., Dorresteijn, I., Schultner, J., Senbeta, F., Bergsten, A., & Fischer, J. (2021). Governance Challenges at the Interface of Food Security and Biodiversity Conservation: A Multi-Level Case Study from Ethiopia. *Environmental Management, 67*, 717–730.

Levin, S.A., Anderies, J. M., Adger, N. et al. (2021). Governance in the Face of Extreme Events: Lessons from Evolutionary Processes for Structuring Interventions, and the Need to Go Beyond. *Ecosystems*.

Palomo, I., Locatelli, B., Otero, I., Colloff, M., Crouzat, E., Cuni-Sanchez, A., Gomez-Baggethun, E., Gonzalez-Garcia, A., Gret-Regamey, A., Jimenez-Aceituno, A., Martín-López, B., Pascual, U., Zafra-Calvo, N., Bruley, E., Fischborn, M., Metz, R., & Lavorel, S. (2021). Assessing nature-based solutions for transformative change. *One Earth, 4(5)*, 730-741.

RESEARCH THEME: LEVERAGE POINTS AND TRANSFORMATION



A leverage points perspective on transformative change in complex systems.

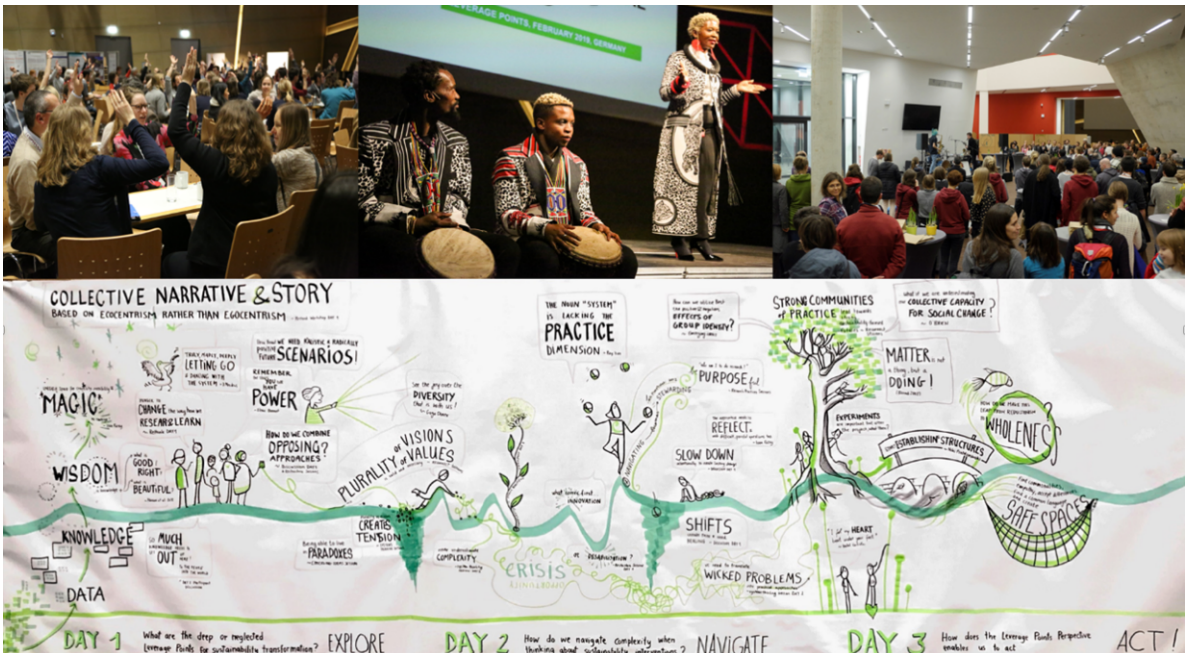
The analysis of 'leverage points' is a systems thinking approach to understanding how and where to intervene in complex systems in order to effect transformative change. The concept is based on the work by Donella Meadows (1999) and is premised on the notion that social-ecological systems can be characterized by their material features, the feedbacks in the system, the design of the system and its intent(s). More shallow interventions (changing material features or feedbacks) are easier to achieve but less likely to lead to transformative change, whereas interventions at deeper leverage points (the design or intent of the system) are more difficult to carry out but more likely to lead to systemic change (see figure above). Some examples of the use of the concept within SESI are presented here (a full list of publications from 2021 can be found towards the back of this report).

Major outputs on leverage points in 2021 include two special issues on addressing different facets of the concept, whose co-editors included SESI members (Maraja Riechers, Jacqueline Loos and David Abson). The special issue "Leverage points for sustainability transformations" in the journal *Sustainability Science* consisted of 14 papers from a broad range of disciplinary perspectives each engaging in unique ways with a leverage points perspective in relation to transformative change. The special issue *Human-nature connectedness as leverage point for sustainability transformation* in the journal *Ecosystems and People* (13 papers), focused specifically on the connections between humans and their surrounding nature as a leverage point to increase human well-being and ecological sustainability.

David Lam and colleagues applied the leverage points perspective to investigate social networks for transformative change in the important bio-cultural landscapes of Transylvania. In doing so they revealed how different non-government (NGO) actors seek to intervene in different system properties to affect transformative change.

Tolera Jiren and colleagues applied a leverage point perspective to governance systems and institutions related to food security in southwestern Ethiopia, highlighting the importance of both formal and informal institutions in providing important but different system intents and information flows with regard to food security. They highlight the potential challenge of new formal institutions to address food security replacing or crowding out traditional informal institutions.

Maraja Riechers and other SESI members focused more specifically on how relational values and human nature connections as a 'deep' leverage point for transformative change are impacted by landscape simplification in rural social-ecological systems in northern Germany. They found that landscape simplification, especially if rapid, negatively influenced human–nature connectedness and particular relational values such as social relations, social cohesion or cultural identity. Maraja Riechers also led a major review of leverage points for addressing marine pollution.



Both special issues arose out of the Leverage Points 2019 International Conference on Sustainability Research and Transformation at Leuphana University.

EXAMPLES OF RECENT PUBLICATIONS

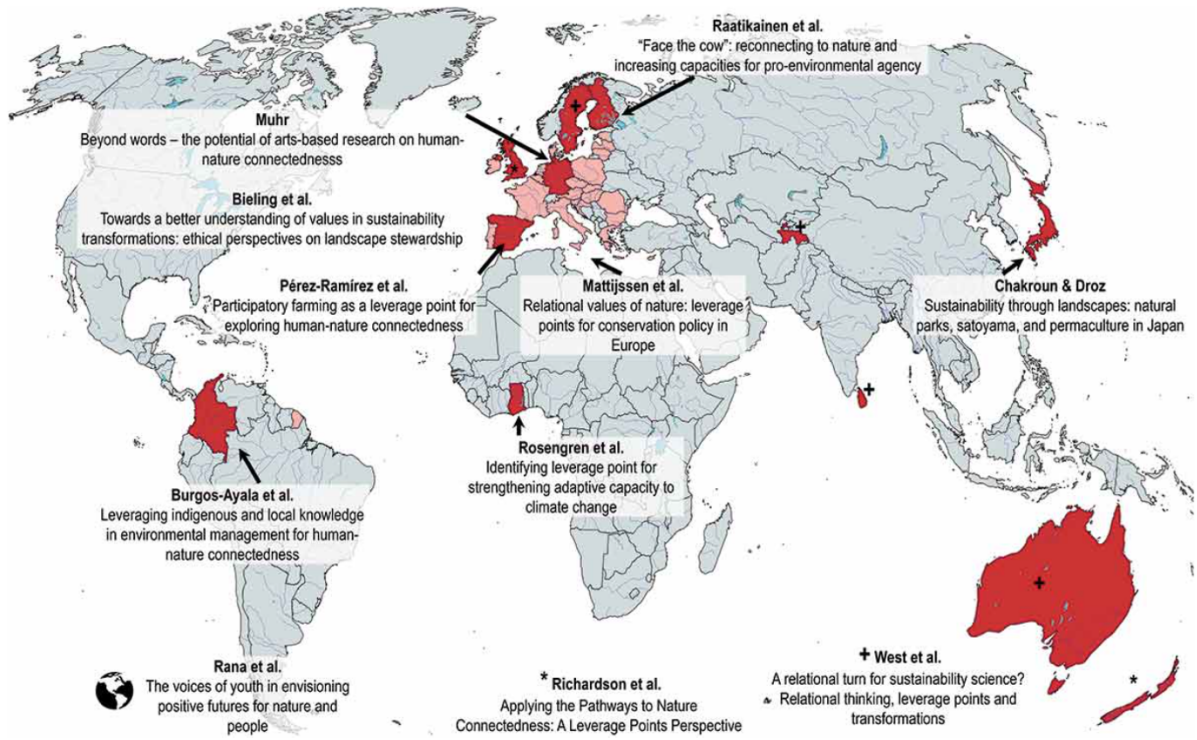
Jiren, T. S., Riechers, M., Bergsten, A., & Fischer, J. (2021). A leverage points perspective on institutions for food security in a smallholder-dominated landscape in southwestern Ethiopia. *Sustainability Science, 16*(3), 767-779.

Leventon, J., Abson, D. J., & Lang, D. J. (2021). Leverage points for sustainability transformations: nine guiding questions for sustainability science and practice. *Sustainability Science, 16*(3), 721-726.

Riechers, M., Balázsi, Á., García-Llorente, M., & Loos, J. (2021). Human-nature connectedness as leverage point. *Ecosystems and People, 17*(1), 215-221.

RESEARCH HIGHLIGHTS

RESEARCH HIGHLIGHT: SPECIAL ISSUE OF ECOSYSTEMS AND PEOPLE: HUMAN-NATURE CONNECTEDNESS AS LEVERAGE POINT FOR SUSTAINABILITY TRANSFOMRATION



Geographical distribution of study areas and exemplary case studies by the articles of the Special Issue.

Despite many international agreements and goals, the current sustainability crisis has not been stopped. By approaching this sustainability problem through a systems perspective, more effective solutions might be found to adapt and transform whole systems. To tackle this issue and discuss the concept of leverage points beyond Leuphana boundaries, the special issue *Human-cature connectedness as leverage point for sustainability transformation* brings together a series of inspiring articles that show new ways of re-connecting humans to nature. The special issue was based on the Leverage Points conference of 2019 at Leuphana University.

In the special issue, innovative ways of understanding human-nature connectedness as leverage points are discussed. For example, Raatikainen et al. (2020) maintain that reconnecting to nature has the potential to reveal deep leverage points that could transform

our current, unsustainable system. Bieling et al. (2020), Chakroun and Droz (2020) and Pérez-Ramírez et al. (2021) assess the potential for fostering values and meanings of nature that can entice sustainable actions within different cultural landscapes. Burgos-Ayala et al. (2020) reveal the importance of considering local contexts and indigenous knowledge, landscape management and agroecology to push systems onto a more sustainable trajectory. Further, Rosengren et al. (2020) argue that the combined consideration of leverage points and adaptive capacity trajectories can also improve adaptations to climate change and create more resilient social-ecological systems.

In order to transform to sustainability, current paradigms that rule collective behaviours and dictate our relationship with the environment have to be shifted to align with sustainability values. In this special issue a range of approaches are discussed, such as arts-based practices used by Muhr (2020), envisioning exercises by Rana et al. (2020), participatory scenario workshops, and direct engagement with nature. All of these can promote pro-environmental behaviours through reconnecting nature with people. Riechers et al. (2021) argue that engaging with nature can allow for holistic worldviews and relational thinking to be fostered, which are important factors in personal as well as societal transformations. This argument is based on West et al. (2020), Richardson et al. (2020) and Mattijssen et al. (2020), who emphasise that human-nature connectedness is a significant and deep leverage point, which improves relational thinking and allows for better nature stewardship and governance.

KEY PUBLICATIONS:

Riechers, M., Balázsi, Á, Garcia-Llorente, M., & Loos, J. (2021) Editorial: Human-nature connectedness as leverage point for sustainability transformation. *Ecosystems and People, 17*(1), 215-221.

Riechers, M. Loos, J., Balázsi, Á., García-Llorente, M., Bieling, C., Burgos-Ayala, A., Chakroun, L., Mattijssen, T.J.M., Muhr, M.M., Pérez-Ramírez, I., Raatikainen, K.J., Rana, S., Richardson, M., Rosengren, L., & West, S. (2021). Key advantages of the leverage points perspective to shape human-nature relations. *Ecosystem and People, 17*, 205-214.

The other publications that are part of the special issue can be found here: https://www.tandfonline.com/doi/full/10.1080/26395916.2021.1912830

RESEARCH HIGHLIGHT: NEW RESEARCH PROJECT "THE ROLE OF NATURE FOR HUMAN WELL-BEING IN THE KILIMANJARO SOCIAL-ECOLOGICAL SYSTEM"

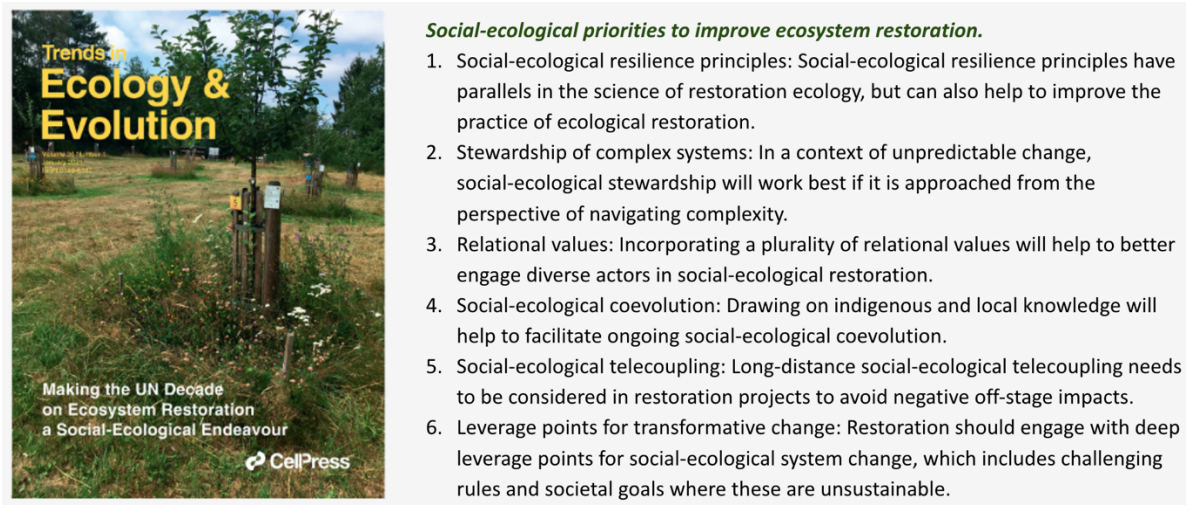
The Kili-SES SP3 team at Leuphana University (Photo by Gudrun Harms): John Julius (PhD student), Prof. Dr. Berta Martín-López (project lead), Dr. Jasmine Pearson (Postdoc) and Milena Gross (PhD student). Members of the Kili-SES SP3 team who are not based at Leuphana University are Dr. Jennifer Kasanda Sesabo (Mzumbe University), Prof. Dr. Katrin Böhning-Gaese and Dr. Ugo Arbieu (Senckenberg Biodiversity and Climate Research Centre) and Prof. Dr. Katrin Rehdanz (Kiel University).

'Demand and Values of Nature's Contributions to People (NCP)' is the third subproject of the DFG Research Unit "The role of nature for human wellbeing in the Kilimanjaro Social-Ecological System" – Kili-SES. With this project, we aim to unravel the demand for and elicit the diverse values of regulating, material and non-material NCP expressed by different stakeholder groups at Kilimanjaro and to assess to what extent the demand and values for NCP are shaped by the preservation of Indigenous and Local Knowledge (ILK) held by the Chagga people.

The project started in 2021, when we were able to conduct online interviews with tourists who hiked up Kilimanjaro in the past and with tourist operators. In 2022, we plan for two fieldwork seasons. First, between January and March, we will conduct semi-structured interviews and exercises with local stakeholders, semi-structured interviews with conservation organizations and local tourist operators, as well as a series of focus group discussions. Second, between June and September, we will conduct face-to-face surveys and additional focus group discussions on ILK and gender differences. In September, we also plan to hike up Uhuru, the highest peak at Kilimanjaro Mountain (5891.8 m.a.s.l.).

For further information, visit https://kili-ses.senckenberg.de/en.

RESEARCH HIGHLIGHT: RESTORATION AS A SOCIAL-ECOLOGICAL ENDEAVOUR



Priorities for restoration to make the UN Decade on Ecosystem Restoration a decade of social-ecological restoration.

The United Nations declared 2021-2030 the Decade on Ecosystem Restoration. Right on time for the beginning of the decade, the January issue of *Trends in Ecology & Evolution* featured a paper by several SESI members: "Making the UN Decade on Ecosystem Restoration a Social-Ecological Endeavour."

The paper argues that restoration can no longer be seen as a purely ecological challenge. Rather, both restoration theory and practice can benefit from key lessons learned through social-ecological systems thinking. Key lessons relate to resilience and adaptability, ecosystem stewardship, relational values, the coevolution of human and ecological systems, long-range social-ecological connections, and leverage points for transformation (see above). For each of these themes, social-ecological systems research has generated rich insights that can also benefit ecosystem restoration. Viewed in this way, the UN Decade really ought to be a Decade of Social-Ecological Restoration.

The paper concludes by recommending two cross-cutting new research foci, namely: (1) post hoc cross-sectional assessments of social-ecological restoration projects; and (2) transdisciplinary social-ecological 'living labs' that accompany new restoration projects as they unfold. Both of these priorities are now beginning to be implemented by the authors of the paper (and other colleagues) in a new transdisciplinary research project funded by the German Ministry for Education and Research (BMBF) entitled *Grassworks*.

REFERENCE: Fischer, J., Riechers, M., Loos, J., Martín-López, B., & Temperton, V. M. (2021). Making the UN decade on ecosystem restoration a social-ecological endeavour. *Trends in Ecology & Evolution*, *36*(1), 20-28.

RESEARCH HIGHLIGHT: ACTION-ORIENTED KNOWLEDGE FOR SUSTAINABILITY

The different tools portrayed in the photo represent the different skills and knowledge held by a Waoroní family to act on their everyday life. The photography represents how to mobilize plural knowledge types for sustainability since it shows how the different tools are essential for the daily life of Waoroní people and how the knowledge underpinning the use of these tools is slowly cooked and handed-down through generations and among family members in a collaborative way.

Social-ecological systems research is in need of mobilizing plural knowledge types in support of interventions that contribute to just and sustainable realities. The work led by Guido Caniglia, the Scientific Director of the Konrad Lorenz Institute in Austria, was initially motivated by two frustrations. First, despite good intentions, most knowledge from academia does not actually inform actions for just and sustainable transformations. Second, sustainability science and social-ecological systems research still lacks systematic approaches to understand the different types of knowledge that are essential for sustainability. To address these two frustrations, we outline a pluralistic and integrated approach to classifying and connecting the diverse kinds of action-oriented knowledge identified in previous sustainability research.

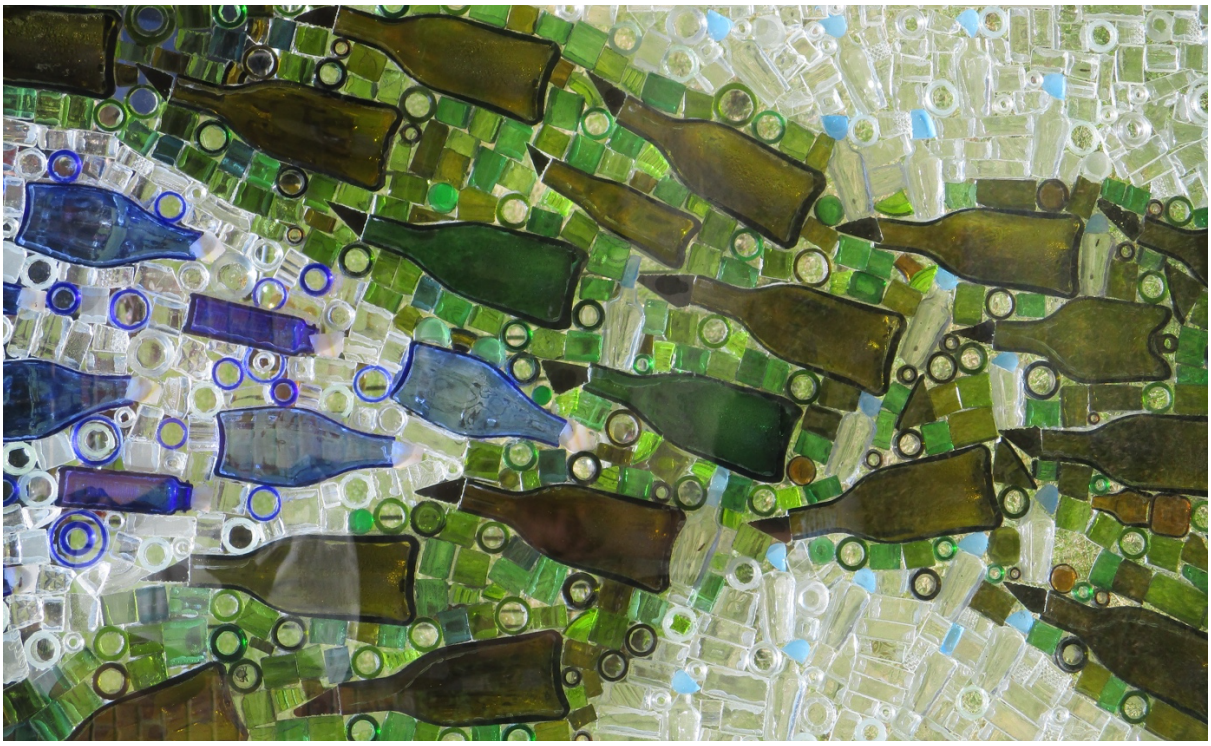
In doing so, we take two conceptual turns. First, we decide that if we want to understand action-oriented knowledge for sustainability, we should not start by talking about knowledge, but we should first clarify what we mean by actions. Here, we suggest that actions for sustainability entail three emergent processes that (1) are designed with the intention to create change; (2) require shared agency of multiple actors; and (3) are realised in complex and evolving social-ecological contexts. Second, we suggest that if action-oriented knowledge has to support people's capacity to create sustainable and just futures, then this knowledge cannot be one thing, but has to emerge from the integration of plural knowledge systems and ways of knowing.

Based on that, what *is* action-oriented knowledge for sustainability? Action-oriented knowledge for sustainability is the "knowledge how" that emerges when working in integrated ways with a plurality of kinds of knowledge to support (1) actions for sustainability and justice and (2) individual and collective capacities for change.

To develop this paper Guido Caniglia embarked in a collaborative endeavour with a diverse group of authors from Leuphana University, including Daniel Lang from the Institute for Ethics and Transdisciplinary Sustainability Research, Henrik von Wehrden from the Institute of Ecology and Berta Martín-López from the Social-Ecological Systems Institute. In this sense, this paper is an example of the strong collaborative links among diverse institutes within the Faculty of Sustainability at Leuphana University.

The description here presented is not only based on Caniglia et al. (2021), but also on the excellent synthesis provided by Guido Caniglia on Twitter:

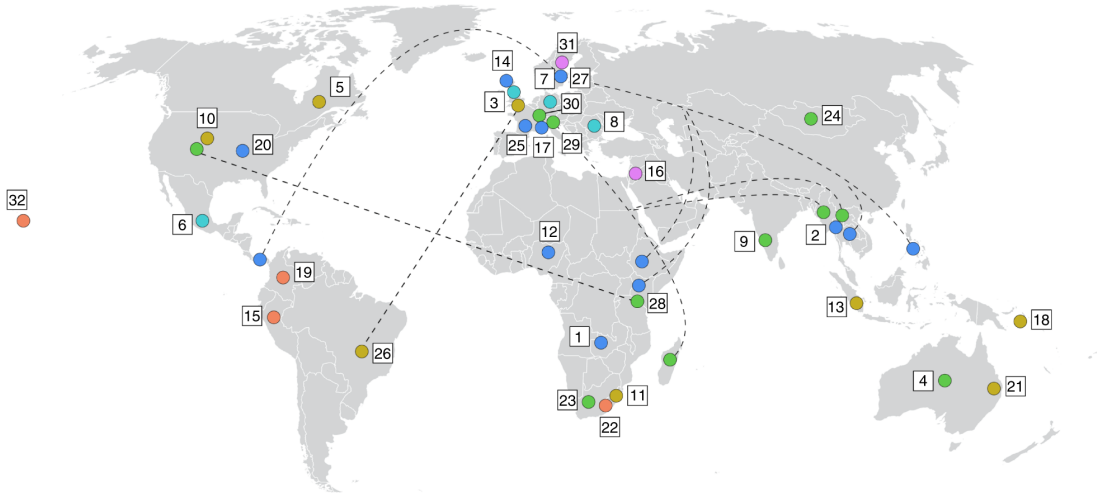
https://twitter.com/GuidoCaniglia/status/1313407497240276994



An art piece made by recycled glass presented at the Kulturelle Landpartie in Wendland, Germany. It represents transformative action-oriented knowledge since it transforms useless material into something useful and aesthetically appealing. The different pieces represent the different types of knowledge required.

REFERENCE: Caniglia, C., Luederitz, C., von Wirth, T., Fazey, I., Martín-López, B., Hondrila, K., König, A., von Wehrden, H., Schäpke, N. A., Laublicher, M. D., & Lang, D. J. (2021). A pluralistic and integrated approach to action-oriented knowledge for sustainability. *Nature Sustainability, 4*, 93-100.

RESEARCH HIGHLIGHT: SIX MODES OF CO-PRODUCTION FOR SUSTAINABILITY



Chambers et al. (2021) mapped out commonalities and differences across 32 sustainability initiatives on six continents, including two initiatives of the SESI team in Germany and Romania.

Co-production aims to connect researchers and societal actors to collaboratively and iteratively produce knowledge, action and societal change. Solutions to sustainability problems developed in such a collaborative way are particularly legitimate as they draw on expertise with, by and for those best placed to apply them. However, there is little guidance on how co-production should take place and which types of co-production may be suitable to address certain sustainability problems so far.

Chambers et al. (2021) conducted a critical analysis of co-production practices in 32 sustainability initiatives around the world with a focus on their approaches to power and politics, and their supposed sustainability pathways. They discovered that while co-production processes aimed to produce collaborations between different societal and scientific actors, they varied in their effectiveness at addressing diverse sustainability problems, and their reason using co-production as a strategy. Overall, Chambers et al. (2021) identified six modes of co-production. These modes have the potential to solve different sustainability problems, yet all pose their own challenges and benefits:

Mode 1: Researching solutions. In this mode, decision-makers or scientists use investigative methods and more practical approaches to co-produce knowledge, with the aim to influence policy and create effective institutional change.

Mode 2: Empowering voices. Co-produced knowledge is used by communities, governmental actors, and interdisciplinary scientists to address sustainability problems and empower marginalised voices.

Mode 3: Brokering power. This rarely used and unique approach engages powerful actors in creating innovative institutions that are built to last, by funnelling scientific knowledge and dialogue into direct policy actions.

Mode 4: Reframing power. Reframing power lies within the simultaneous engagement of marginalised communities and powerful actors in science-led discussions to shift power and narratives to marginalised communities.

Mode 5: Navigating differences. This mode has a much stronger focus on empowerment and collective learning within the co-production process, to create relationships and minimise existing hierarchies and power gradients.

Mode 6: Reframing agency. This approach mainly focuses on creating safe spaces to determine issues within systemic governance and reframe issues through diverse knowledge and immersion in local contexts.

REFERENCE: Chambers, J. M., Wyborn, C., Ryan, M. E., Reid, R. S., Riechers, M., Serban, A., ..., & Pickering, T. (2021). Six modes of co-production for sustainability. *Nature Sustainability*, *4*, 983-996.

SOCIAL-ECOLOGICAL SYSTEMS: A GLOBAL CONVERSATION

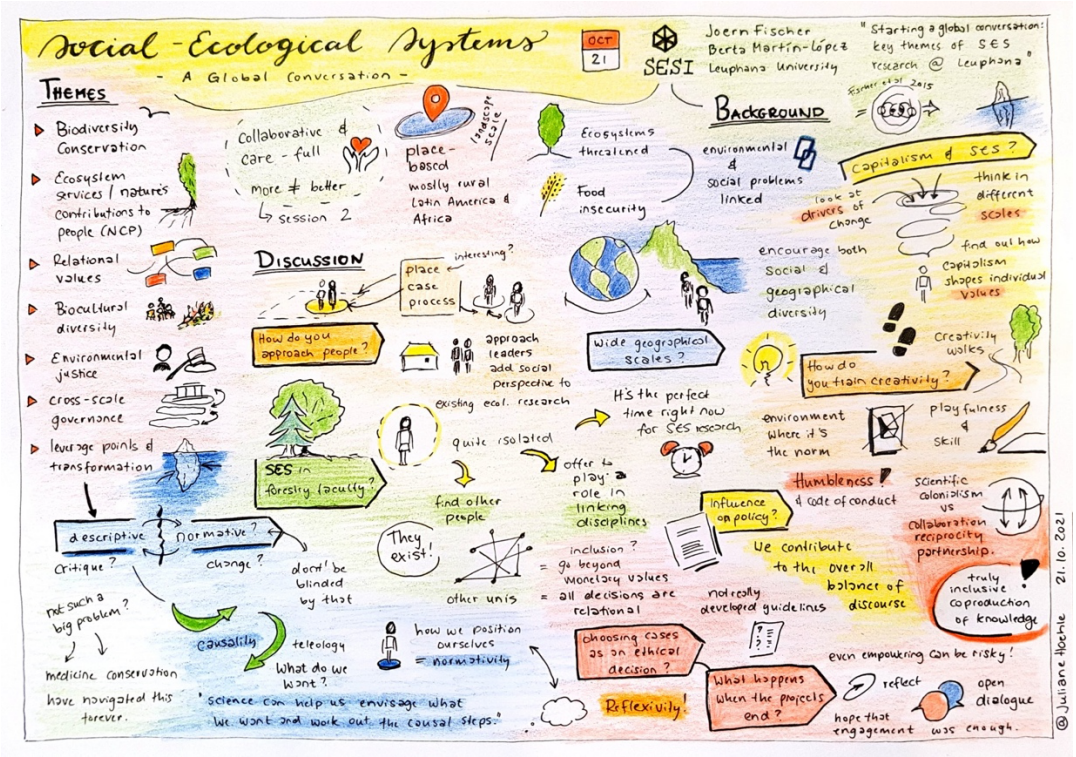
The program of SESI's online seminar series "Social-Ecological Systems: A Global Conversation".

The research conducted at SESI covers a broad range of topics and study areas. To share our work with a larger audience and engage in a global conversation about social-ecological systems research we initiated an online seminar series. PhD students, postdocs, and professors of SESI presented or will present their work in four interactive sessions between October 2021 and February 2022 as part of the "Social-Ecological Systems: A Global Conversation" series.

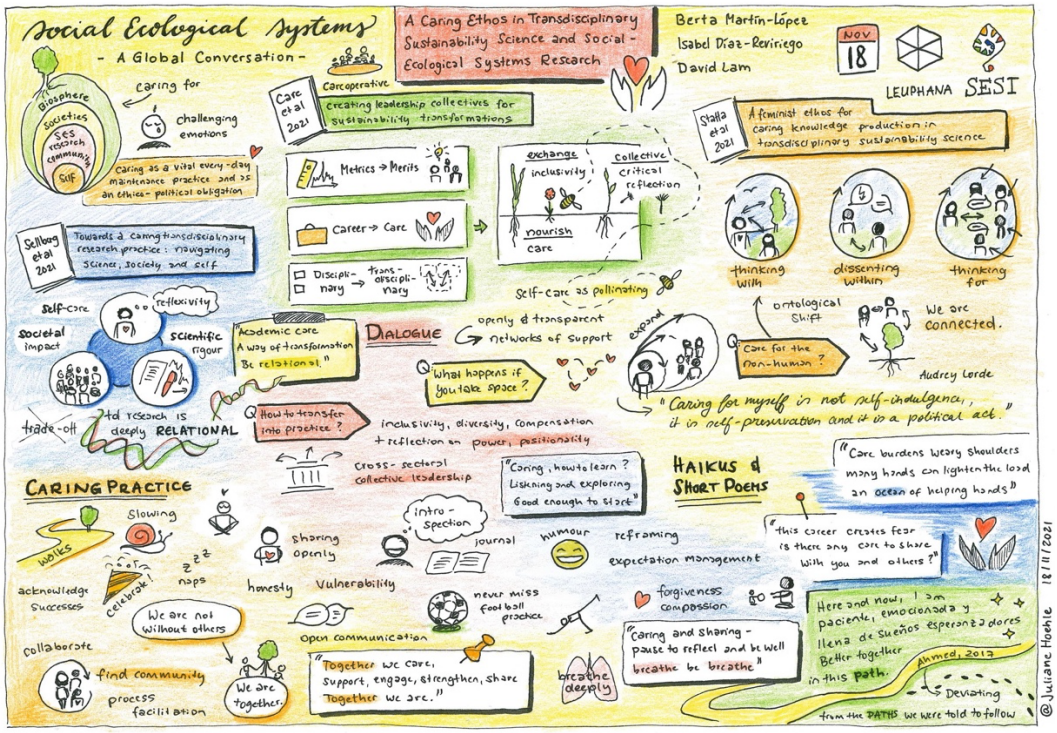
In 2021, a session on key themes of social-ecological research featuring Berta Martín-López and Joern Fischer, and a panel on how to best collaborate in sustainability research with Berta Martín-López, Isabel Díaz Reviriego and David Lam took place. Both events attracted researchers, practitioners and students from around the world and resulted in lively discussions.

Two more sessions will follow in 2022. In January, Jacqueline Loos will discuss environmental justice in the context of area-based conservation with a panel of five researchers with experiences in protected areas across Africa, Asia and Europe. In February, SESI's biocultural diversity working group including Jan Hanspach, Camila Benavides Frias, Stefan Ortiz Przychodzka and Isabel Díaz Reviriego will share their work.

The presentations of all four sessions were or will be recorded and shared with the public on YouTube. In addition, Juliane Höhle creates graphical recordings of each session that summarize key points and illustrate both the presentation and the subsequent discussion with the audience.



Graphical recording of the first session of the online seminar series on the work of SESI in October 2021 by Juliane Höhle.



Graphical recording of the second session of the online seminar series on care and collaboration in November 2021 by Juliane Höhle.

PUBLICATIONS

SESI publishes across a broad range of journals in ecology and the social sciences. The following list shows publications led or co-authored by SESI members in 2021.

1. Acosta-Naranjo, R., Rodríguez-Franco, R., Guzmán-Troncoso, A. J., Pardo-de-Sanayana, M., Aceituno-Mata, L., Gomez-Melara, J., Domínguez-Gregorio, P., Díaz-Reviriego, I., González-Nateras, J., & Reyes-Garcia, V. (2021). Gender dynamics in wild edible plants. Insights from three Spanish areas. *Sustainability, 13*(5), 2639.
2. Burghardt, S., Topp, E., Esler, K., & Loos, J. (2021). Limited knowledge flow among stakeholders of critically endangered renosterveld in South Africa. *Ecology and Society*, *26*(3), 1-17.
3. Cadavid, M.J., Ortiz, S., Espinosa, N. & Lastra, C. (2021). Multiterritorialidades campesinas: propuestas desde las zonas de reversa campesina para una construcción plural del estado en Colombia. In: Quiroga, C., Uscátegui, O. Conflictos socioambentales en el Sur Global. Respuestas y construcciones locales de otras naturalezas.
4. Caniglia, G., Luederitz, C., von Wirth, T., Fazey, I., Martin-López, B., Hondrila, K., König, A., von Whreden, H., Schäpke, N. A., Laubichler, M. D., & Lang, D. J. (2021). A pluralistic and integrated approach to action-oriented knowledge for sustainability. *Nature Sustainability*, *4*(2), 93-100.
5. Care, O., Bernstein, M., Chapman, M., Díaz Reviriego, I., Dressler ,G., Felipe-Lucia, MR., Friis, C., Graham S., Haenke, H., Haider LJ., Hernández-Morcillo, M., Hoffmann, H., Kernecker, M., Nicol, P., Piñeiro, C., Pitt H., Schill, C., Seufert, V., Shu, K., Valencia, V., & Zaehringer, J.G. (2021). Creating leadership collectives for sustainability transformations. *Sustainability Science, 16*, 703–708.
6. Ceaușu, S., Apaza-Quevedo, A., Schmid, M., Martín-López, B., Cortés-Avizanda, A., Maes, J., Brotons, L., Queiroz, C., & Pereira, H. M. (2021). Ecosystem service mapping needs to capture more effectively the biodiversity important for service supply. *Ecosystem Services*, *48*, 101259.
7. Celliers, L., Costa, M. M., Williams, D. S., & Rosendo, S. (2021). The 'last mile' for climate data supporting local adaptation. *Global Sustainability*, *4*, 1-8.
8. Celliers, L., Scott, D., Ngcoya, M., & Taljaard, S. (2021). Negotiation of knowledge for coastal management? Reflections from a transdisciplinary experiment in South Africa. *Humanities and Social Sciences Communications*, *8*(1), 1-11.

9. Chambers. J.M., Wyborn, C., Ryan, M., Reid, R.S., Riechers, M., Serban, A., Bennett, N., Cvitanovic, C., Fernandez-Gimenez, M.E., Galvin, K., Goldstein, B., Klenk, N., Tengö, M., Brennan, R., Cockburn, J., Hill, R., Munera, C., Nel, J., Österblom, H., … & Pickering, T. (2021). Six modes of co-production for sustainability. *Nature Sustainability, 4*, 983-996.
10. Consuegra, C., Ortiz, S., Cely-Santos, M., van der Hammen, M.C., & Pérez, D. (2021). Plantas que toda la vida han estado: una co-investigación alrededor de la cocina y las relaciones bioculturales asociadas a plantas alimenticias locales en la ruralidad de Bogotá. Revista Antropología y Sociología, 23(2).
11. Cortés-Avizanda, A., Pereira, H. M., McKee, E., Ceballos, O., & Martín-López, B. (2021). Social actors' perceptions of wildlife: Insights for the conservation of species in Mediterranean protected areas. *Ambio*, 1-11.
12. Delory, B. M., Schempp, H., Spachmann, S. M., Störzer, L., van Dam, N. M., Temperton, V. M., & Weinhold, A. (2021). Soil chemical legacies trigger species-specific and context-dependent root responses in later arriving plants. *Plant, Cell & Environment*, *44*(4), 1215-1230.
13. Döring, M., Walsh, C. & Egberts, L. (Eds.) (2021) Beyond nature and culture: relational perspectives on the Wadden Sea landscape. *Maritime Studies*.
14. Dorninger, C., Hornborg, A., Abson, D. J., von Whreden, H., Schaffartzik, A., Giljum, S., … Wieland, H. (2021). Global patterns of ecologically unequal exchange: Implications for sustainability in the 21st century. *Ecological Economics, 179*, 106824.
15. Dorninger, C., von Wehrden, H., Krausmann, F., Bruckner, M., Feng, K., Hubacek, Erb, H.-K., & Abson, D. J. (2021). The effect of industrialization and globalization on domestic land-use: A global resource footprint perspective. *Global Environmental Change, 69*, 102311.
16. Egerer, S., Cotera, R. V., Celliers, L., & Costa, M. M. (2021). A leverage points analysis of a qualitative system dynamics model for climate change adaptation in agriculture. *Agricultural Systems*, *189*, 103052.
17. Engler, J. O., Abson, D. J., & von Wehrden, H. (2021). The coronavirus pandemic as an analogy for future sustainability challenges. *Sustainability Science, 16*(1), 317-319.
18. Fanini, L., Costa L., Rosental Zalmon, I., Riechers, M. (2021) Social and ecological elements for a perspective approach to citizen science on the beach. *Frontiers in Ecology and Evolution, 9*, 694487*.*
19. Ficiciyan, A. M., Loos, J., & Tscharntke, T. (2021). Similar yield benefits of hybrid, conventional, and organic tomato and sweet pepper varieties under well-watered and drought-stressed conditions. *Frontiers in Sustainable Food Systems*, *5*, 41.
20. Fischer, J. (2021). A change of values is in the air. *Nature Sustainability, 4,* 292–293.

21. Fischer, J., Bergsten, A., Dorresteijn, I., Hanspach, J., Hylander, K., Jiren, T. S., Manlosa, A. O., Rodrigues, P., Schultner, J., Senbeta, F., & Shumi, G. (2021). A social-ecological assessment of food security and biodiversity conservation in Ethiopia. *Ecosystems and People*, *17*(1), 400-410.
22. Fischer, J. & Riechers, M. (2021). From conservation grief to hope. *Conservation Biology*, 1-3.
23. Fischer, J., Riechers, M., Loos, J., Martín-López, B., Temperton, V. (2021) Making the UN Decade on Ecosystem Restoration a Social-Ecological Endeavour. *Trends in Ecology & Evolution*, *36* (1), 20-28.
24. Galaz, V., Centeno, M. A., Callahan, P. W., Causevic, A., Patterson, T., Brass, I., Baum, S., Farber, D., Fischer, J., Garcia, D., McPhearson, T., Jimenez, D., King, B., Larcey, P., & Levy, K. (2021). Artificial intelligence, systemic risks, and sustainability. *Technology in Society*, *67*, 101741.
25. Ghoddousi, A., Loos, J., & Kuemmerle, T. (2021). An Outcome-Oriented, Social–Ecological Framework for Assessing Protected Area Effectiveness. *BioScience*, 1-12.
26. Hermans, K., Berger, E., Biber-Freudenberger, L., Bossenbroek, L., Ebeler, L., Groth, J., Hack, J., Hanspach, J., Hintz, K.S., Kimengsi, J.N., Kwong, Y.M.C., Oakes, R., Pagogna, R., Plieninger, T., Sterly, H., van der Geest, K., van Vliet, J., & Wiederkehr, C. (2021). Crisis-induced disruptions in place-based social-ecological research - an opportunity for redirection. *GAIA - Ecological Perspectives for Science and Society, 30*, 72–76.
27. Jiren, T.S., Leventon, J., Jager, N.W., Dorresteijn, I., Schultner, J., Senbeta, F., Bergsten, A., & Fischer, J. (2021). Governance Challenges at the Interface of Food Security and Biodiversity Conservation: A Multi-Level Case Study from Ethiopia. *Environmental Management, 67*, 717–730.
28. Jiren, T.S., Riechers, M., Bergsten, A. & Fischer, J. (2021). Leverage points for ensuring food security in a smallholder dominated landscape in southwestern Ethiopia. *Sustainability Science,* 16, 767-779.
29. Jiren, T.S., Riechers, M., Kansky, R., Fischer, J. Participatory scenario planning to facilitate human-wildlife coexistence (2021). *Conservation Biology*, *35*(6), 1957-1965.
30. Kamau, C. W., van Duijnen, R., Schmid, C. A. O., Balàzs, H. E., Roy, J., Rillig, M., Schröder, P., Radl, V., Temperton, V. M., & Schloter, M. (2021). Impact of high carbon amendments and pre-crops on soil bacterial communities. *Biology and Fertility of Soils, 57*(2), 305-317.
31. Kangler, G., Walsh, C. & Schaffert, M. (2021) Landschaftsbilder und Landschaftsverständnisse in Politik und Praxis – eine Einleitung. In C. Walsh, G.

Kangler & M. Schaffert (Eds.) *Landschaftsbilder und Landschaftsverständnisse in Politik und Praxis*, (pp. 1-12). Springer, Wiesbaden.
32. Kansky, R., Kidd, M., & Fischer, J. (2021). Does money "buy" tolerance toward damage-causing wildlife? *Conservation Science and Practice*, *3*(3), e262.
33. Kansky, R., Kidd, M., & Fischer, J. (2021). Understanding drivers of human tolerance towards mammals in a mixed-use transfrontier conservation area in southern Africa. *Biological Conservation*, *254*, 108947.
34. Klaniecki, K., Duse, I. A., Engler, J.O., Leventon, J., & Abson, D.J. (2021). Energy conservation attitudes and intentions: investigating place attachement in Eastern Transylvania, Romania (Actitudes e intenciones respecto al ahorro de energía: investigando el apego al lugar en Transilvania Oriental, Rumanía). *Psyecology, 12*(2), 177-201.
35. Koricho, H. H., Shumi, G., Gebreyesus, T., Song, S., & Fufa, F. (2021). Woody plant species diversity and composition in and around Debre Libanos church forests of North Shoa Zone of Oromiya, Ethiopia. *Journal of Forestry Research*, *32*(5), 1929-1939.
36. Kumar, A., Blagodaskaya, E., Dippold, M. A., & Temperton, V. M. (2021). Positive intercropping effects on biomass production are species-specific and involve rhizosphere enzyme activities: Evidence from a field study. *Soil Ecology Letters*, 1-10.
37. Kumar, A., Rosinger, C., Chen, H., Protic, S., Bonkowski, M., & Temperton, V. M. (2021). Gone and forgotten: facilitative effects of intercropping combinations did not carry over to affect barley performance in a follow-up crop rotation. *Plant and Soil*, *467*(1), 405-419.
38. Lam, D. P., Martin-Lopez, B., Horcea-Milcu, A. I., & Lang, D. J. (2021). A leverage points perspective on social networks to understand sustainability transformations: evidence from Southern Transylvania. *Sustainability Science*, *16*(3), 809-826.
39. Law, E. A., Macchi, L., Baumann, M., Decarre, J., Gavier-Pizarro, G., Levers, C., Mastrangelo, M. E., Murray, F., Müller, D., Piquer-Rodríguez, M., Torres, R., Wilson, K. A., & Kuemmerle, T. (2021). Fading opportunities for mitigating agriculture-environment trade-offs in a south American deforestation hotspot. *Biological Conservation*, *262*, 109310.
40. Lazzari, N., Becerro, M. A., Sanabria-Fernandez, J. A., & Martín-López, B. (2021). Assessing social-ecological vulnerability of coastal systems to fishing and tourism. *Science of the Total Environment*, *784*, 147078.
41. Leventon, J., Abson, D.J., & Lang, D. J. (2021). Leverage points for sustainability transformations: nine guiding questions fir sustainability science and practice. *Sustainability Science, 16*(3), 721-726.
42. Llanque, A., Jacobi, J., Tribaldos, T., Mukhovi, S., Silvestre, C., Tecchio, A., & Rist, S. (2021). Transformations towards food sustainability using the participatory Food

Sustainability Assessment Framework (FoodSAF). *Social Innovations Journal*, *5*(64), 695.
43. Loch, T. K. & Riechers, M. (2021). Integrating indigenous and local knowledge in management and research on coastal ecosystems in the Global South: a literature review. *Ocean and Coastal Management, 212,* 105821.
44. Loos, J. (2021). Reconciling conservation and development in protected areas of the Global South. *Basic and Applied Ecology*, *54*, 108-118.
45. Loos, J., Gallersdörfer, J., Hartel, T., Dolek, M., & Sutcliffe, L. (2021). Limited effectiveness of EU policies to conserve an endangered species in high nature value farmland in Romania. *Ecology and Society*, *26*(3).
46. Loos, J., Krauss, J., Lyons, A., Föst, S., Ohlendorf, C., Racky, S., Röder, M., Hudel, L., Herfert, V., & Tscharntke, T. (2021). Local and landscape responses of biodiversity in calcareous grasslands. *Biodiversity and Conservation*, *30*, 2415-2432.
47. Lübker, H. M., Abson, D.J., & Riechers, M. (2021). Discourses for deep transformation: perecptions of economic growth in two rural communities in Lower Saxony, Germany. *Sustainability Science, 16*, 1827-1840.
48. Meijaard, E., Santika, T., Wilson, K. A., Budiharta, S., Kusowro, A., Law, E. A., Friedman, R., Hutabarat, J. A., Indrawan, T. P., & Sherman, J. (2021). Toward improved impact evaluation of community forest management in Indonesia. *Conservation Science and Practice*, *3*(1), 189.
49. Nippen, P., Dolek, M., & Loos, J. (2021). Preserving Colias myrmidone in European cultural landscapes: requirements for the successful development from egg to higher larval stages at a Natura 2000 site in Romania. *Journal of Insect Conservation*, *25*, 643-655.
50. Nüchter, V., Abson, D.J., von Wehrden, H., & Engler, J.O. (2021). The concept of resilience in recent sustainability research. *Sustainability, 13*(5), 1-21.
51. Ortiz, S., Consuegra, C., van der Hammen, M. C., & Pérez, D. (2021). Perspectivas urbano-rurales sobre la circulación de dos frutos silvestres del bosque altoandino en sistemas agroalimentarios de Bogotá, Colombia. *Revista Etnobilogía*, 19(1).
52. Ortiz, S., Rodríguez, M., Dueñas, J.D., Hernández, F., & Hernández, C. (2021). Los activos intangibles de la agricultura familiar en los sistemas agroalimentarios. Marco conceptual y consideraciones metodológicas. FAO.
53. Palomo, I., Locatelli, B., Otero, I., Colloff, M., Crouzat, E., Cuni-Sanchez, A., Gómez-Baggethun, González-García, A., Gret-Regamey, A., Jiménez-Aceituno, Martín-López, B., Pascual, U., Zafra-Calvo, N., Bruley, E., Fischborn, M., Metz, R., & Lavorel, S. (2021). Assessing nature-based solutions for transformative change. *One Earth*, *4*(5), 730-741.

54. Pascual-Rico, R., Morales-Reyes, Z., Aguilera-Alcalá, N., Olszańska, A., Sebastián-González, E., Naidoo, R., Moleón, M., Lozano, J., Botella, F., von Wherden, H., Martín-López, B., & Sánchez-Zapata, J. A. (2021). Usually hated, sometimes loved: A review of wild ungulates' contributions to people. *Science of the Total Environment*, *801*, 149652.
55. Reyes-García, V., Gallois, S., Pyhälä, A., Díaz-Reviriego, I., Fernández-Llamazares, Á., Galbraith, E., Miñarro, S., & Napitupulu, L. (2021). Happy just because. A cross-cultural study on subjective wellbeing in three Indigenous societies. *Plos one*, *16*(5), e0251551.
56. Riechers, M., Balázsi, Á, Engler, J-O., Shumi, G., & Fischer, J. (2021). Understanding relational values in cultural landscapes in Romania and Germany. *People & Nature, 3*(5), 1036-1046.
57. Riechers, M., Balázsi, Á, Garcia-Llorente, M. & Loos, J. (2021). Editorial: Human-nature connectedness as leverage point for sustainability transformation. *Ecosystems and People, 17*, 215-221.
58. Riechers, M., Brunner, B.P., Dajka, J-C., Duşe-Pargu, I. A., Lübker, H.M., Manlosa, A.O., Sala, J. E., Schaal, T. & Weidlich, S. (2021). Leverage points for tackling marine and coastal pollution: a review. *Marine Pollution Bulletin*, 167, 12263.
59. Riechers, M., Duşe, I.A. & Balázsi, Á. (2021). Leverage points to foster human-nature connectedness in cultural landscapes. *Ambio*, 50, 1670-1680.
60. Riechers, M., Fanini, L., Apicella, A., Galván, C.B., Blondel, E., Espiña, B., Kefer, S., Keroullé, T., Klun, K., Pereira, T.R., Ronchi, F., Rodríguez, P.R., Sardon, H., Silva, A.V., Stulgis, M. & Ibarra-González, N. (2021). Microplastics in our ocean as a transdisciplinary challenge: Lessons from a co-learning workshop. *Marine Pollution Bulletin*, *164*, 112051.
61. Riechers, M., Loos, J., Balázsi, Á., García-Llorente, M., Bieling, C., Burgos-Ayala, A., Chakroun, L., Mattijssen, T.J.M., Muhr, M.M., Pérez-Ramírez, I., Raatikainen, K.J., Rana, S., Richardson, M., Rosengren, L. & West, S. (2021). Key advantages of the leverage points perspective to shape human-nature. *Ecosystems and People, 17*, 205-214.
62. Riechers, M., Martín-López, B. & Fischer, J. (2021). Human-nature connectedness and other relational values are negatively affected by land use change: insights from Lower Saxony, Germany. *Sustainability Science*, 1-13.
63. Rodrigues, P., Dorresteijn, I., Guilherme, J.L., Hanspach, J., De Beenhouwer, M., Hylander, K., Bekele, B., Senbeta, F., Fischer, J., & Nimmo, D. (2021). Predicting the impacts of human population growth on forest mammals in the highlands of southwestern Ethiopia. *Biological Conservation, 256*, 109046.

64. Rölfer, L., Liconti, A., Prinz, N., & Klöcker, C. A. (2021). Integrated Research for Integrated Ocean Management. *Frontiers in Marine Science, 8*, 1094.
65. Roy, J., van Duijnen, R., Leifheit, E. F., Mbedi, S., Temperton, V. M., & Rillig, M. C. (2021). Legacy effects of pre-crop plant functional group on fungal root symbionts of barley. *Ecological Applications, 31*(6), e2378.
66. Rubio-Martin, A., Mañez-Costa, M., Pulido-Velazquez, M., Garcia-Prats, A., Celliers, L., Llario, F., & Macian, J. (2021). Structuring Climate Service Co-Creation Using a Business Model Approach. *Earth's Future*, *9*(10), e2021EF002181.
67. Santika, T., Wilson, K.A., Law, E. A., St John, F. A. V., Carlson, K. M., Gibbs, H., Morgans, C. L., Ancrenaz, M., Meijaard, E. & Struebig, M. J. (2021). Impact of palm oil sustainability certification on village well-being and poverty in Indonesia. *Nature Sustainability, 4*, 109–119.
68. Schmitt, T. M., Martín-López, B., Kaim, A., Früh-Müller, A., & Koellner, T. (2021). Ecosystem services from (pre-)Alpine grasslands: Matches and mismatches between citizens' perceived suitability and farmers' management considerations. *Ecosystem Services*, *49*, 101284.
69. Schoon, M., Chapman, M., Loos, J., Ifejika Speranza, C., Carr Kelman, C., Aburto, J., Alexander, S., Baggio, J., Brady, U., Cockburn, J., Cundill, G., Garcia Lopez, G., Hill, R., Robinson, C., Thondhlana, G., Trimble, M., & Whittaker, D. (2021). On the frontiers of collaboration and conflict: how context influences the success of collaboration. *Ecosystems and People*, *17*(1), 383-399.
70. Schultner, J., Dorresteijn, I., Manlosa, A. O., von Wehrden, H., Hylander, K., Senbeta, F., & Fischer, J. (2021). Ecosystem services from forest and farmland: Present and past access separates beneficiaries in rural Ethiopia. *Ecosystem Services*, *48*, 101263.
71. Sellberg, M. M., Cockburn, J., Holden, P. B., & Lam, D. P. (2021). Towards a caring transdisciplinary research practice: navigating science, society and self. *Ecosystems and People*, *17*(1), 292-305.
72. Shackelford, N., Dudney, J., Stueber, M. M., Temperton, V. M., & Suding, K. L. (2021). Measuring at all scales: sourcing data for more flexible restoration references. *Restoration Ecology*, e13541.
73. Shumi, G., Rodrigues, P., Hanspach, J., Härdtle, W., Hylander, K., Senbeta, F., Fischer, J. & Schultner, J. (2021). Woody plant species diversity as a predictor of ecosystem services in a social–ecological system of southwestern Ethiopia. *Landscape Ecology, 36*, 373–391.
74. Staffa, R. K., Riechers, M., & Martín-López, B. (2021). A feminist ethos for caring knowledge production in transdisciplinary sustainability science. *Sustainability Science*, 1-19.

75. Swart, R., Celliers, L., Collard, M., Prats, A. G., Huang-Lachmann, J. T., Sempere, F. L., de Jong, F., Máñez Costa, M., Martinez, G., Pulido Velasquez, M., Rubio Martín, A., Segretier, W., Stattner, E., & Timmermans, W. (2021). Reframing climate services to support municipal and regional planning. *Climate Services*, *22*, 100227.
76. Talanow, K., Topp, E. N., Loos, J., & Martín-López, B. (2021). Farmers' perceptions of climate change and adaptation strategies in South Africa's Western Cape. *Journal of Rural Studies*, *81*, 203-219.
77. Tölgyesi, C., Buisson, E., Helm, A., Temperton, V. M., & Török, P (2021). Urgent need for updating the slogan of global climate actions from 'tree planting'to 'restore native vegetation'. *Restoration Ecology*, e13594.
78. Topp, E. N., Loos, J., & Martín-López, B. (2021). Decision-making for nature's contributions to people in the Cape Floristic Region: the role of values, rules and knowledge. *Sustainability Science*, 1-22.
79. Topp, E. N., Tscharntke, T., & Loos, J. (2021). Fire and landscape context shape plant and butterfly diversity in a South African shrubland. *Diversity and Distributions*.
80. van Duijnen, R., Uther, H., Härdtle, W., Temperton, V. M., & Kumar, A. (2021). Timing matters: Distinct effects of nitrogen and phosphorus fertilizer application timing on root system architecture responses. *Plant-Environment Interactions*, *2*(4), 194-205.
81. Walsh, C. (2021). Protected area management in a post-natural world: negotiated governance at the Danish Wadden Sea. *Maritime Studies, 20,* 255-266.
82. Walsh, C. (2021). Zwischen ‚Ruhe' und ‚Unberührtheit': Landschaftsbilder am Wattenmeer im internationalen Vergleich. In C. Walsh, G. Kangler, & M. Schaffert (Eds.) *Landschaftsbilder und Landschaftsverständnisse in Politik und Praxis*, (pp. 33-59). Springer, Wiesbaden.
83. Walsh, C. (2021). Transcending Land-Sea Dichotomies through Strategic Spatial Planning. *Regional Studies, 55*(5), 818-830.
84. Walsh, C. Kangler, G. & Schaffert. M. (Eds.) (2021). *Landschaftsbilder und Landschaftsverständnisse in Politik und Praxis*. Springer: Wiesbaden.
85. Weidlich, E. W., Nelson, C. R., Maron, J. L., Callaway, R. M., Delory, B. M., & Temperton, V. M. (2021). Priority effects and ecological restoration. *Restoration Ecology*, *29*(1), e13317.

PEOPLE

Prof. Dr. David Abson (secondary affiliation), Junior Professor in Sustainability Economics. I am an interdisciplinary scientist working at the intersection of the natural sciences and economics. I focus on land use change, ecosystem services, systems thinking and transformative changes in social-ecological systems.

Martin Balaš, Research Associate and PhD Student (based at Eberswalde University for Sustainable Development). My research is focused on indicator development for social and ecological assessment of tourism, with a particular focus on the impacts of tourism in biosphere reserves.

Camila Benavides-Frias, Research Associate and PhD student. I am an agro-ecologist. My research is part of a transdisciplinary project on biocultural diversity, I focus on agroecosystems functioning (integrating social and biological components) and linking it to sustainability topics such as food sovereignty.

Maria Brück, Research Associate and PhD student. I am a sustainability scientist with a background in economics. My PhD work focuses on equity issues related to land use change and ecosystem services in southwestern Ethiopia.

Dr. Isabel Díaz Reviriego, Postdoc Researcher. My research focuses on the role that social relations and social difference play in shaping environmental governance and in the plurality of understandings and practices of human-nature relationships (biocultural diversity) and ways of living with biodiversity.

Annika Drews-Shambroom, Project Coordinator. I am in charge of the administrative and team processes, budget, website and social media in the research project “Biocultural Diversity in Farming Landscapes of the Global South”.

Dr. Girma Shumi Dugo, Postdoc Researcher in social-ecological systems sustainability. I am deeply motivated to enhance the resilience of social-ecological systems and the ecosystem services they produce. My research focuses on land use change, biodiversity (woody vegetation), ecosystem services and human well-being. ecological systems in southwestern Ethiopia.

Dula Wakassa Duguma, Research Associate and PhD Student in Ecology. I am working on land use change, biodiversity and ecosystem services in social-ecological systems in southwestern Ethiopia.

Prof. Dr. Joern Fischer, Professor of Sustainable Landscapes. I have a background in landscape ecology and work at the intersection of social and ecological systems. I am particularly interested in biodiversity conservation, food security, and sustainable development in the Global South.

Marina Frietsch, Research Associate. I am a sustainability scientist with a background in landscape ecology and nature conservation. My work is based on social-ecological systems thinking and focuses on the restoration of degraded ecosystems.

Richard Giliba, PhD Student in Ecology. I am a spatial ecologist. My research is part of a transdisciplinary project on wildlife, values, and justice. I focus on understanding wildlife and land cover responses to different biodiversity governance in southern African protected areas.

Milena Gross, Research Associate and PhD Student. I am a sustainability scientist aiming to unravel how people are connected with and value nature as well as how natures contribute to people's quality of life.

Dr. Jan Hanspach, Junior Research Group Leader. I have a background in ecology and conduct interdisciplinary work on biocultural diversity in the global south as well as on the integration of biodiversity conservation in farming landscapes. In 2021, I received the Leuphana Young Researcher Award.

Gudrun Harms. I am responsible for all secretarial and administrative work, financial processing, budget monitoring and the preparation of employment contract matters at the Social-Ecological Systems Institute.

Roman Isaac, Research Associate and PhD Student. I am interested in the role of governance in human-nature interactions. More specifically I focus on the multi-level governance of natural and anthropogenic capitals in the co-production of ecosystem services.

Dr. Tolera Senbeto Jiren, Postdoctoral researcher. My research interest is on the governance of rural development and social-ecological systems. My current work focuses on teleconnected stakeholders' power analysis, and the application of transdisciplinary scenario backcasting in southwest Ethiopia.

Rhoda Nthena Kachali, Research Associate and PhD Student. I am particularly interested in the interface between people and nature and how a better understanding of these interactions can enhance protected area effectiveness and capabilities among people living in and around them.

John Sanya Julius, Research Associate and PhD Student. I am a social environmentalist interested in sustainability management and socio-ecological systems. I focus on understanding how human-nature interaction with existing Indigenous and Local Knowledge can influence the demand for and value of nature contribution's to people

Dr. David P. M. Lam (secondary affiliation), Scientific Director of the project tdAcademy - Platform for transdisciplinary studies and research. I work on transdisciplinary research methods, processes to increase the impact of sustainability initiatives, and the role of indigenous and local knowledge in change processes.

Dr. Elizabeth Law (external consultant) Statistics and Modelling Advisor. My research focuses on effective, efficient, and equitable biodiversity conservation and environmental management. I evaluate evolving incentives for conservation, and develop tools for effective conservation and environmental management in complex socio-ecological systems.

Dr. Aymara Victoria Llanque-Zonta, Research Associate and lecturer. I am interested in food justice and sustainability, with special emphasis on feminist and decolonial studies connected to sustainable consumption, co-production of knowledge with peasant and indigenous communities, transdisciplinary and transformations in science, politics and practice.

Prof. Dr. Jacqueline Loos, Robert-Bosch Junior Professor for Research into the Sustainable Use of Natural Resources. I research environmental justice in development and biodiversity conservation, applying a social-ecological understanding of protected areas to scrutinize interdependencies between governance arrangements, management effectiveness and social-ecological outcomes.

Prof. Dr. Berta Martín-López, Junior Professor in Sustainability Science. I am a collaborative, inter- and transdisciplinary researcher aiming to understand the role of values, knowledge and institutions in supporting transition pathways towards sustainability.

Stefan Ortiz Przychodzka, Research Associate and PhD student. I am an Ecological Economist with experience in transdisciplinary research with peasant and indigenous communities. I work on topics related to biocultural diversity, agrarian change and social-environmental conflicts.

Dr. Jasmine Pearson, Postdoc researcher. My research interests include nature valuation, Indigenous and local knowledge (ILK) systems, gender equity and sustainable livelihoods. I am currently working on a project which seeks to elicit the demand and values of nature´s contributions to people at Mt Kilimanjaro, Tanzania.

Dr. Maraja Riechers, Postdoc researcher. My research interests include leverage points for sustainability transformation, especially in the domain of human-nature relations, including human-wildlife conflicts, and land-use changes.

Dr. Patrícia Rodrigues, Postdoc Researcher. I am an ecologist and my research intersects biodiversity conservation, ecosystem services and drivers of biodiversity change within social-ecological systems in tropical regions.

Lena Rölfer, PhD Student. I am a research associate at the Climate Service Center Germany (GERICS), Helmholtz-Zentrum Hereon. I have a background in environmental science and marine ecology and am particularly interested in inter- and transdisciplinary approaches for coastal social-ecological systems that advance sustainable and climate resilient coastal governance.

Patricia Santillán Carvantes, Research Associate and PhD Student. My project aims to co-design sustainable management strategies that foster biodiversity conservation, nature's contributions to people, and farmers' good quality of life in the context of a tropical dry forest socio-ecological system.

Tamara Schaal, Research Associate and PhD Student. I am a social scientist interested in understanding perceptions of local people and communities related to biodiversity as well as land use and implications for policy and governance.

Dr. Matthias Schröter-Vinke (visiting fellow). I am an environmental scientist with a broad interdisciplinary background, including landscape ecology, conservation biology, ecological economics and environmental ethics. I am interested in spatial ecosystem service assessments, social-ecological systems, and the science-policy-interface of ecosystem services.

Dr. Jannik Schultner (visiting fellow), Researcher in rural social-ecological systems. I am interested in human-environment interactions, including ecosystem services, human-wildlife conflicts, biodiversity conservation, land use and rural livelihoods, and in mixed methods.

Prof. Dr. Vicky Temperton (secondary affiliation), Professor of Ecosystem Functions and Services. I have a background in experimental plant ecology and test ecological theories and knowledge for its potential to improve ecological restoration in a global change world.

Simon Thomsen, Research Associate. I have a background in Geography and am interested in the spatial analysis of land use change, their direct and underlying causes as well as assessing the environmental impact of these changes.

Dr. Cormac Walsh (secondary affiliation), Lecturer and Researcher. I am a human geographer and spatial planning researcher by training. My research interests include protcted area management, spatial and environmental planning on land and at sea, coastal management and climate adaptation. My research is focused on Northwestern Europe.

Hannah Wahler, Intern. I am involved in two research projects. Firstly, I work on relational values regarding coastal ecosystems represented in social media together with Dr. Maraja Riechers. Secondly, I apply resilience principles and leverage points to woody vegetation diversity in Ethiopia with Dr. Girma Shumi Dugo. I am especially interested in social-ecological forest systems.

COURSES TAUGHT BY SESI

SESI members teach a diversity of subjects at the Bachelor, Master and PhD level. These include:

- Advanced spatial analysis methods
- African protected areas at the crossroads between justice and conservation
- Basics of inter- and transdisciplinary research
- Basics of sustainable development
- Biodiversity of insects and conservation planning
- Conservation biology
- Conservation ecology
- Current status and challenges of coastal systems – a SES perspective
- Dealing with complexity: methodological pluralism for transformative science, towards sustainability
- Earth systems and climate change
- Ecological restoration for sustainability
- Ecosystem functions and services
- Environmental geography: society-environment interactions at the coast
- Environmental justice in conservation and development
- Environmental sciences – an introduction
- Environmental studies: introduction to the subject area
- Field Exercise 1 & 2 - Introduction to Ecology
- Fundamentals of sustainability economics
- Fundamentals of sustainable development - sustainable consumption
- Global sustainability science research project
- Grundlagen Nachhaltiger Entwicklung
- Indigenous and local knowledge in transformative transdisciplinary research
- Indigenous peoples and local perspectives towards sustainability
- Introduction to ecology
- Introduction to spatial sciences
- Introduction to spatial analysis
- Leverage points to combat marine pollution
- Methods of environmental sciences
- Our present and future nature: an analysis of the book "Rambunctious Garden" by Emma Marris

— Planungswerkstatt Metropolregion Hamburg: Nachhaltige Regionalentwicklung und Stadt-Umland Verhältnisse
— Remote sensing
— Restoration of biodiversity in urban settings
— Sustainability economics and assessment
— Sustainability science
— The economics of biodiversity and ecosystem services
— "When we stand up, they have to negotiate with us" - South-North North-South proposals from local to global sustainable changes”
— Writing a journal article

THESES COMPLETED IN 2021

The following theses were completed in 2021 after supervision or co-supervision by SESI members.

PHD THESES

— **Dr. Anna-Lena Rau:** The representation of temporal aspects in ecosystem services research: current state and recommendations for future research

MASTER THESES

— Benefits and drawbacks of cradle to cradle farming: a systematic review
— Children's perception of play affordances in an urban park
— Ein Beitrag zur Diskussion um Standards für populärwissenschaftliche Veröffentlichungen anhand einer Fallstudie zum Faktengehalt ausgewählter Werke Peter Wohllebens
— Environmental Justice and Protected Areas in Nigeria, Osse River Park, Ondo state as case study
— Exploring the social-ecological effectiveness of protected areas - A case study from North Luangwa, Zambia
— Initiation of motivation in stakeholders to actively participate in digital real world laboratories
— Nature relatedness – A predictor of nature conservation? An analysis of the influence of nature relatedness on the intention to conserve nature.
— Successful participatory protected area decision-making–A systematic review of the scientific evidence

BACHELOR THESES

— Analyzing the social-ecological system of the Península Valdés in Argentina using the DAPSI(W)R(M) framework
— Beekeping in the developing world: To what extent does sustainable beekeeping attenuate individual livelihood in developing nations
— Das Erlebnis von Natur – Eine Online-Befragung an der Tideelbe

- Data-supported Identification of Policy Interventions for Marine Litter in the Southern Aegean Sea
- Die Bedeutung des Plattdeutschen für die Beziehung der Bewohner:innen von Pellworm zu Pellworm. Eine Betrachtung der Regionalsprache
  Plattdeutsch als Zugang zu relationalen Werten auf Pellworm
- Drivers for conflicts between mining and indigenous peoples and local communities in Latin America – A systematic literature review
- Economic teaching as a leverage point for transformation? A multi-level perspective on German economics
- Effect of plant functional group order of arrival on the productivity and distribution of roots in dry grassland communities: a Minirhizotron Experiment
- Effects of holistic versus conventional grazing on pollination processes in grasslands in northern Germany
- Establishing the baseline: A comparison of two different pastures in North Germany as a basis for assessing the potential of Holistic Grazing, with regard to soil conditions
- Event management actor views on indicators for social sustainability in Hamburg
- Fostering individuals' experiential and emotional human-nature connectedness through arts-based research practices – A systematic literature analysis
- Generierung einer Grundlage: Ein Vergleich der räumlichen Variation der Wurzelproduktivität auf zwei verschiedenen Weiden in Norddeutschland als eine Basis zur Bewertung des Potentials von Holistischem Weidemanagement
- GIS analysis of the influence of clove price changes on land use in eastern Madagascar
- Herausforderungen und Chancen eines tierschutzgerechten Stadttaubenmanagements am Beispiel der „Zukunftsstadt Lüneburg“
- How do priority effects caused by plant functional groups order of arrival affect the structure and functioning of dry grassland plant communities?
- How can fiscal measures aimed at tackling GHG emissions be designed so as to reduce economic inequality and is it worth striving for?
- How can rooftop urban agriculture contribute to sustainable livelihoods in the Palestine refugee community of Ein El-Hilweh camp in Lebanon?
- How small-scale aquaculture farmers’ organizations contribute to sustainable rural development
- Implications of multidimensional poverty on the electric energy landscape in Sub-Saharan Africa
- Land use transition and forest policies in four provinces of Ecuador
- Nature, People and the Policy In-Between: An Analysis of Ecosystem Services Co-Production in German and European Forestry and Agriculture Polic
- Peatlands as a natural climate solution – Potentials and limitations under different future scenarios (the case of Schleswig-Holstein)

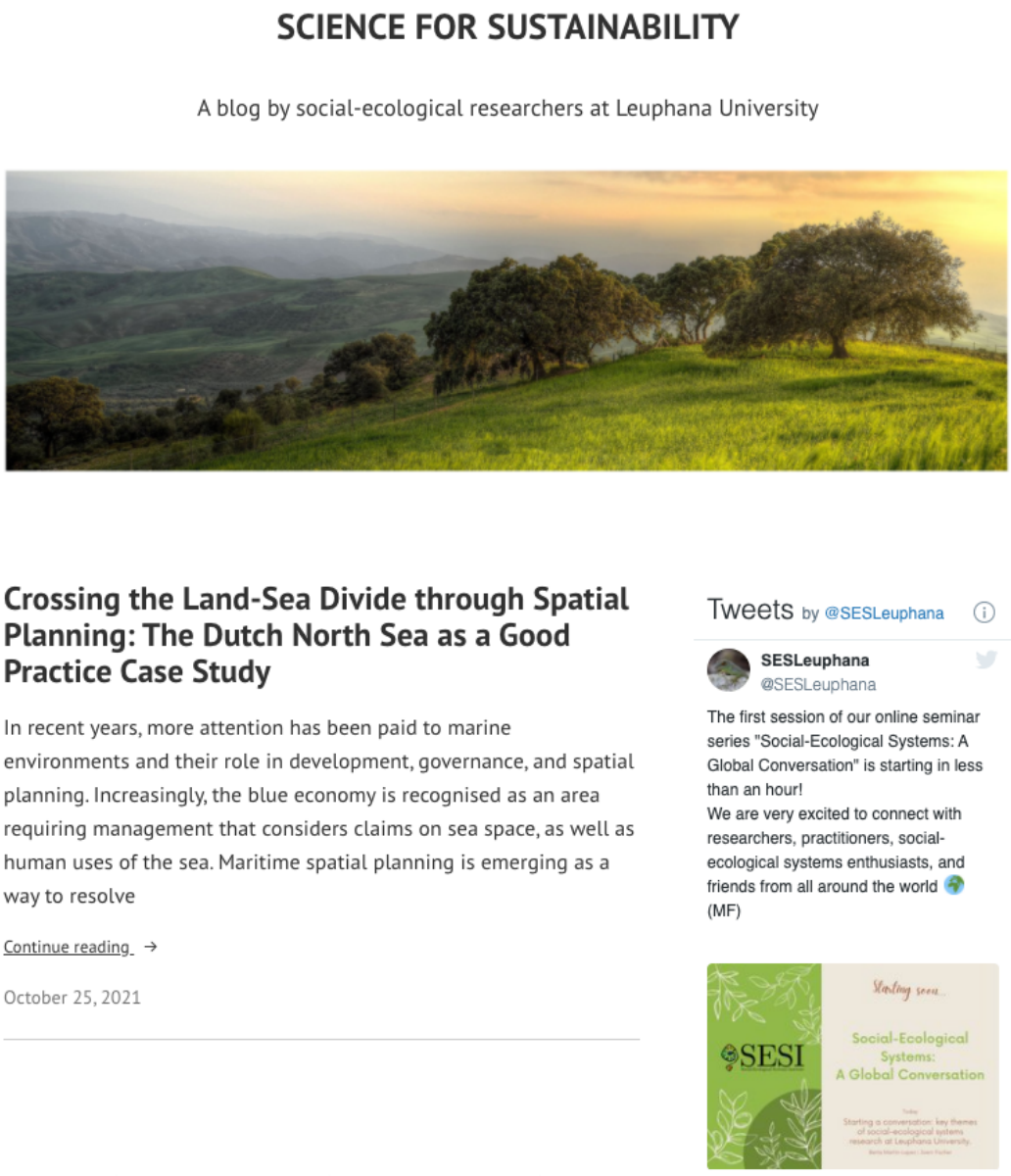
- Picturing Nature: A Systematic Literature Review of Participatory Photography Research on Environmental Issues
- Relevance of local languages for place-based human-nature connectedness: the case of local languages in Germany
- Sozial-Ökologische-Systeme in Küstenregionen. Evaluierung des Modellprojekts "Biosphärenreservat Schleswig-Holsteinisches Wattenmeer und Halligen" im Bezug zu einer nachhaltigen Entwicklung
- Stadtbäume im Klimawandel - Dendroökologische Untersuchungen an der Stiel-Eiche (*Quercus robur*) im Lüneburger Stadtgebiet
- Sustainability Transformation Understandings: An insight to the Mosetene Community of Asunción del Quiquibey, Bolivia
- The impact of group dynamics on the establishment of community-based alternatives to growth-oriented economy
- The role of priority effects on target and non-target species productivity and community structure in a Grassland field experiment
- Understandings and applications of traditional, indigenous and local knowledge in biocultural approaches to sustainabilit
- Valuation of nature in new measures of (environmental) welfare – The happy planet index and the system of environmental-economic accounting
- Vergleich der Nachhaltigkeitsstrategien cradle to cradle und Postwachstumsökonomie am Beispiel ausgewählter SDGs.
- Wälder im Klimawandel - Eine Online-Befragung zum Wissen in Deutschland
- What is a cradle to cradle company and what measures need to be implemented to enable transformation
- Which challenges need to be overcome in order to establish an extractive aquaculture industry in the Schleswig-Holstein part of the Baltic Sea?

Pictures from a study site in Ethiopia. Photo credit: Girma Shumi Dugo.

FOR MORE INFORMATION

Visit our website to learn more about us and our work!

You can also follow our institute's news and publications on social media. Many of our papers are featured on our blog science4sustainability soon after publication. You can engage with us on Twitter @SESLeuphana. Recorded talks by SESI members can be found on our YouTube channel Social Ecological Systems Institute SESI.



A screenshot of the SESI blog.

IMPRINT
Leuphana University Lueneburg, Universitätsallee 1, 21335 Lüneburg | Edited by Joern Fischer, Berta Martín-López, Marina Frietsch | Pictures: from SESI members | Titel: SESI 2021 ANNUAL REPORT, January 2022

Leuphana University Lueneburg