

## **Human-nature connectedness as leverage point**

Riechers, Maraja; Balázsi, Ágnes; García-Llorente, Marina; Loos, Jacqueline

*Published in:*  
Ecosystems and People

*DOI:*  
[10.1080/26395916.2021.1912830](https://doi.org/10.1080/26395916.2021.1912830)

*Publication date:*  
2021

*Document Version*  
Publisher's PDF, also known as Version of record

[Link to publication](#)

*Citation for pulished version (APA):*  
Riechers, M., Balázsi, Á., García-Llorente, M., & Loos, J. (2021). Human-nature connectedness as leverage point. *Ecosystems and People*, 17(1), 215-221. <https://doi.org/10.1080/26395916.2021.1912830>

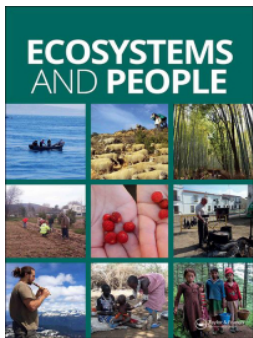
### **General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal ?

### **Take down policy**

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.



## Human-nature connectedness as leverage point

Maraja Riechers, Ágnes Balázsi, Marina García-Llorente & Jacqueline Loos

To cite this article: Maraja Riechers, Ágnes Balázsi, Marina García-Llorente & Jacqueline Loos (2021) Human-nature connectedness as leverage point, Ecosystems and People, 17:1, 215-221, DOI: [10.1080/26395916.2021.1912830](https://doi.org/10.1080/26395916.2021.1912830)

To link to this article: <https://doi.org/10.1080/26395916.2021.1912830>



© 2021 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.



Published online: 13 May 2021.



Submit your article to this journal [↗](#)



Article views: 2160



View related articles [↗](#)



View Crossmark data [↗](#)



Citing articles: 3 View citing articles [↗](#)

## Human-nature connectedness as leverage point

### The need for transformative change

Despite early warnings (Meadows et al. 1972), humanity continues to exceed planetary boundaries (Rockström et al. 2009; Steffen et al. 2015). The unprecedented anthropogenic impacts on the climate (IPCC 2014, 2018) and natural habitats brought in the new geological epoch of the Anthropocene (Steffen et al. 2007). The Anthropocene is characterized by a sixth mass extinction event (Millennium Ecosystem Assessment 2005; Barnosky et al. 2011; Hughes et al. 2017), which negatively impacts the functioning and resilience of ecosystems (Carpenter et al. 2005; Biggs et al. 2012). Consecutively, the loss and degradation of ecosystems impairs not only goods that can be extracted from ecosystems but also aspects of human well-being depends, including places for inspiration, relaxation or sense of belonging (IPBES 2019; Riechers et al. 2020b).

Despite intensified efforts over the years both in science and society, numerous indicators of social and biophysical unsustainability continue to increase exponentially (Ripple et al. 2017). Many agreements on various iterations of global goals for sustainability (such as the Millennium Goals and the Sustainable Development Goals) have been made public, yet for many indicators there is an ever-growing, rather than shrinking, ‘sustainability gap’ (Fischer et al. 2007). Instead of approximating the internationally agreed sustainability goals, humanity is experiencing a growing discrepancy between the ideal and the actual state of the world (Steffen et al. 2018). As this discrepancy between efforts and goals shows, one-dimensional and conventional ways for solving these problems are insufficient to foster sustainability (Santos-Martín et al. 2013).

To overcome this discrepancy, a systems approach may allow more holistic pathways towards reaching sustainability. In many cases, the adaptation to changing environmental conditions and halting degradation of the natural resources that human wellbeing depends on requires transformation of the entire system. Nevertheless, transformations of systems are difficult to induce (Meadows 1999). Thus, knowledge of where to intervene in a system and what consequences and ripple effects these interventions might bring about for system resilience are needed to foster an effective and lasting sustainability transformation.

In this Editorial for the Special Issue ‘Human-nature connectedness as leverage points for sustainability transformation’, we present an overview of how human-nature connectedness may foster such lasting sustainability transformation by using a leverage points perspective.

### Human-nature connectedness as leverage point

We argue that a leverage points perspective (Fischer and Riechers 2019) can help us to identify and trigger interventions for deep transformative change. *Leverage points* are places in a complex system in which small interventions can have wide ranging influences to bring about system change and may hold great potential for system transformation (Meadows 1999). Donella Meadows highlighted 12 places to intervene in a system, which Abson et al. (2017) summarized into four system characteristics: (1) parameters (e.g. constants, buffer stocks), (2) changes in feedbacks (length of delay, strength of feedback), (3) changes in system design (information flows, rules), and (4) changes in the intent (goals, paradigms) encapsulated by the system with increasing order of effectiveness for a system transformation. ‘Deep’ leverage points, which encompass the design and intent of a system, might be more difficult to access, but have greater transformative potential than ‘shallow’ leverage points (parameters, feedbacks) in which interventions can be relatively easy but may bring little overall change in the function of the system (Meadows 1999; Abson et al. 2017). A synthesizing discussion on how the articles in this Special Issue highlight four key advantages of the leverage points perspective can be found in Riechers et al. (2021, this issue).

One realm of leverage is human-nature connectedness, as disconnection of people and societies from nature may exacerbate the global environmental crisis by enhancing unsustainable behaviour patterns (Miller 2005; Nisbet et al. 2009; Riechers et al. 2020b). Changes in the broader historical social-ecological system (Balázsi et al. 2019), rapid landscape simplification (Riechers et al. 2020a) or urbanisation (Miller 2005) are just a few factors that can decrease and alter human-nature connectedness. Yet, beneficial effects of connections between humans and nature are widely recognized for sustainability (Folke et al. 2011; Zylstra et al. 2014). Benefits include positive outcomes for health (Maller et al. 2006; Shanahan et al. 2016), the cognitive development of children (Taniguchi et al. 2005; Giusti 2019), and overall happiness and well-being (Capaldi et al. 2014). As an attempt to combine this longstanding work of many disciplines, the notion of human-nature connectedness comprises a wide range of concepts and means to operationalize notions of human-nature interactions (Ives et al. 2017). Within this realm, prominent literature includes notions of a ‘connectedness to nature’ (Mayer

and Frantz 2004), 'nature relatedness' (Nisbet et al. 2009), or 'connectivity with nature' (Dutcher et al. 2007) (for a more comprehensive overview see Restall and Conrad 2015; Ives et al. 2017).

While this literature is rich and vast, many calls for a 'reconnection' with nature have remained vague and abstract. So far, a comprehensive assessment of human-nature connectedness and how to foster it and enable transformative system change is lacking. The leverage points perspective may be able to illustrate places to intervene in a system with promising potential to cause positive ripple effects though human-nature connectedness. The current Special Issue aims at illustrating leverage points by providing a selection of topics and approaches to identify interventions that foster human-nature connectedness.

### Contributions to this Special Issue

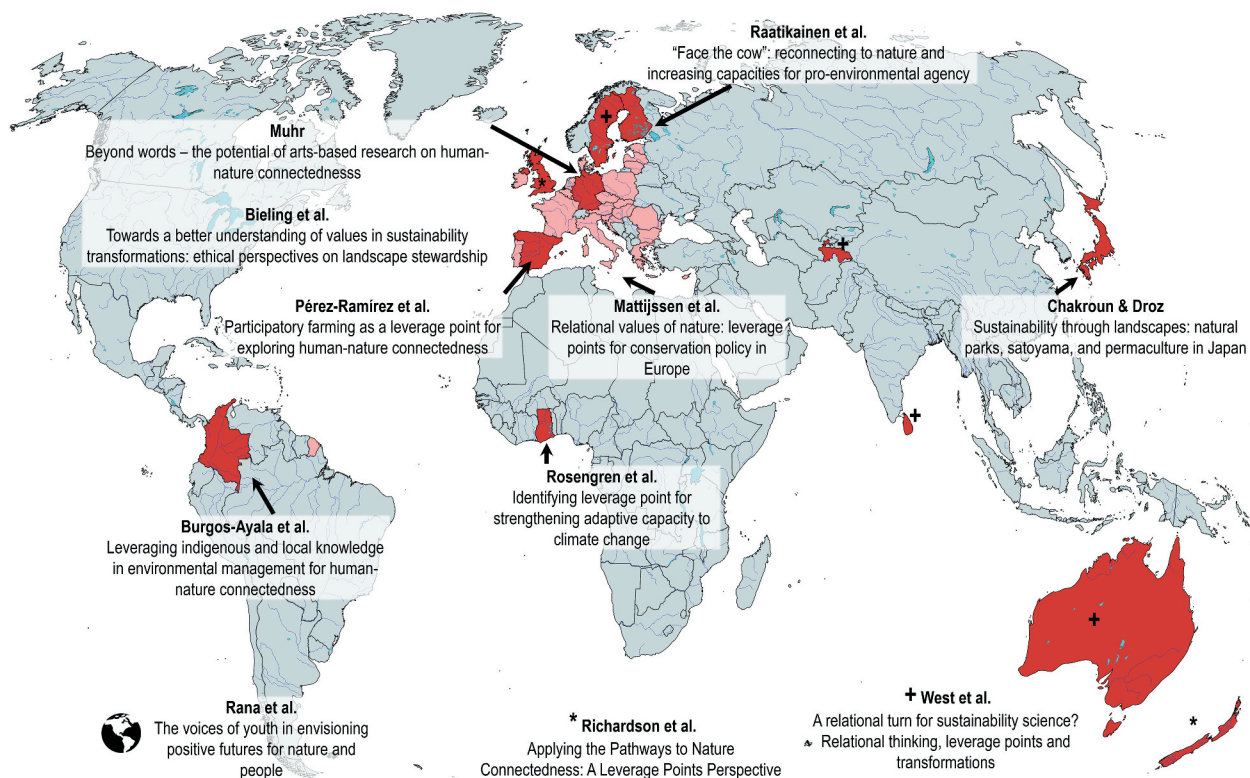
The contributions in this Special Issue cover a broad geographical range (Figure 1), with four empirical case studies from Europe, including Finland, Germany and Spain, one study from the Americas (Colombia), one from Africa (Ghana) and one from Asia (Japan). In addition, other studies in this issue have covered examples from Sweden, the UK, Australia, New Zealand, Sri Lanka, and Tajikistan. The scale of the studies primarily involves local or regional

cases, with some cases addressing a national context and a review with an international scope.

To give an overview of the articles in this Special Issue, we provide a summary based on overarching themes. The 11 articles of this Special Issue can be grouped into two main themes based on how the authors address human-nature connectedness: 1) a focus on different dynamics and interactions within social-ecological systems, with frameworks such as landscape sustainability, nature stewardship, and adaptation to climate change; and 2) a focus on finding transformative pathways reconnecting society with nature including methodologies based on arts-based experiences and visioning exercises, as well as a shift towards relational thinking (Table 1). The two themes are not mutually exclusive and the topic of transformation is inherent in all discussion around leverage points, yet this distinction serves to highlight the focus of the articles in this Special Issue.

### Social-ecological systems dynamics and interactions

Social-ecological systems are complex, dynamic systems in which interactions between system components are determined by several values and meanings of human-nature connections. In this Special Issue, Bieling et al. (2020), Chakroun and Droz (2020) and Pérez-Ramírez



**Figure 1.** Geographical distribution of study areas and exemplary case studies by the articles of this Special Issue. The globe icon signifies no specific study area, \* and + show articles with multiple study areas across continents. Map created through mapchart.net.

**Table 1.** Summary of themes and topics of the articles published in this Special Issue.

Human-nature connectedness	Challenges	General interventions	Who intervenes?
<i>Social-ecological systems dynamics</i>			
Landscape sustainability (Bieling et al. 2020, Chakroun and Droz 2020, Pérez-Ramírez et al. 2021)	Consideration of values and meanings of nature that drive sustainable actions in landscape management	Cultivating collective values and relational thinking for sustainable behaviors	Multiple societal factors
Nature stewardship and policies (Mattijssen et al. 2020, Burgos-Ayala et al. 2020)	Recognition and incorporation of relational values and Indigenous and local knowledge in governance and policy	Considering the impact of policies and decisions on communities and their values	Science-policy-practice
Adaptation to climate change of farming systems (Rosengren et al. 2020)	Strengthening of adaptive capacity to climate change in rural farming areas	Identifying place-specific adaptive trajectories with transformative potential	Policy-practice
<i>Pathways for transformative change</i>			
Embodying connectedness through arts (Mühr 2020, Raatikainen et al. 2020)	Connecting body and mind through arts-based practices for pro-environmental behavior and sustainable living	Connecting science and arts and embodying nature	Science-art-education
Transformative seeds for a good Anthropocene (Rana et al. 2020)	Transformation of human systems that are the prime force of global ecological crisis and uncertain future	Visions based on transformative seeds as leverage points toward the desired future	Science-policy-practice
A paradigm shift towards connecting society to nature (Richardson et al. 2020, West et al. 2020)	Societal disconnectedness from nature urges the need for a relational turn toward nature	Engaging in different ways with nature and cultivating holistic worldviews and relational thinking	Multiple societal factors

et al. (2021) examine the potential of considering and cultivating values and meanings of nature, that drive sustainable actions in cultural landscapes. Bieling et al. (2020) state that values of nature are considered essential, though ill-defined, ingredients of sustainability transformations. Three types of ethical reasoning about why and how people should care about nature (i.e. Prudence, Justice and Good life) were used to highlight the role of values of nature (i.e. instrumental, intrinsic and relational) in landscape stewardship conceptualizations. To exemplify, two case studies were presented from recent initiatives advancing landscape sustainability in Baden-Württemberg (i.e. insect conservation and pesticides use) and in Rhein-Hunsrück (i.e. wind park development and locals' emotional bond with landscapes) in Germany. The authors state that interventions should emerge from understanding the way values guide thinking and actions for caring for nature and should be tailored towards addressing the complexity of values in different contexts.

Through the framework of milieu, Chakroun and Droz (2020), explore the diversity of ways in which humans live with nature in three value-rich landscapes with different nature protection and landscape management strategies (i.e. natural parks, Satoyama and permaculture) in Japan. Through these examples, the authors show how humans continuously evolve with the milieu they live in (Droz 2018), which contains, among others, meanings and values (Gibson 1979) resulting from interactions between humans and nature over generations. Chakroun and Droz (2020) exemplify how individual perceptions are interconnected with collective perceptions about nature within a certain milieu. Every milieu is unique; therefore, sustainability cannot be levered without

considering the diversity of ways humans live with nature.

Further, Pérez-Ramírez et al. (2021), show that participatory farming and promotion of agroecological principles hold multiple benefits for human-nature connectedness, while promoting sustainable food production and well-being. This study found that factors such as social importance of agricultural landscapes, linkages with farming activities, time spent outdoors, gender, and urban origin influence human-nature connectedness. In addition, it was found that women showed a stronger and broader worldview on the philosophical arguments about their connection with nature, while men identified themselves and nature through more cognitive responses. Pérez-Ramírez et al. (2021) highlight the potential of collective farming actions for the transformation of agri-food systems and the quality of relationships with nature in a pilot living lab project in Madrid called *Agrolab* (Spain).

The impact of nature policies and decisions upon communities and their values mirrors the awareness with which complex systems are governed. Recognizing and integrating multidimensional values into policies that govern complexity is challenging in practice. So far, the least integrated values are relational values, which reflect the qualities of the relationship between nature and humans (Chan et al. 2016). Based on the nature policy of Europe, the contribution by Mattijssen et al. (2020) show the importance of such values for policy and discuss several routes through which incorporation of relational values into nature policies can lead to transformation in the three realms of leverage by Abson et al. (2017): re-think (e.g. pluralized meanings of nature, relational language), re-structure (e.g. integrated landscape policy, community engagement) and



re-connect (e.g. nature education and benefits of digital technology).

Burgos-Ayala et al. (2020) illustrate that little attention is dedicated for exploring Indigenous and local knowledge in environmental management projects in Colombia. The authors emphasize that relational values have particular importance for sustainability in socio-cultural contexts, where Indigenous communities' relationship with nature and their knowledge about nature come into play. The authors argue that the leverage point perspective has great potential for improving conservation measures and achieving sustainability in practice by including indigenous knowledge, especially as there were very few governmental projects that have sparked real, deep transformative change within the last decade (Burgos-Ayala et al. 2020).

When navigating complex social-ecological systems toward sustainability, adaptation to climate change should build on systemic conceptualizations, while remaining locally focused when applied. Considering the severe impact of climate change in the agricultural systems, Rosengren et al. (2020) explore leverage points for strengthening the adaptive capacity of small-scale farmers in the Northern Region of Ghana. The article explores possibilities to fast-track positive adaptive capacity trajectories at the farm and food system, using the leverage points perspective. Consequently, 15 place-specific leverage points are presented in the topics: gender equality, social learning, information and knowledge, and access to finance. Finally, Rosengren et al. (2020) identify four benefits of using leverage points for adaptive capacity in adaptation planning: i) provide guidance on where to intervene in a system, ii) provide the ability to deal with complex systems, iii) embrace both casual and teleological decision-making and iv) target at deep, transformative change.

## Pathways for transformative change

Sustainability transformation requires shifts in current paradigms that determine collective behaviours and relationships with the living environment. In this process, a multitude of approaches may tackle change and reconfigure the role of nature in individuals' or society's worldviews.

One of these approaches are arts-based practices, which can highlight connections between body and mind and reveal unspoken realities of a (dis)connectedness with nature. Arts-based practices, especially when connected with science, may promote pro-environmental behaviours for a more sustainable future (Muhr 2020; Raatikainen et al. 2020; Richardson et al. 2020). In environmental education, arts-based methods (e.g. theatre

exercises, drawings, playful methods) could engage pupils in a process of resignification of key concepts, for example, about agroecology (Goris et al. 2019). Raatikainen et al. (2020) apply an arts-based research methodology to conduct an environmental education activity with pupils regarding the management and conservation of meadows and wood-pastures in Finland, focussing on conceptualizing the human-nature relationship. The authors use arts-based practices as levers for transformative learning about sustainability. To promote transformative changes, society also needs to be innovative in the development of pedagogical and learning approaches (Oteros-Rozas et al. 2019). In addition, as seen in Raatikainen et al. (2020), selecting an arts-based method is also a way to enhance social engagement, empathy and stewardship feelings towards nature.

Similarly, Muhr (2020) explores the potential of arts-based methods to overcome the reliance on language and unveil nuances of human-nature connectedness beyond words. To do so, Muhr (2020) presents three studies applying arts-based methods in research approaches on human-nature connectedness, showing the potential of arts to evoke deep emotional connections with nature. Additionally, Muhr (2020) remarks that arts-based research can also serve as a deep leverage point of sustainability transformation in the way we produce, use and exchange knowledge, going beyond scientific paradigms to integrate other sources and worldviews.

Another effective pathway towards enhancing transformative change is the one presented by Rana et al. (2020) – envisioning the futures of nature and people. This article is based on the results of a participatory scenario workshop with early career professionals at an IPBES event in Brazil that helped to identify leverage points towards sustainable and desirable futures. The exercise was built on the Seeds of Good Anthropocene concept, using the Nature Futures Framework, where inspiring initiatives are characterized by having a transformative positive impact at other initiatives, sectors, existing values and more (Bennett et al. 2016). In this regard, Rana et al. (2020) present four envisioned and desirable futures elaborated during the workshop where humanity has organized itself, the economy, politics and technology, to achieve improved nature-human well-being.

Societal disconnectedness from nature highlights the need for a relational turn to re-think the role of nature for human well-being. Engaging in different ways with nature and cultivating holistic worldviews and relational thinking are ingredients of the transformation itself. In this sense, Richardson et al. (2020) promote five types of positive relationships with nature (i.e. sensory contact, emotional, beauty, meaning and compassion). The

authors present four practical examples from the United Kingdom and New Zealand where the pathways approach successfully informed interventions for human-nature relationships. As they claim, applying this framework in designing different interventions (e.g. landscape design, arts, transports, resident management) may strengthen the human-nature relationship at societal level, in all of the four system characteristics parameters, feedbacks, design, and intent (Abson et al. 2017).

West et al. (2020) advance the concept of a ‘relational turn’ as an alternative to dualistic research paradigms that polarize complex systems into separate spheres (i.e. ‘humans’ and ‘nature’, or ‘social’ and ‘ecological’). Therefore, West et al. (2020) propose a paradigm shift in sustainability sciences and society toward focusing on relational approaches. The authors identify four major themes in relational thinking: continually unfolding processes, embodied experience, reconstructing language, and concepts and practices of care.

## Concluding remarks

The contributions in this Special Issue offer various perspectives on human-nature connectedness and shed light on how working towards this connectedness may foster system transformations towards more sustainable pathways. From the starting points of conservation, education, stewardship and shifts in the perception of the dichotomy of what humans and nature are, the articles included in this Special Issue exemplify human-nature connectedness as a realm of leverage. These articles highlight that understanding and recognizing values and meanings of nature are indispensable for nature stewardship and governance. Further, simultaneous interventions in multiple leverage points could foster sustainability transformations. Together with authors from the articles in this Special Issue, we offer a second part of this Editorial (Riechers et al. 2021, this issue), presenting synergies, open questions and implications based on the insights that this Special Issue contributes to the scientific as well as societal discourse on human-nature connectedness as a leverage point for societal transformation.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## References

- Abson DJ, Fischer J, Leventon J, Newig J, Schomerus T, Vilsmaier U, von Wehrden H, Abernethy P, Ives CD, Jager NW, et al. 2017. Leverage points for sustainability transformation. *Ambio*. 46:30–39. doi:10.1007/s13280-016-0800-y.
- Assessment ME. 2005. Ecosystems and human well-being: synthesis. Washington (DC): Island Press.
- Balázs Á, Riechers M, Hartel T, Leventon J, Fischer J. 2019. The impacts of social-ecological system change on human-nature connectedness: a case study from Transylvania, Romania. *Land Use Policy*. 89:104232. doi:10.1016/j.landusepol.2019.104232.
- Barnosky AD, Matzke N, Tomiya S, Wogan GOU, Swartz B, Quental TB, Marshall C, McGuire JL, Lindsey EL, Maguire KC, et al. 2011. Has the Earth's sixth mass extinction already arrived? *Nature*. 471(7336):51–57. doi:10.1038/nature09678.
- Bennett EM, Solan M, Biggs R, McPhearson T, Norström AV, Olsson P, Pereira L, Peterson GD, Raudsepp-Hearne C, Biermann F, et al. 2016. Bright spots: seeds of a good Anthropocene. *Front Ecol Environ*. 14(8):441–448. doi:10.102/fee.1309.
- Bieling C, Eser U, Plieninger T. 2020. Towards a better understanding of values in sustainability transformations: ethical perspectives on landscape stewardship. *Ecosyst People*. 16(1):188–196. doi:10.1080/26395916.2020.1786165.
- Biggs R, Schlüter M, Biggs D, Bohensky EL, BurnSilver S, Cundill G, Dakos V, Daw TM, Evans LS, Kotschy K, et al. 2012. Toward principles for enhancing the resilience of ecosystem services. *Annu Rev Environ Resour*. 37(1):421–448. doi:10.1146/annurev-environ-051211-123836.
- Burgos-Ayala A, Jiménez-Aceituno A, Torres-Torres AM, Rozas-Vásquez D, Lam DPM. 2020. Indigenous and local knowledge in environmental management for human-nature connectedness: a leverage points perspective. *Ecosyst People*. 16(1):290–303. doi:10.1080/26395916.2020.1817152.
- Capaldi CA, Dopko RL, Zelenski JM. 2014. The relationship between nature connectedness and happiness: a meta-analysis. *Front Psychol*. 5:976. doi:10.3389/fpsyg.2014.00976.
- Carpenter SR, Westley F, Turner MG. 2005. Surrogates for resilience of social-ecological systems. *Ecosystems* (New York, NY). 8(8):941–944. doi:10.1007/s10021-005-0170-y.
- Chakraborty L, Droz L. 2020. Sustainability through landscapes: natural parks, satoyama, and permaculture in Japan. *Ecosyst People*. 16(1):369–383. doi:10.1080/26395916.2020.1837244.
- Chan KMA, Balvanera P, Benessaiah K, Chapman M, Díaz S, Gómez-Baggethun E, Gould R, Hannahs N, Jax K, Klain S, et al. 2016. Opinion: why protect nature? Rethinking values and the environment. *Proc Natl Acad Sci USA*. 113(6):1462–1465. doi:10.1073/pnas.1525002113.
- Droz L. 2018. Watsuji's idea of the self and the problem of spatial distance in environmental ethics. *Eur J Jpn Philoso*. (3):145–168.
- Dutcher DD, Finley JC, Luloff AE, Johnson JB. 2007. Connectivity with nature as a measure of environmental values. *Environ Behav*. 39(4):474–493. doi:10.1177/0013916506298794.
- Fischer J, Manning AD, Steffen W, Rose DB, Daniell K, Felton A, Garnett S, Gilna B, Heinsohn R, Lindenmayer DB, et al. 2007. Mind the sustainability gap. *Trends Ecol Evol*. 22(12):621–624. doi:10.1016/j.tree.2007.08.016.
- Fischer J, Riechers M. 2019. A leverage points perspective on sustainability. *People Nat*. 1: 115–120.
- Folke C, Jansson A, Rockström J, Olsson P, Carpenter SR, Chapin FS, Crépin A-S, Daily G, Danell K, Ebbesson J,

- et al. 2011. Reconnecting to the biosphere. *Ambio*. 40 (7):719–738. doi:10.1007/s13280-011-0184-y.
- Gibson JJ. 1979. The ecological approach to visual perception. Boston: Houghton Mifflin.
- Giusti M. 2019. Human-nature relationships in context. Experiential, psychological, and contextual dimensions that shape children's desire to protect nature. *Plos One*. 14(12):e0225951. doi:10.1371/journal.pone.0225951.
- Goris M, van den Berg L, Da Silva Lopes I, Behagel J, Verschoor G, Turnhout E. 2019. Resignification practices of youth in zona da mata, brazil in the transition toward agroecology. *Sustainability*. 11(1):197. doi:10.3390/su11010197.
- Hughes TP, Barnes ML, Bellwood DR, Cinner JE, Cumming GS, Jackson JBC, Kleypas J, van de Leemput IA, Lough JM, Morrison TH, et al. 2017. Coral reefs in the Anthropocene. *Nature*. 546(7656):82–90. doi:10.1038/nature22901.
- IPBES. 2019. Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental science-policy platform on biodiversity and ecosystem services. Bonn (Germany):IPBES secretariat.
- IPCC. 2018. Global warming of 1.5°C. Summary for policy makers. Switzerland:IPCC.
- IPCC. 2014. Climate change 2014: synthesisReport. Contribution of working groups I, II and III to the fifth assessmentreport of the intergovernmental panel on climate change. IPCC, editor. IPCC: Geneva (Switzerland).
- Ives CD, Giusti M, Fischer J, Abson DJ, Klaniecki K, Dorninger C, Laudan J, Barthel S, Abernethy P, Martín-López B, et al. 2017. Human–nature connection: a multidisciplinary review. *Curr Opin Environ Sustainability*. 26–27:106–113. doi:10.1016/j.cosust.2017.05.005.
- Maller C, Townsend M, Pryor A, Brown P, St Leger L. 2006. Healthy nature healthy people: “contact with nature” as an upstream health promotion intervention for populations. *Health Promot Int*. 21(1):45–54. doi:10.1093/heapro/dai032.
- Mattijssen TJM, Ganzevoort W, van den Born RJG, Arts BJM, Breman BC, Buijs AE, van Dam RI, Elands BHM, de Groot WT, Knippenberg LWJ. 2020. Relational values of nature: leverage points for nature policy in Europe. *Ecosyst People*. 16(1):402–410. doi:10.1080/26395916.2020.1848926.
- Mayer FS, Frantz CM. 2004. The connectedness to nature scale: a measure of individuals' feeling in community with nature. *J Environ Psychol*. 24(4):503–515. doi:10.1016/j.jenvp.2004.10.001.
- Meadows DH. 1999. Leverage points: places to intervene in a system. Hartland: The Sustainability Institute.
- Meadows DH, Meadows DL, Randers J, Behrens WW. 1972. The limits to growth. New York (NY): Universe Books.
- Miller JR. 2005. Biodiversity conservation and the extinction of experience. *Trends Ecol Evol*. 20(8):430–434. doi:10.1016/j.tree.2005.05.013.
- Muhr MM. 2020. Beyond words– the potential of arts-based research on human-nature connectedness. *Ecosyst People*. 16(1):249–257. doi:10.1080/26395916.2020.1811379.
- Nisbet EK, Zelenski JM, Murphy SA. 2009. The nature relatedness scale: linking individuals' connection with nature to environmental concern and behavior. *Environ Behav*. 41 (5):715–740. doi:10.1177/0013916508318748.
- Oteros-Rozas E, Ravera F, García-Llorente M. 2019. How does agroecology contribute to the transitions towards social-ecological sustainability? *Sustainability*. 11(16):4372. doi:10.3390/su11164372.
- Pérez-Ramírez I, García-Llorente M, Saban de la Portilla C, Benito A, Castro AJ. 2021. Participatory collective farming as a leverage point for fostering human-nature connectedness. *Ecosyst People*. doi:10.1080/26395916.2021.1912185.
- Raatikainen KJ, Juhola K, Huhmarniemi M, Peña-Lagos H. 2020. Face the cow“: reconnecting to nature and increasing capacities for pro-environmental agency. *Ecosyst People*. 16(1):273–289. doi:10.1080/26395916.2020.1817151.
- Rana S, Ávila-García D, Dib V, Familia L, Gerhardinger LC, Martin E, Martins PI, Pompeu J, Selomane O, Tauli JJ, et al. 2020. The voices of youth in envisioning positive futures for nature and people. *Ecosyst People*. 16(1):326–344. doi:10.1080/26395916.2020.1821095.
- Restall B, Conrad E. 2015. A literature review of connectedness to nature and its potential for environmental management. *J Environ Manage*. 159:264–278. doi:10.1016/j.jenvman.2015.05.022.
- Richardson M, Dobson J, Abson DJ, Lumber R, Hunt A, Young R, Moorhouse B. 2020. Applying the pathways to nature connectedness at a societal scale: a leverage points perspective. *Ecosyst People*. 16(1):387–401. doi:10.1080/26395916.2020.1844296.
- Riechers M, Balázi Á, Abson DJ, Fischer J. 2020a. The influence of landscape change on multiple dimensions of human–nature connectedness. *Ecol Soc*. 25(3):3. doi:10.5751/ES-11651-250303.
- Riechers M, Balázi Á, Betz L, Jiren TS, Fischer J. 2020b. The erosion of relational values resulting from landscape simplification. *Landscape Ecol*. (35):2601–2612. doi:10.1007/s10980-020-01012-w.
- Riechers M, Balázi Á, García-Llorente M, Bieling C, Burgos-Ayala A, Chakroun L, Mattijssen TJM, Muhr M, Pérez-Ramírez I, Raatikainen KJ, et al. 2021. Key advantages of the leverage points perspective to shape the human-nature relations. *Ecosyst People*. doi:10.1080/26395916.2021.1912829.
- Ripple WJ, Wolf C, Newsome TM, Galetti M, Alamgir M, Crist E, Mahmoud MI, Laurance WF, 15,364 scientist signatories from 184 countries. 2017. World scientists' warning to humanity: a second notice. *Bioscience*. 67 (12):1026–1028. doi:10.1093/biosci/bix125.
- Rockström J, Steffen W, Noone K, Persson A, Chapin FS, Lambin EF, Lenton TM, Scheffer M, Folke C, Schellnhuber HJ, et al. 2009. A safe operating space for humanity. *Nature*. 461(7263):472–475. doi:10.1038/461472a.
- Rosengren L, Raymond C, Sell M, Vihinen H. 2020. Identifying leverage points for strengthening adaptive capacity to climate change. *Ecosyst People*. 16(1):427–444. doi:10.1080/26395916.2020.1857439.
- Santos-Martín F, Martín-López B, García-Llorente M, Aguado M, Benayas J, Montes C. 2013. Unraveling the relationships between ecosystems and human wellbeing in Spain. *Plos One*. 8(9):e73249. doi:10.1371/journal.pone.0073249.
- Shanahan DF, Bush R, Gaston KJ, Lin BB, Dean J, Barber E, Fuller RA. 2016. Health benefits from nature experiences depend on dose. *Sci Rep*. 6:28551. doi:10.1038/srep28551.
- Steffen W, Crutzen J, McNeill JR. 2007. The Anthropocene: are humans now overwhelming the great forces of nature? *Ambio*. 36(8):614–621. doi:10.1579/0044-7447-(2007)36[614:TAAHNO]2.0.CO;2.



Steffen W, Richardson K, Rockström J, Cornell SE, Fetzer I, Bennett EM, Biggs R, Carpenter SR, de Vries W, de Wit CA, et al. 2015. Sustainability. Planetary boundaries: guiding human development on a changing planet. *Science*. 347(6223):1259855. doi:[10.1126/science.1259855](https://doi.org/10.1126/science.1259855).

Steffen W, Rockström J, Richardson K, Lenton TM, Folke C, Liverman D, Summerhayes CP, Barnosky AD, Cornell SE, Crucifix M, et al. 2018. Trajectories of the earth system in the anthropocene. *Proc Natl Acad Sci USA*. 115(33): 8252–8259. doi:[10.1073/pnas.1810141115](https://doi.org/10.1073/pnas.1810141115).

Taniguchi ST, Freeman PA, Richards AL. 2005. Attributes of meaningful learning experiences in an outdoor education program. *J Adventure Educ Outdoor Learn*. 5(2):131–144. doi:[10.1080/14729670585200661](https://doi.org/10.1080/14729670585200661).

West S, Haider J, Stålhammar S, Woroniecki S. 2020. A relational turn for sustainability science? Relational thinking, leverage points and transformations. *Ecosyst People*. 16(1):304–325. doi:[10.1080/26395916.2020.1814417](https://doi.org/10.1080/26395916.2020.1814417).

Zylstra MJ, Knight AT, Esler KJ, Le Grange LLL. 2014. Connectedness as a core conservation concern: an interdisciplinary review of theory and a call for practice. *Springer Sci Rev*. 2(1–2):119–143. doi:[10.1007/s40362-014-0021-3](https://doi.org/10.1007/s40362-014-0021-3).

Maraja Riechers

*Faculty of Sustainability, Social-Ecological Systems Institute,  
Leuphana University Lüneburg, Lüneburg, Germany*

 [Riechers@leuphana.de](mailto:Riechers@leuphana.de)

 <http://orcid.org/0000-0003-3916-8102>

Ágnes Balázsi

*Ecosystem Services Laboratory, Sapientia Hungarian  
University of Transylvania, Cluj-Napoca, Romania*

 <http://orcid.org/0000-0002-3815-8538>

Marina García-Llorente

*Social-Ecological Systems Laboratory, Universidad  
Autónoma de Madrid, Madrid, Spain  
Fractal Collective, Madrid, Spain*

 <http://orcid.org/0000-0002-3527-9318>

Jacqueline Loos

*Faculty of Sustainability, Social-Ecological Systems Institute,  
Leuphana University Lüneburg, Lüneburg, Germany*

 <http://orcid.org/0000-0002-7639-2894>