



## D1.6 Social Ecological System (SES) conceptual framework

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- 1      PU = Public  
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## Document history

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## Summary

### Summary of Deliverable

The deliverable (*SES guidance and conceptual frameworks review*, or *SES guidance* in short) *provides* the conceptual and analytical approaches used in the BIOTraCes project for mapping direct and indirect drivers of biodiversity change given the strongly interconnected character of the social, economic, cultural, and ecological factors in the studied systems. The diverse system features that affect biodiversity can be conceptualized through Social-Ecological Systems (SES) thinking stemming from and associated with other emerging theories, frameworks, metaphors, and heuristics targeting the complex systems characterizing relationships between people and nature. Such conceptualization approach is an input for each of the nine empirical BIOTraCes case studies. The *SES guidance* also builds on the context-specific needs of each of the project partners and the contextual features of the targeted SES across the case studies. The deliverable provides an introductory overview of theoretical approaches that help conceptualise and advance thinking on the interplay, links, and connections between society and nature through. By mapping out how different concepts can contribute to the central BIOTraCes *PEPE-Framework* with its principles of Politicising, Empowering, Pluralising and Embedding (PEPE), the document is meant as a starting base for grounded and empirical approaches of co-producing locally situated notions of all the nine SES studies that will then allow to inform the theory of transformative change of BIOTraCes.

## Disclaimer

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## 1. Introduction

The purpose of this document is to guide through the different frameworks, associated with different disciplines and knowledge systems, that help advance a holistic thinking about the interlinked social and natural systems that can be applied across all the nine case studies in BIOTraCes. We focus on both system-based approaches and their critiques to develop inclusive approaches that can leverage nature-positive transformative changes. To do so, we review a broad range of key literature that offers plural perspectives on social-ecological systems (henceforth SES). The reviewed list of theories and frameworks does not aim to be exhaustive; rather, while being aware about a wide range of possible conceptual frameworks, we build on those ones which were identified by BIOTraCes partners based on their experience and expertise in their case study contexts (see Section 5 on how this deliverable was created).

The document offers a range of conceptual frameworks that can be adapted in ways to suit the local needs of each case study. The frameworks involve different lenses to examine the characteristics and the intertwined cultural, social, institutional aspects of each of the case studies and broader impact sectors, such as urbanisation, agriculture, food production and consumption, maritime/aquatic living sources or forestry and relate them to the state of the natural systems. The synthetic approach to reviewing the range of the identified and chosen frameworks is also meant to foster conceptual pluralism within the BIOTraCes consortium, a diversity which also aims at strengthening the sense of agency for each of the partners (academic or beyond).

One starting point in BIOTraCes when trying to understand what SES is generally linked to Elinor Ostrom's interpretation of SES, which offers an analytical approach to conceptualise and examine people-nature relationships as inter-linked, in which humans are part and not apart from nature (Ostrom, 2009)<sup>1</sup>. That is, to advance thinking of society-nature relationship, new conceptual frameworks and theories of transformative change should put the strong linkages, connections, and inter-/co-dependencies of social and ecological elements at the centre. In this line, the companion Deliverable 1.8 also proposes four possible avenues to propel SES thinking that allows for comparison of plural SES across the nine case studies: a) A SES approach that incorporates grounded theory on all sorts of relations between the social and the ecological systems; b) a SES approach that is based on a holistic view of nature, often present in bio-innovations, and that gives a counterweight to a technical and reductionist approach; c) a SES that does not look from the social to the ecological or vice versa, but one, based on system theory, that focuses on that relationship in terms of reciprocity; d) An approach that resonates with the SES thinking in the biodiversity science policy interface.

Given the diversity of SES that BIOTraCes engages with across all of its nine case studies, the idea here is not to produce a single conceptualization of an overall kind of SES that serves and helps generalise across all the cases. Rather the idea is to present guidance and the processes that would help build a plurality of frameworks from which different concepts and theoretical inputs can be applied in an empirical fashion. The ideas that are

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<sup>1</sup> Elinor Ostrom. 2009. A General Framework for Analyzing Sustainability of Social-Ecological Systems. *Science* **325**, 419-422. DOI: [10.1126/science.1172133](https://doi.org/10.1126/science.1172133)

chosen and put forward in the deliverable itself can be seen as part of a co-production process within the partnership of the project towards understanding key elements of the specific SES of the different case studies (also noting that each case study can apply multiple SES, e.g., co-produced with different stakeholders, especially when trying to reflect minority and marginalised perspectives). With this in mind, we are also being careful to avoid any normative top-down perspective that may help reinforce dominant perspectives, e.g., the Western dichotomy of nature and society. It should also be noted that the goal of developing a grounded approach of understanding, researching, and conceptualising a plurality of SES results from the BIOTraCes' commitment to practical relevance and social change via participatory action research building upon the inclusion of other-than-academic expertise (see Deliverable 1.4, Action Research Review).

Here, we are specifically interested in connecting previous theories and frameworks surrounding different understandings and conceptualization of SES with the following three questions (Table 1):

- How are *society* and *nature* and their relations, interdependencies or entanglements conceptualised across frameworks that draw from different schools of thought, and re-interpreted by the BIOTraCes partnership?
- How does each of the chosen and reviewed frameworks deal with a broad understanding of *power*? Power can relate here for example to issues like the role of capitalist market forces, institutional and other governance frameworks, corruption, agencies of social and more-than-human actors and their interplay, the inclusion of marginalised knowledge, the role of technology or infrastructures, or the role of intersecting identities in perceiving people living from, in, with, and as nature.
- How does each framework allow for an emphasis on marginalised perspectives from the bottom-up, identities and communities/groups?

We organize the main concepts and theories around the meta-framework developed within BIOTraCes, that is, the 'PEPE-framework', with its four main principles of Politicizing, Embedding, Pluralising, and Empowering. The PEPE framework will be presented below (Table 2). In the next section an overview over the different SES theories and frameworks identified by the BIOTraCes research partners is presented. By so doing we present a first set of indications regarding how far each selected theory and framework can contribute towards conceptualising society-nature relations, given power dynamics and marginalised communities. We also identify how they can contribute to the four PEPE principles. Section 3 provides a succinct description of each of the selected theories and frameworks and Section 4 then offers hints of the different types of SES that are prevalent in the BIOTraCes empirical case studies. Finally, we describe how the deliverable was created.



## 2. Conceptualising social-ecological systems

### 2.1. Overview of SES approaches: society-nature relations, conceptualization of power, lens on marginalized communities

Table 1 offers a descriptive snapshot of key schools of thought (or “epistemic communities”) and selected SES theories and frameworks’ that serves as an introduction in terms of, first, conceptualizing of society-nature relationships, second, examining underlying power relations that may hinder or challenge transformative change and third, offering conceptual pathways for the inclusion of marginalised perspectives, values and identities in SES analyses.

Table 1. Overview of the SES approaches

Conceptual or theoretical framework	Conceptualization of society-nature relationships	Conceptualization of “power relations”	How does it focus on marginalised communities?
<b>THEORIES - epistemic communities</b>			
Ecological Economics	Economy as a subsystem of a social system. The social system as a subsystem of the natural system.	Power is broadly related to institutions (norms and rules) in accordance with institutional economics.	Normative position that identifies political economic factors that propagate environmental conflicts that harm marginalized communities.
Sustainability Science	Social and ecological aspects increasingly intertwined but economy not seen as embedded in the environment.	Power is not a fundamental aspect of the understanding of sustainability but increasingly focus on institutional systems and governance structures.	Role of marginalized communities is often acknowledged in theory but there is no in-depth engagement in transdisciplinary or bottom-up approaches to bring up the voices of marginalized communities.
Political Ecology	The society as a primary driver of the ecological and environmental quality. Society and Nature are understood as entangled and connected.	Power hierarchies shape the quality of ecosystems and environment. Strong focus is on examining the impact of elites’ decisions on marginalized communities (including nature).	Marginalised communities are deprived from rights to access key contributions of nature while powerful groups have a wider spectrum of rights regarding accessing nature’s contributions.
Environmental	The state of nature determines the well-being of society and	Power has traditionally not been at the centre of EJ analyses.	Focus on historically marginalized and vulnerable communities,

Justice	the achievement of social justice. Nature is understood as environmental goods/bads to society. Increasingly, turn to include more-than-human entities and dissolve nature-society dichotomy.	However, the recent move towards intersectional approaches is enabling a deeper understanding of structural power issues, e.g. through decolonial and multi-species EJ frameworks.	e.g., those most exposed to environmental degradation and pollution. Traditionally, focus on distribution, recognition and procedural justice, more recently those notions have been expanded towards relational and intersectional approaches.
Degrowth	Based on the notion from Ecological Economics that economy and social system are subsystems of the natural system. The scale of energy and material throughput is seen as central to (un-) sustainable society-nature relations.	The benefits of growth flow to those who have power at the expense of the environment.	Besides environmental costs, the costs of economic growth are also shifted onto those who are marginalized through capital accumulation.
Posthumanist approaches	Critique on anthropocentric and dichotomous conceptualizations of society-nature relations. Human, non-human and more-than-human entities are intertwined. Nature and society should be seen as equal, relational and reciprocal elements.	Power is implicitly embedded, as post- and more-than human approach challenges the human superiority over nature and include non- and more-than-human agency in its conceptualizations.	Post-human approaches start with the premise to move beyond Western epistemologies, to includes local and indigenous perspectives. Further, it includes non- and more-than-human elements in research design and analysis.
Conservation psychology	The nature and society are interconnected, affect each other reciprocally. Society-nature well-being is interdependent.	CP recognizes that some individuals, groups or institutions often have more influence and control over environmental decision-making and resource management than others.	Marginalized communities are disproportionately affected by various forms of environmental crisis. CP seeks to empower people and communities to engage in conservation and advocate for a more just and sustainable relationship with the environment.

EXAMPLE FRAMEWORKS THAT DRAW ON THESE THEORIES			
IPBES Conceptual framework	Nature and its contributions to people can be interpreted from a western scientific or more context dependent perspectives that allow for respecting different worldviews and positionality of people and nature.	Power relations implicitly conceptualized within governance systems.	Worldviews of marginalized communities, e.g., Indigenous peoples and local communities are recognized at the same level as worldviews supported by western scientific knowledge, e.g. see Nature's Contributions to People framework.
IPBES Values framework	Same as IPBES conceptual framework. It takes into consideration how people live from, in, with and as nature, leading to multiple (plural) perspectives of the values of nature.	Power relations emphasized to understand the way institutional systems and values interact, e.g. which values are given priority in decision making and which values are marginalized.	High emphasis on Indigenous peoples and local communities' views about notions of nature and values about nature. Typology of values allows for differentiating how people position themselves viz a viz nature and its different socially constructed meanings. Indigenous and local knowledge and associated values seen as potential ways to catalyse transformative change.
Complex adaptive systems' framework	Social and ecological domains are inherently relational. Most focus has been on ecological resilience, though social-ecological resilience and transformability of the SES system increasingly acknowledged.	There has not been much emphasis on power as the focus has been on the idea of "good governance" where power is typically devolved or nested.	No specific focus on marginalised communities.
Leverage points framework	Flexible and largely determined by society's goals, values and worldviews. Shallow and deep leverage points differentiated.	Systems can be changed by changing power structures and through the power to transcend paradigms as deep leverage points	No specific focus on marginalised communities.

SES framework by Ostrom	Social-ecological outcomes of a system result from complex interactions among diverse social and ecological system components. The social system includes resource users (actors), the governance system, and rules. The ecological system is defined as resource system and corresponding resource units.	The framework focuses on local communities and resources and often neglects broader scales. Little attention is given to cross-scale power dynamics and the relationships between power, efficiency, sustainability, and effectiveness	No specific focus on marginalised communities.
Landscape geography	Society-nature relationships are viewed holistically as part of interacting spatial and temporal relations. Focus put upon how such relations coincide in space-time, including legacy effects and possible future developments.	This has been a weakness, but critical landscape geographers study power as manifested in the relations underlying the observable landscape, e.g. the uneven distribution of resources between places or groups or how a particular place is dependent on the appropriation of another.	No specific focus on marginalised communities, but can be incorporated in the analysis of power
Biophilia	Humans have an existential need for connection to everything living, yet their character, which influences thoughts and actions, is largely determined by social-economic demands of society.	Structural barriers such as exploitation and class hierarchies prevent the flourishing of biophilia.	Social movements need to change societal structures and create the conditions for biophilia to become the 'social character'.
Connectedness with nature; relating to and identifying with the place	The nature and society are interconnected, affect each other reciprocally. Society-nature well-being is interdependent.	As part of conservation psychology, the concept recognizes that some individuals, groups or institutions often have more influence and control over environmental decision-	Marginalized communities are disproportionately affected by various forms of environmental crisis. CP seeks to empower people and communities to engage in conservation and advocate for a more just

		making and resource management than others.	and sustainable relationship with the environment.
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## 2.2. How do the selected SES conceptual approaches contribute to the PEPE framework?

Over the course of the project, the BIOTraCes team will develop a Theory of Transformative Change, which is based on the PEPE framework with its four principles of Pluralising, Empowering, Politicising and Embedding:

- 1) **Pluralising.** Moving beyond top-down and technocratic approaches for protecting biodiversity by recognising and respecting the wide diversity of values and perspectives (related to the diversity in identities, e.g., gender, lifestyle, religion, culture) about biodiversity as well as human-nature relations, and the associated plurality of knowledge systems that co-exist across social and cultural contexts.
- 2) **Empowering.** Empowering stakeholders, with particular focus on those whose voices are often marginalised due to power asymmetries, by co-producing actionable, equitable and just interventions to navigate sustainability transformation pathways.
- 3) **Politicising.** Address the political dimensions of transformation and structural obstacles for change, including asymmetric power relations, locked-in policies and institutions, and dominant values and interests.
- 4) **Embedding.** Foster the transformative potential of bottom-up local initiatives by connecting them with relevant policy and institutional levels to facilitate change and overcome key obstacles for desired transformational changes. By engaging relevant policy, business and civil society actors (decision makers), the project aims at ensuring uptake of transformative options across sectors (e.g., agriculture and food, forestry, water, urbanisation) and decision-making contexts.

Here we intend to bring in specific SES frameworks and theories to help towards reflexive conceptual decisions by each research partner in their engagement with their case studies. Our approach is descriptive rather than prescriptive as the goal is to offer guidance through the multiple trade-offs of applying a given SES approach or components therein by pointing to strengths and weaknesses associated with each theory/framework in connection to the four PEPE principles of BIOTraCes.

A first categorisation of *low*, *medium*, or *high* derived from the descriptions of each framework/theory below is applied to connect the selected theories and frameworks with the PEPE principles. The categories have been labelled as *low* if they do not include or only marginally touch upon the respective PEPE principles. Theories and frameworks labelled as *medium* do implicitly include notions of pluralising, empowering, politicising or embedding into their analyses. Those labelled as *high* explicitly integrate the respective principle.

Table 2. Contribution of each theory/framework to the PEPE Framework

Conceptual framework/ approach	Contribution to the PEPE Framework			
	Politicising	Embedding	Pluralising	Empower
<b>THEORIES - Epistemic communities</b>				
Ecological Economics	High	Medium	High	Low
Sustainability Science	Low	Medium	Medium	Low
Political Ecology	High	Medium	Medium	High
Environmental Justice	High	Low	Medium	High
Degrowth	High	Medium	High	Medium
Posthumanist approaches	Low	Low	High	Medium
Conservation psychology	High	Medium	Medium	Medium
<b>EXAMPLE FRAMEWORKS THAT DRAW ON THESE THEORIES</b>				
IPBES Conceptual framework	Low	Medium	High	Medium
IPBES Values framework	Medium	High	High	Medium
Complex adaptive systems framework	Low	High	Medium	Low
Leverage points framework	High	Medium	Low	Low
SES framework by Ostrom	Low	High	Low	Low
Landscape geography	Medium	High	Low	Medium
Biophilia	Medium	Low	Low	Low
Connectedness with nature; relating to and identifying with the place	High	Medium	Medium	Medium

### 3. Review summary of SES theories and frameworks

In this section, we present the plural SES theories and frameworks suggested by the BIOTraCes' research team. First, we give an overview over theoretical approaches from key schools of thought and epistemic communities. We focus here on Ecological Economics, Sustainability Science, Political Ecology, Environmental Justice, Degrowth, Posthumanist approaches and Conservation psychology. The second part of this section then focuses on SES conceptual frameworks or conceptual approaches embedded in the different school of thoughts surrounding SES thinking. Those are: IPBES Conceptual framework, IPBES Values framework, Complex adaptive systems framework, Leverage points framework, SES framework by Ostrom, Landscape geography, Biophilia and Connectedness with nature; relating to and identifying with the place.

#### 3.1. Theoretical approaches from key schools of thought and epistemic communities

There are different schools of thought that coalesce into topics of transformative change for environmental sustainability with a social justice perspective, that is where sustainability is inherently connected to societal issues. Each school of thought is typically organised around specific worldviews, shared knowledge, expertise or beliefs, or ways of looking at and understanding the world. Groups of people within different schools of thought give rise to so-called epistemic communities that influence ways of approaching specific issues, e.g., via the development of discursive tools and conceptual frameworks that can influence policymaking by decision-makers. Here we look at a small set of influential disciplinary views (broadly grouped as schools of thought), each with its own epistemic communities that can help situate various conceptual frameworks that are useful for BIOTraCes. Here we review the following schools of thought and academic fields, each with its associated epistemic community: ecological economics, sustainability science, political ecology, environmental justice, degrowth, posthumanist approaches, and conservation psychology.

##### 3.1.1. Ecological Economics

Ecological economics, founded in the 1980s, is a trans- and interdisciplinary field that mainly focuses on the interdependence and co-evolution of economics, institutions and the environment. While its core relies in heterodox economics (e.g., political economy, development economics and institutional economics), it bridges with other disciplines such as ecology and social sciences, e.g., psychology, geography, anthropology, and political ecology. One of its fundamental tenets is that the human economy is a subsystem of Earth's larger ecosystem. It thus promotes enhancing the understanding of economics as embedded within their ecological life-support system, and consequently not separated from the environment or focusing on the environment as an external facet to the economics system. In this way, it promotes SES thinking and in so doing it is differentiated from environmental economics, which reflects the mainstream economic analysis about environmental problems.

A primary objective of ecological economics is to ground economic thinking and practice in physical (and especially biological and ecological) reality, for instance by paying especial attention to the implication of the laws of thermodynamics and in the functioning of



biological systems. Further, well-being in ecological economics tends to be seen as a multi-dimensional concept, differentiated from welfare or utility in mainstream (neoclassical) environmental economics.

Ecological economics strongly questions the view that the sustainability of human welfare can be achieved by assuming that the natural capital may be substituted for other forms of capital (especially human-made capital, e.g., technology and infrastructure). In this vein it supports "stronger" forms of sustainability *viz-a-viz* so-called "weaker" notion of sustainability associated with neoclassical environmental economics, which for instance favour "inclusive wealth" indicators to measure sustainability of a given economic system. Besides focusing on intra and inter-generational efficiency in the allocation of natural resources, it explicitly focuses on normative aspects associated with environmental justice and equity. This is a result of the interest of ecological economics since its foundation for issues of distribution of environmental goods (benefits, e.g., ecosystem services) and bads (burdens, e.g., pollution), and the scale of the economy relative to the ecosystems upon which it relies. A traditional interest by ecological economics is the question of the appropriate scale of the economy within the biophysical boundaries of the ecological system, for instance represented by Herman Daly's (1938-2022) idea of a steady state economy, i.e., an economy where the constant growing is not mandatory in order to enhance wellbeing of people. This has largely influenced the degrowth movement.

Within ecological economics, different conceptual frameworks are used, including the ecosystem services framework although there are important debates about the usefulness of such frameworks especially in the Global South contexts as this is assumed to typically lead to applying monetary valuation to the environment, which while still used in ecological economics, it is increasingly being questioned due to the problems of value incommensurability and value monism that can lead to commodification of the environment. In the European context, ecological economics is also influencing and being influenced by the degrowth movement. In North America, a more pragmatic approach in ecological economics exists which largely favours the ecosystem services approach together with the use of monetary valuation and application of market mechanisms, such as market signals through taxes and subsidies, and more recently as well through new institutions around the idea of Payments for Ecosystem Services (PES), for biodiversity conservation. In this context it is interesting to note that (heterodox) ecological economics and its sister (neoclassical) environmental economics share the need to pay attention to correcting market and other institutional (e.g., policy) failures to achieve enhance more socially efficient resource allocation solutions. They stress the need to internalize negative environmental externalities via quantity-based (e.g., quality or quantity standards, such as pollution limits, certification schemes) or price-based mechanisms (taxes, subsidies, PES, etc). In this case, though, ecological economics also goes further in noting that externalities can sometimes not be seen as unintentional effects but rather intentional "cost-shifting" decisions by powerful actors on less powerful ones. This connects with classical institutional economists such as William Kapp (1910-1976).

As mentioned, overall, ecological economics recognizes the unavoidability of normativity and thus incorporates justice issues in many of its analyses, in ways that enrich models about efficiency of resource allocation under the unavoidable constraints of the physical (e.g., via the laws of thermodynamics) and ecological functioning of the biophysical system in which the economy is embedded.

### Recommended readings:

Common, Michael, and Sigrid Stagl. *Ecological economics: an introduction*. Cambridge University Press, 2005.

Costanza, Robert, et al. "Quality of life: An approach integrating opportunities, human needs, and subjective well-being." *Ecological economics* 61.2-3 (2007): 267-276.

Daly, H.E. and Farley, J., 2011. *Ecological economics: principles and applications*. Island press.

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Gowdy, John, and Jon D. Erickson. "The approach of ecological economics." *Cambridge Journal of economics* 29, no. 2 (2005): 207-222.

Hanaček, K., Roy, B., Avila, S. and Kallis, G., 2020. *Ecological economics and degrowth: Proposing a future research agenda from the margins*. *Ecological Economics*, 169, p.106495.

Kish, K. and Farley, J., 2021. A research agenda for the future of ecological economics by emerging scholars. *Sustainability*, 13(3), p.1557.

Martínez-Alier, Joan, and Roldan Muradian, eds. *Handbook of ecological economics*. Edward Elgar Publishing, 2015.

Munda, G., 1997. Environmental economics, ecological economics, and the concept of sustainable development. *Environmental values*, 6(2), pp.213-233.

Spash, C.L., 2017. Social ecological economics. In *Routledge Handbook of Ecological Economics* (pp. 3-16). Routledge.

### **3.1.2. Sustainability Science**

The 1987 report of the World Commission on Environment and Development (also known as the Brundtland report) marked a milestone towards setting the foundations for developing a research field defined by the study of transitions toward sustainable development. This was underpinned by the need to understand interactions between human and environmental systems and gave rise to what is broadly understood as the field of sustainability science. This field mainly focuses on understanding the challenges of achieving sustainable development understood as the reconciliation of society's human development goals within the planet's environmental limits over the long term (Clark and Dickson 2003). Sustainability science is also typically seen as a field of research that offers insights to make the normative concept of sustainability operational, and the means to plan and implement actions towards this end (Spangenberg, 2011).

Clark (2007) and Kates (2011) identified some key questions as to guide sustainability science, including among others: How can dynamic interactions between humans and environmental systems be better incorporated into models and conceptualizations that integrate the earth system, social development, and sustainability? How are long-term trends in environment and development reshaping nature–society interactions? What determines the adaptability, vulnerability, and resilience of human–environment systems? What are the principal trade-offs between human well-being and the natural environment? Can scientifically meaningful “limits” be defined that would provide effective warning for human–environment systems? What systems of incentive structures can most effectively improve social capacity to guide interactions between nature and society toward more

sustainable trajectories? How can the “sustainability” of alternative pathways of environment and development be evaluated? How can science and technology be more effectively harnessed to address sustainability goals?

Sustainability science is mostly preoccupied by urgent human needs such as access to water supplies, promoting cleaner energy systems, mitigating the human health impact of pollution, enhancing food security, improving management of natural resources for poverty alleviation, among others. Special attention is given to climate mitigation and protecting biodiversity taking into account integrative approaches in particular places where multiple human needs interact. While in origin it is a problem-solving field, sustainability science also engages in generating new knowledge by dealing with issues such as complex systems theory as well as cultural and political ecology (Clark 2007). Sustainability science also typically focuses on integrated analyses and assessments, including through reflective and iterative participatory processes that links science and policy regarding complex science and technology (S&T) issues (Spangenberg, 2011).

#### Recommended readings:

Clark, William C., and Nancy M. Dickson. "Sustainability science: the emerging research program." *Proceedings of the national academy of sciences* 100, no. 14 (2003): 8059-8061

Clark, W.C. ed., 2007. Sustainability science: A room of its own. *Proceedings of the National Academy of Sciences*, 104(6), pp.1737-1738.

Kates, R.W., 2011. What kind of a science is sustainability science?. *Proceedings of the National Academy of Sciences*, 108(49), pp.19449-19450.

Spangenberg, J.H., 2011. Sustainability science: a review, an analysis and some empirical lessons. *Environmental Conservation*, 38(3), pp.275-287.

### **3.1.3. Political Ecology**

Political ecology started in the 1970s from the premise to understand the underlying power dynamics and structural processes, such as economic modernization, that accelerate a socio-environmental crisis (Robert, 2020). While still an anthropocentric lens, political ecology builds upon critical approaches for understandings of the strong connections, interdependencies and linkages between the social and the natural world. Here, the concept of socio-natures is core to a thinking that describes how the interactions between society and nature are continuously shaped by each other as part of the same historical-geographical process (Swyngedouw, 1999; Linton and Budds, 2014). From a Marxist lens, this means that nature and society are co-produced through use-value relations, and under capitalism relations between nature and society are increasingly embedded as part of exchange-value relations (Castree, 2000). Early political ecology research focused on understanding localised and situated social-environmental interactions (Huff and Brock, 2023). With time, the analytical approach developed towards the multi-scale dynamics that drive socio-environmental change in a globalised world (Robert, 2020).

Power is one of the core concepts of the political ecology scholarship. Hereby, studies do look both at those exercising power through some sort of environmental intervention, that is, elite actors, such as institutions, governments, or private actors, and at those whose agency is undermined and disempowered by these interventions, that is, historically marginalized communities. This is with the objective to understand the negative socio-

environmental impacts driven by global elites on those poorer-of communities (Svarstad, Benjaminsen, Overå, 2018). Many early works of Political Ecology embed their analysis of power in a neo-Marxist approach in the context of global capitalism, and more concretely describe the negative consequences of the economic model on society and environment, understanding power in form of networks and webs of complex relationships across all the multiple scales of policy-making. Power is hereby replicated through discourses and narratives by the elites that are the main driving force of environmental change (Robbins, 2004).

More recently, political ecology has offered an intersectional, feminist, and multispecies lens to dimensions of power inherent to many of the structural inequalities yet understudied (Sultana, 2021; Mollett and Faria, 2013). Especially feminist political ecology opens conceptual pathways to shed light on the multi-sited crises that are differently perceived across intersecting identities. That is, special emphasis is set on disentangling how gender, race, socio-economic background, or local histories determine one's likelihood of being vulnerable to socio-environmental change under a neoliberal logic (Harcourt and Nelson, 2015).

#### Recommended readings:

Castree, N. (2000). Marxism and the production of nature. *Capital & Class*, 24(3), 5-36.

Harcourt, W. and Nelson, I. (eds.) (2015). *Practising feminist political ecologies. Moving beyond the green economy*. Zed Books London

Harcourt, W. et al. (2023). *Contours of Feminist Political Ecology*. Palgrave Macmillan.

Huff, A. and Brock, A. (2023). Introduction: Accumulation by restoration and political ecologies of repair, *EPE: Nature and Space* 1–21, DOI: 10.1177/25148486231168393

Linton, J. & Budds, J. (2014). The hydrosocial cycle: defining and mobilizing a relational-dialectical approach to water. *Geoforum*, 57, 170-180.

Mollett, S., & Faria, C. (2013). Messing with gender in feminist political ecology. *Geoforum*, 45, 116–125. <https://doi.org/10.1016/j.geoforum.2012.10.009>

Roberts, J. (2020). "Political ecology". In *The Open Encyclopedia of Anthropology*, edited by Felix Stein. Facsimile of the first edition in *The Cambridge Encyclopedia of Anthropology*. Online: <http://doi.org/10.29164/20polieco>

Robbins, P. (2004). *Political ecology: a critical introduction*. Oxford: Blackwell.

Sultana, F. (2021). Political ecology 1: From margins to center. *Progress in Human Geography*, 45(1), 156–165. <https://doi.org/10.1177/0309132520936751>

Svarstad, H.; Benjaminsen, T.A. and Overå, R. (eds.). 2018. "Power in political ecology", *Special Section of the Journal of Political Ecology* 25: 350-425.

Swyngedouw, E. (1999). Modernity and Hybridity: Nature, Regeneracionismo, and the Production of the Spanish Waterscape, 1890-1930. *Annals of the Association of American Geographers*, 89(3), 443-465.

#### **3.1.4. Environmental Justice/ Intersectionality**

The environmental justice scholarship arose in the context of social, environmental and civil rights movements in the 1980s in the United States (Schlosberg and Collins, 2014).

Those activist groups contested the unequal distribution of environmental bads, that is, environmental pollution and degradation, which affected disproportionately marginalised and racialised groups of society (Agyeman et al. 2022). Beginnings of the Environmental Justice scholarship focused on socio-environmental conflicts surrounding the impacts of environmental degradation and pollution in more rural areas. However, over the last two decades, there has been a turn to include studies understanding the distribution of both environmental bads/dis-services and goods/services across urban areas where green areas' access, design, and management tend to prioritise wealthier residents' needs and perceptions (Anguelovski and Martínez-Alier, 2014).

Environmental Justice scholarship forwards the idea that the well-being of a social community strongly depends on the state of the natural environment. Environment is here understood as not being bounded to a specific place (location), but as reaching across the local, regional and (inter)national scales (Kopina, 2014). In its beginnings, this scholarship further tried to expand the understanding of "environment" moving away from white conservations movements focusing on conserving "wild" nature, towards a more holistic framing of the environment that includes people's place of 'live, work, and play' (Novotny, 2000). That is, Environmental Justice scholarship turned to conceptualizing nature and society as reciprocal (Agyeman et al. 2016). Studies are highly transdisciplinary, with contribution from social sciences and humanities, and more recently also receive broad attention from environmental health scientists that examine the impacts of environmental pollution on physical and mental health.

What started with a focus on the spatial distribution of environmental burdens (that is both access to environmental goods, such as urban parks or gardens, or proximity to degraded and polluted) areas was then advanced towards examining recognition and participation of marginalised perspectives in political decision-making processes (Schlosberg 2007). Since then, the Environmental Justice framework has been consistently adapted in order to understand the complexity of factors that conditions (in)justices towards intersectional analyses. Anguelovski et al. (2020) for example argue for expanding understanding of justice towards its emancipatory, intersectional, and relational dimensions as for paying closer attention to the situated relationship of marginalised communities that are in close interaction with their direct environment.

More recently, the field is now moving towards intersectional climate justice, that is, emphasis is given to multiple intercepting characteristics that determine the likeliness of being negatively affected by environmental impacts under an accelerating climate crisis. Amorim-Maia et al. (2022) for example has developed a justice framework of five components that allows to understand the impacts of the climate crisis through an intersectional lens that builds upon place-based governance forms and an ethics of care. This allows for a closer examination of differential vulnerabilities driven by factors such as gender and race, among others. Intersectionality as a concept was first been put forward by Kimberlé Crenshaw in the 1990s as a critique to "white" feminism that lacked a nuanced understanding of inequalities due to the simplification of the issue to one single identity of gender while overriding racist and colonial factors. More recently the concept refers to the multiplicity of intersecting identities that determine how one is perceived in society, including for example religion, sexual orientation, (dis)abled bodies, or educational background. The conceptualisation of intersectionality is now also accounting for forms of human-nature power relations (Kaijser and Kronell, 2013).

### Recommended readings:

Agyeman, J., Bullard, R. D., & Evans, B. (2002). Exploring the Nexus: Bringing together sustainability, environmental justice and equity. *Space and Polity*, 6(1), 77–90. <https://doi.org/10.1080/13562570220137907>

Agyeman, J, Schlosberg, D, Craven, L., and Matthews, C. (2016). Trends and Directions in Environmental Justice: From Inequity to Everyday Life, Community, and Just Sustainabilities, *Annu. Rev. Environ. Resour.* 2016. 41:321–40, 10.1146/annurev-environ-110615-090052

Amorim-Maia, A.T., Anguelovski, I., Chu, E. and Connolly, J. (2022). Intersectional climate justice: A conceptual pathway for bridging adaptation planning, transformative action, and social equity, *Urban Climate*, Volume 41, 2022, <https://doi.org/10.1016/j.uclim.2021.101053>.

Anguelovski, I., Brand, A. L., Connolly, J. J. T., Corbera, E., Kotsila, P., Steil, J., Garcia-Lamarca, M., Triguero-Mas, M., Cole, H., Baró, F., Langemeyer, J., del Pulgar, C. P., Shokry, G., Sekulova, F., & Argüelles Ramos, L. (2020). Expanding the Boundaries of Justice in Urban Greening Scholarship: Toward an Emancipatory, Antisubordination, Intersectional, and Relational Approach. *Annals of the American Association of Geographers*, 4452, 1–27. <https://doi.org/10.1080/24694452.2020.1740579>

Anguelovski, I. & Martínez-Alier, J. (2014). The 'Environmentalism of the Poor' revisited: Territory and place in disconnected glocal struggles. *Ecological Economics*. Volume 102, June 2014, Pages 167-176, <https://doi.org/10.1016/j.ecolecon.2014.04.005>

Brewer, R., Cecilia A. Conrad & Mary C. King (2002) The Complexities and Potential of Theorizing Gender, Caste, Race, and Class, *Feminist Economics*, 8:2, 3-17, DOI: [10.1080/1354570022000019038](https://doi.org/10.1080/1354570022000019038)

Crenshaw, K. (1991). Mapping the Margins: Intersectionality, Identity Politics, and Violence against Women of Color. *Stanford Law Review*, Jul., 1991, Vol. 43, No. 6 (Jul., 1991), pp. 1241-1299, *Stanford Law Review*, <https://www.jstor.org/stable/1229039>

Kaijser, A. & Kronsell, A. (2013). Climate change through the lens of intersectionality. *Environmental Politics*, 23, P. 417-433,

<https://doi.org/10.1080/09644016.2013.835203> Koprina, H. (2014). Environmental justice and biospheric egalitarianism: reflecting on a normative-philosophical view of human-nature relationship. *Earth Perspectives*, 1(1), 8. <https://doi.org/10.1186/2194-6434-1-8>

Novotny P. *Where We Live, Work and Play: The Environmental Justice Movement and the Struggle for a New Environmentalism*. West Port, CT: Praeger; 2000.

Schlosberg D (2007) *Defining Environmental Justice: Theories, Movements, and Nature*. Oxford University Press, Oxford

Schlosberg D and Collins L (2014). From environmental to climate justice: climate change and the discourse of environmental justice. *WIREs Climate Change*, Volume 5, Issue 3. <https://doi.org/10.1002/wcc.275>

### 3.1.5. Degrowth

Degrowth is a field of radical social-ecological theory by addressing both biophysical limits and global inequality while rejecting neoliberal economics. Degrowth is also a movement that prioritises grassroots initiatives and progressive social-ecological goals, mostly calling for shrinking the human ecological footprint (Martinez-Alier et al 2010). Degrowth puts the scale of economic activity and its related energy and material throughput at the centre of the debate when it comes to ensuring the sustainability of social-ecological systems, since it argues that economic growth cannot be decoupled from environmental pressures at a sufficient rate. Currently, the rate of production and consumption is exceeding biocapacity (Rockström 2009; Steffen et al. 2015). This leaves humanity with two morally acceptable pathways: Pathway one is improving ecological efficiency of the economy so far that economic growth is absolutely decoupled from environmental impact, meaning that economic growth can continue (so-called 'green growth', mostly adhered to by mainstream environmental economists), while pressures on the planetary systems that support human societies declines. Pathway two is opting for sufficiency, i.e. reorganising society and the economy to meet human needs while reducing production and consumption to a scale within planetary boundaries. While the idea of green growth has been the dominant policy response from governments and international organisations to climate change and ecological breakdown over the past decades (see OECD 2011; UNEP 2011; World Bank 2012), Degrowth has emerged as a social movement and academic field which questions its feasibility.

Degrowth scholars have brought forward different theoretical and empirical arguments against green growth. Empirically, a decoupling of GDP growth and environmental pressures has so far not been observed "on anywhere near the scale needed to deal with environmental breakdown" (Parrique et al. 2019, p. 3). A future absolute decoupling remains unlikely because of the 'problem shifting' tendency of technological solutions, i.e. solving one environmental problem but creating another (e.g. lithium and cobalt extraction for electric cars, land use increase for biofuels or radioactive waste production from nuclear energy) (Parrique et al. 2019).

Degrowth scholars and activists furthermore argue that efficiency improvements because of technological innovation do not tend to lead to absolute reductions in energy and material use in capitalist markets, since the falling cost resulting from efficiency increases demand. This rebound effect was first documented by William Stanley Jevons in 1865, who found that technological innovations that improved the efficiency of coal use led to an increase in its consumption and has therefore been dubbed the 'Jevons Paradox' (Jevons 1865). Lastly, proponents of degrowth question the necessity for economic growth for achieving wellbeing. Based on Richard Easterlin's pioneering work, it has been shown that the correlation between increased income and wellbeing over time is marginal in rich countries (Easterlin 1974). At the same time, a correlation between higher income and wellbeing can be observed at a certain point in time. This so-called 'Easterlin Paradox' suggests that above a certain threshold where basic needs are met, the critical factor for wellbeing is not a growth in income, but its height in comparison to others. This means that a reduction in GDP coupled with measures for more equal distribution could in fact increase wellbeing in high-income countries.

In light of these arguments against the possibility and desirability of unlimited growth, degrowth presents itself as a conceptual framework for 'decolonizing the imaginary' from growth (Latouche 2009) and "imagining and enacting alternative ways of articulating society, the economy, and nature" (Akbulut 2021, p. 98). Green growth promises a win-

win solution and a continuation of the current economic order, presenting ecological degradation as a technical issue which only requires technocratic regulation and technological innovations to be solved. Due to finite resources and planetary boundaries emphasized by degrowth scholars and activists, however, sustainability becomes a highly political question that needs to address the fair distribution of limited resources. This process of re-politicization of sustainability requires recognising hegemony – the “naturalization of the need of economic growth [...] and capitalism as the only reasonable and possible form of organization of socio-natural metabolism” (Swyngedouw, 2014, p. 91) – and opening up debates and new pathways for provisioning and relationships between society and non-human nature. While this process is meant to result in a “matrix of alternatives” (Latouche 2015, p. 209) and not one fixed solution, the overall objective of degrowth has been defined as the “equitable downscaling of production and consumption that increases human well-being and enhances ecological conditions” (Schneider 2010 et al., p. 511), based on principles such as sharing, simplicity, conviviality, care and the commons (Kallis et al. 2014).

#### Recommended readings:

Akbulut, B. (2021). Degrowth. *Rethinking Marxism*, 33(1), 98-110.

Easterlin, R. A. (1974). Does economic growth improve the human lot? Some empirical evidence. In *Nations and households in economic growth* (pp. 89-125). Academic press.

Jevons, W. S. (1865). *The coal question*, 3rd ed. 1965. New York: Augustus M. Kelley

Kallis, G., Demaria, F., & D’Alisa, G. (2014). Introduction: degrowth. In: D’Alisa G, Demaria F, Kallis G (eds) *Degrowth: a vocabulary for a new era* (pp. 1-18). Routledge, London

Latouche, S. (2009). *Farewell to growth*. Cambridge, UK: Polity.

Latouche, S. (2015). Is a degrowth society desirable?. *Revue juridique de l’environnement*, (2), 208-210.

Martínez-Alier, J., Pascual, U., Vivien, F.D. and Zaccai, E., 2010. Sustainable de-growth: Mapping the context, criticisms and future prospects of an emergent paradigm. *Ecological economics*, 69(9), pp.1741-1747.

Organisation for Economic Cooperation and Development (OECD) (2011). *Towards green growth*. Paris: OECD

Parrique, T., Barth, J., Briens, F., Kuokkanen, A., & Spangenberg, J. H. (2019). Evidence and arguments against green growth as a sole strategy for sustainability. *European Environmental Bureau*.

Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin III, F. S., Lambin, E., ... & Foley, J. (2009). Planetary boundaries: exploring the safe operating space for humanity. *Ecology and society*, 14(2).

Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., ... & Sörlin, S. (2015). Planetary boundaries: Guiding human development on a changing planet. *Science*, 347(6223), 1259855.

Swyngedouw E (2014). Depoliticization (‘the political’). In: D’Alisa G, Demaria F, Kallis G (eds) *Degrowth: a vocabulary for a new era*. Routledge, London



United Nations Environment Programme (UNEP) (2011). *Towards a green economy: pathways to sustainable development and poverty eradication – a synthesis for policy makers*. Nairobi: UNEP.

World Bank (2012). *Inclusive green growth: the Pathway to sustainable development*. Washington, DC: World Bank.

### **3.1.6. Posthumanist approaches**

Posthuman approaches shed light on the entanglements of society and nature, such as e.g. in political ecology society-nature conceptualizations, and go even further by applying a critique of anthropocentrism. Posthuman approaches hence attribute agency and rights to non-human and more-than-human entities, including living beings but also technologies and infrastructures (Blanco-Wells, 2021; Whatmore, 2006). While attributing agency to a broader range of actors, posthuman approaches also acknowledge the unequal distribution of power in-between each actor category as not every human has equal rights in a world characterised by a patriarchal, capitalistic and colonial dynamics (Celermajer et al. 2021). These approaches intend to overcome the antagonism of the different non-human, more-than-human and human actors by offering ways to explore the symbiotic multispecies relationships that are embedded in assemblages. The work of Donna Haraway and Anna Tsing (2015) has here been ground-breaking, as they deliver a nuanced analysis of the depth of interconnectedness of the multiple species, human and beyond. Tsing (2015) follows for example the ecologically and socially interwoven story of the matsutake mushroom in the context of capitalist ruins, while Haraway creates Science Fiction utopia of humans and more-than-humans living together.

What is central to a posthuman reading of nature-society relationships is to overcome the divide between nature and society/humans/culture – an outcome of mainly western and more recent thinking (Descola, 2013). Still, as Maller (2021) emphasises, although more-than-human approaches have become embedded in Western knowledge production, they draw on Indigenous and non-western ontologies from e.g. Indigenous and Amerindian perspectives, such as Viveiros de Castro's (1996) theory on Perspectivism and Natural Relativism or theories on Amerindian sociability by Fernando Santos-Granero (2009). This means that care must be taken to not reinforce and replicate already existing ontological and epistemological power dynamics.

Like related scholarly fields such critical theory and science and technology studies (STS), posthumanist approaches are based on a relational ontology that considers that agency, discourse, knowledge, power, nature, identities are emergent and constituted in relations (Ingold 2004; West et al 2020; Scoones et al 2020). This means that none of these can be taken a given or cast as a cause or independent variable that explains one of the others (Mol 2002, Latour 1993). This is one reason why these relational approaches have been influential by various emancipatory movements that advocate against the oppression produced by fixed and binary categorisations, for example movements related to nature rights, feminism, and intersectionality. The recognition of relationality also profoundly influences the conceptualization of knowledge, and of knowledge-action relations. In particular, it foregrounds the importance of performativity; the idea that knowledge, while attempting to represent reality, in fact produces reality (Turnhout 2018). From that perspective, knowledge must be evaluated not in terms of its accuracy or neutrality, but in terms of its political effects and its consequences for human and ecological justice and well-being. This suggests that in order to facilitate transformative change, knowledge

production needs to bring worlds into being with transformative potential, worlds that are emancipatory, just, pluralist and sustainable and that open up space for societal actions to further foster such worlds. Posthumanist and relational forms of knowledge production have this potential because they decentre humans and unfix and de-essentialise notions of identity, values, or interests.

Recently, there has been one concept coming to the fore with the goal to embed a more-than-human reading in environmental governance: multispecies environmental justice. This approach departs from the Environmental Justice scholarship yet expands its frameworks towards non-human entities. That is, the multispecies framework builds on a critique of human exceptionalism and its moral assumptions "a) that humans are physically separate or separable from other species and non-human nature, b) that humans are unique from all other species because they possess minds (or consciousness) and agency and c) that humans are therefore more important than other species" (Celermajer et al., 2021). Recent publications argue for policies that integrate a view that is not prioritising humans' needs over those from other non-human and more-than-human actors (Pineda-Pinto et al. 2023). One way of doing that has been put forward through the concept of Ecologies of repair that thereby describes the "spatial fixing" of our natural environment and surrounding infrastructures, in order to repair what has been extracted and/ or destroyed by (human) society through capitalistic industrial activity. At the centre of this approach is the relationship of humans with their natural environment through care (Blanco-Wells, 2021).

#### Recommended readings:

Blanco-Wells, G. (2021). Ecologies of Repair: A Post-human Approach to Other-Than-Human Natures, *Front. Psychol.* 12:633737., doi: 10.3389/fpsyg.2021.633737

Celermajer, D., Schlosberg, D., Rickards, L., Stewart-Harawira, M., Thaler, M., Tschakert, P., Verlie, B., & Winter, C. (2021). Multispecies justice: theories, challenges, and a research agenda for environmental politics. *Environmental Politics*, 30(1–2), 119–140. <https://doi.org/10.1080/09644016.2020.1827608>

Descola, P. (2013). *Beyond Nature and Culture*. Chicago University Press

Haraway, D. (2016). *Staying with the trouble. Making kin in the Chthulucene*. Duke University Press.

Huff, A. and Brock, A. (2023). Introduction: Accumulation by restoration and political ecologies of repair, *EPE: Nature and Space* 1–21, DOI: 10.1177/25148486231168393

Ingold, T. 2004. Beyond biology and culture. The meaning of evolution in a relational world. *Social Anthropology* 12(2):209-221.

Latour, B. 1993. *We Have Never Been Modern*. Cambridge, MA: Harvard University Press.

Lien, M.E. & Pálsson, G. (2019). 2019): *Ethnography Beyond the Human: The 'Other-than-Human' in Ethnographic Work*, *Ethnos*, DOI:10.1080/00141844.2019.162879

Lorimer, J. (2015). *Wildlife in the Anthropocene: Conservation after Nature*, 2015, University of Minnesota Press

- Mol, A. 2002. *The Body Multiple: Ontology in Medical Practice*. London: Duke University Press.
- Maller, C. (2021). Turning things around: A discussion of values, practices, and action in the context of social-ecological change. *People and Nature*, December 2020, 1–13. <https://doi.org/10.1002/pan3.10272>
- Pineda-Pinto, M., Kennedy, C., Collier, M., Cooper, C., O'Donnell, M., Nulty, F., & Castaneda, N. R. (2023). Finding justice in wild, novel ecosystems: A review through a multispecies lens. *Urban Forestry & Urban Greening*, 83, 127902. <https://doi.org/10.1016/j.ufug.2023.127902>
- Santos-Granero, F. (2009). *The Occult Life of Things. Native Amazonian Theories of Materiality and Personhood*. The University of Arizona Press Tucson.
- Scoones, Ian, Andrew Stirling, Dinesh Abrol, Joanes Atela, Lakshmi Charli-Joseph, Hallie Eakin, Adrian Ely, Per Olsson, Laura Pereira, Ritu Priya, Patrick van Zwanenberg, and Lichao Yang. 2020. "Transformations to sustainability: combining structural, systemic and enabling approaches." *Current Opinion in Environmental Sustainability* 42:65-75.
- Tschakert, P. (2022). More-than-human solidarity and multispecies justice in the climate crisis. *Environmental Politics*, 31(2), 277–296. <https://doi.org/10.1080/09644016.2020.1853448>
- Tsing, A. (2015). *The mushroom at the end of the World. On the possibility of Life in Capitalist Ruins*, Princeton University Press.
- Turnhout, E., 2018. The politics of environmental knowledge. *Conservation and Society*, 16(3), 363-371.
- Viveiros de Castro, E. (1996). Images of Nature and Society in Amazonian Ethnology, *Annual Review of Anthropology*, Vol. 25 (1996), pp. 179-200
- West, Simon, L. Jamila Haider, Sanna Ståhlhammar, and Stephen Woroniecki. 2020. "A Relational Turn for Sustainability Science? Relational Thinking, Leverage Points and Transformations." *Ecosystems and People* 16 (1): 304–25.
- Whatmore, S. (2006). Materialist returns: Practising cultural geography in and for a more-than-human world. *Cultural Geographies*, 13(4), 600–609. <https://doi.org/10.1191/1474474006cgj3770a>

### 3.1.7. Conservation psychology

The term conservation psychology refers to "the use of psychological techniques and research to understand and promote a healthy relationship between humans and the natural environment" (Clayton & Myers, 2015; p. 15). It was coined around 2000s as a response to the need to promote visibility of a research and researchers in this domain. The specific aim was to draw the attention of the public, as well as professionals, including psychologists and non-psychologists, to the current state of research in exploring how the human-nature relationship can be restored, made more ethical and harmonized. Additionally, the goal was to understand how long-lasting behavioral changes that benefit nature can be achieved at both individual and collective levels (Clayton & Myers, 2015). Furthermore, conservation psychology serves as a platform that connects psychology practitioners and researchers who are dedicated to environmental conservation. The platform was created by establishing *Society for Environmental, Population, and*

*Conservation Psychology: Division 34 at American Psychological Association* that enables experts from all over the world to connect to the network of conservation psychologists (Richards, 2000).

Conservation psychology recognizes that power relationships play a significant role in shaping how societies interact with the natural world (Amel et al., 2017; Dietsch et al., 2021; Scott et al., 2021). These power dynamics can manifest in various ways, such as unequal access to resources, decision-making processes that prioritize economic interests over environmental conservation and environmental injustices that disproportionately affect marginalized communities (e.g., case on building river dams in rural Portugal; Batel & Küpers, 2022). Conservation psychologists work to highlight these power imbalances and advocate for more equitable and sustainable approaches to conservation (e.g., Batel, 2021; Küpers & Batel, 2023; Ryder et al., 2023); they may work to raise awareness about environmental issues, mobilize public support, promote acknowledgement of indigenous knowledge, inform policy to promote sustainability and address the interests of marginalized groups (Amel & Manning, 2019; Manning et al., 2021; Normann, 2021).

While generally conservation psychology highlights that the current environmental crisis and biodiversity loss are the result of both individual and collective (in)actions of people (SEPCP, 2011), researchers within the field are increasingly focusing on the well-being of nature, such as the conservation of ecosystems and biodiversity, as well as the empowerment of marginalized groups. But still, a significant body of research still approaches these topics through the instrumental lens of ecosystem services, particularly exploring how nature conservation can benefit the wellbeing of humanity.

*Recommended readings:*

Amel, E., & Manning, C. (2019). Fostering collective effort toward ecosystem conservation. In *E3S Web of Conferences* (Vol. 119, p. 00006). EDP Sciences. <https://doi.org/10.1051/e3sconf/201911900006>

Amel, E., Manning, C., Scott, B., & Koger, S. (2017). Beyond the roots of human inaction: Fostering collective effort toward ecosystem conservation. *Science*, 356(6335), 275-279. <https://doi.org/10.1126/science.aal1931>

Batel, S. (2021). A brief excursion into the many scales and voices of renewable energy colonialism. In *Routledge Handbook of Energy Democracy* (pp. 119-132). Routledge.

Batel, S., & Küpers, S. (2022). Politicizing hydroelectric power plants in Portugal: spatio-temporal injustices and psychosocial impacts of renewable energy colonialism in the Global North. *Globalizations*, 1(20), 887-906. <https://doi.org/10.1080/14747731.2022.2070110>

Clayton, S., & Myers, G. (2015). *Conservation psychology: Understanding and promoting human care for nature* (2<sup>nd</sup> ed.). John Wiley & Sons.

Dietsch, A. M., Wald, D. M., Stern, M. J., & Tully, B. (2021). An understanding of trust, identity, and power can enhance equitable and resilient conservation partnerships and processes. *Conservation Science and Practice*, 3(6), e421. <https://doi.org/10.1111/csp2.421>

Küpers, S., & Batel, S. (2023). Time, history and meaning-making in research on people's relations with renewable energy technologies (RETs)—A conceptual proposal. *Energy Policy*, 173, 113358. <https://doi.org/10.1016/j.enpol.2022.113358>

Manning, C., Bautista, A., & Anderson, A. (2021). *A Call for Change: Minnesota Environmental Justice Heroes in Action*. DeWitt Wallace Library, Macalester College. <https://mlpp.pressbooks.pub/environmentaljustice>

Normann, S. (2021). Green colonialism in the Nordic context: Exploring Southern Saami representations of wind energy development. *Journal of community psychology, 49*(1), 77-94. <https://doi.org/10.1002/jcop.22422>

Richards, J. M., Jr. (2000). A history of Division 34: The Division of population and Environmental Psychology. In D. A. Dewsbury (Ed.) *Unification Through Division, Histories of the Divisions of the American Psychological Association, Volume 5* (pp. 113-136). Washington, DC: American Psychological Association.

Ryder, S., Walker, C., Batel, S., Devine-Wright, H., Devine-Wright, P., & Sherry-Brennan, F. (2023). Do the ends justify the means? Problematizing social acceptance and instrumentally-driven community engagement in proposed energy projects. *Socio-Ecological Practice Research, 5*, 189–204. <https://doi.org/10.1007/s42532-023-00148-8>

Scott, B. A., Amel, E. L., Koger, S. M., & Manning, C. M. (2021). How Did We Get Here? Power, Privilege, and a Paradigm Problem. In (eds.), *Psychology for sustainability*. Routledge.

SEPCP (Society for Environmental, Population, and Conservation Psychology: Division 34) (2011). Conservation Psychology. Accessed via <https://www.apadivisions.org/division-34/interests/conservation>

### 3.2 Example conceptual frameworks

Conceptual frameworks can be seen as being built by a set of concepts that are relevant for analysing a given phenomenon. Conceptual frameworks can work as “boundary objects” for inter- and transdisciplinary communication. They are tools by which complex systems can be clarified. Further, conceptual frameworks can be used inductively to generate new descriptions of social-ecological systems and causal relations within them. For example, in sustainability science such frameworks are often characterised as box-and-arrow frameworks, based on the specific variables or factors (boxes) that have a causal influence (arrows) on other factors. Conceptual frameworks can facilitate the deliberation of essential components and interactions of social-ecological systems and to highlight gaps in understanding and uncertainties. It is key to note that all conceptual frameworks are inherently value-laden, involving balance and contention among and between different epistemic communities and their underlying ideologies, principles and interests (Díaz et al., 2015). Here we briefly summarize a few SES conceptual frameworks or conceptual approaches (not necessarily based on box-and-arrow ways of depicting a system or issue) embedded in the different school of thoughts surrounding SES thinking described above.

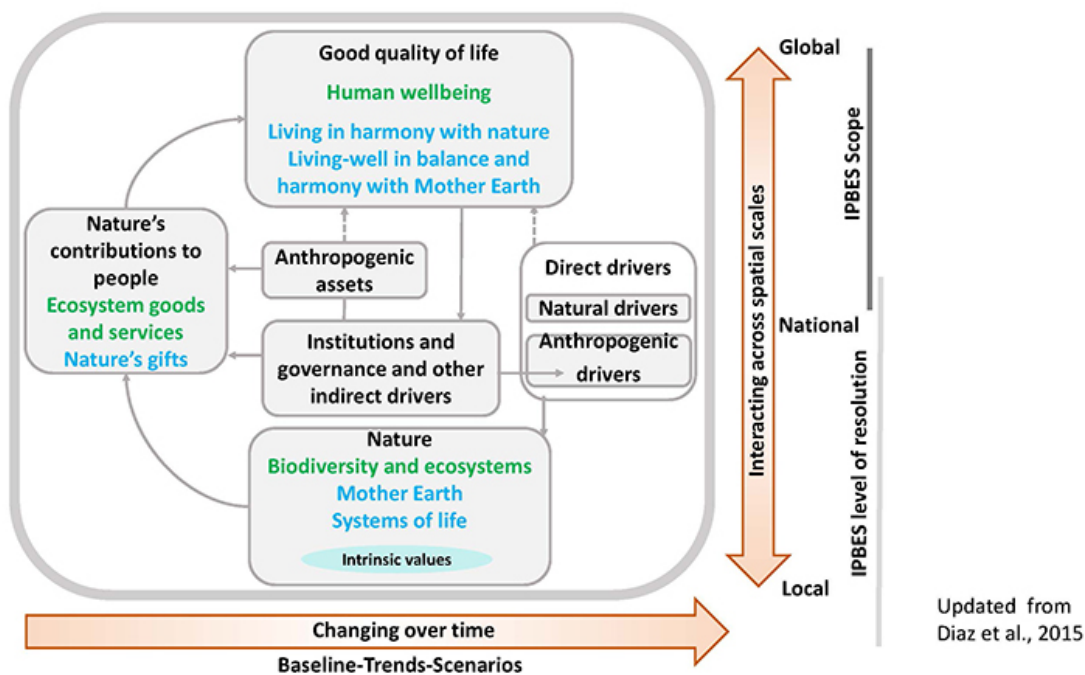
#### 3.2.1. IPBES Conceptual framework

The Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), established in 2012, is a global effort by governments, academia, and civil society organizations to assess and promote knowledge of the Earth’s biodiversity and ecosystems, and their contribution to the quality of life of people, to inform policy formulation (Diaz et al 2018). IPBES engages with a wide range of stakeholders with multiple knowledge systems. IPBES developed a conceptual framework (CF) for its assessments which was approved by IPBES plenary and published in Diaz et al (2015). The CF is a simplified model that captures key interactions between people and nature. It is the main analytical scaffolding for IPBES assessments, and it was formally adopted by IPBES in 2013. A key aspect of the IPBES CF is that it explicitly recognizes that representations of human–nature relationships vary across cultures and knowledge systems. Hence, the CF highlights the central role that institutions, governance and decision-making play on the links among nature, its contributions to people and people’s quality of life, given the multiple worldviews and knowledge systems.

The CF includes six primary interlinked elements representing the natural and social systems (Diaz et al 2015): 1) “Nature” refers to the natural world with an emphasis on the diversity of living organisms and their interactions among themselves and with their environment. it includes categories such as biodiversity, ecosystems, living natural resources, and biocultural diversity; 2) ‘Anthropogenic assets’ refers to build infrastructure, health facilities, knowledge (including ILK and technical or scientific knowledge, as well as formal and nonformal education), technology (both physical objects and procedures), and financial assets, among others; 3) nature’s contributions to people (NCP) that includes all the contributions, both positive and negative, of living nature to people’s quality of life; 4) ‘Institutions and governance systems and other indirect drivers’ are the ways in which people and societies organise themselves and their interactions with nature at different scales. They are the underlying causes of change that are generated outside the ecosystem in question. They are assumed to influence all aspects of relationships between people and nature. 5) ‘Direct drivers’, both natural and anthropogenic including ‘natural direct drivers’ (i.e. those that are not the result of human activities) and ‘Anthropogenic direct drivers’ (i.e. those that are the result of human decisions and actions, via institutions and

governance systems), and 6) Good quality of life' which is highly value-based and context-dependent state comprising multiple factors, including e.g. livelihood security, equity, cultural identity, material prosperity, spiritual satisfaction, freedom of choice, action and participation in society).

The notion of NCP was further developed by IPBES in response to challenges in the application of its main antecedent, the ecosystem service concept popularised by the Millennium Ecosystem Assessment as an attempt to include other knowledge systems and worldviews represented in the social sciences and other stakeholders such as indigenous and local communities. The NCP framing recognizes that a range of worldviews and positionalities exist within the human-nature continuum. For instance, at one extreme humans and nature may be viewed as distinct, as the ecosystem services framing does at the other, humans and other than human entities are seen as interwoven in deep relationships such as kinship and reciprocal obligations (Diaz et al 2018). Further, NCP are conceptualised as being co-produced by natural assets and human-made assets and that such coproduction is understood through different cultural lenses. Culture is thus a meta-concept in that culture gives meaning to all NCP and thus it is not something reduced to the idea of cultural ecosystem services.



**Figure 1:** The IPBES Conceptual Framework

Recommended readings:

Díaz, S., Demissew, S., Carabias, J., Joly, C., Lonsdale, M., Ash, N., ... & Zlatanova, D. (2015). The IPBES Conceptual Framework—connecting nature and people. *Current opinion in environmental sustainability*, 14, 1-16.

Díaz, S., Pascual, U., Stenseke, M., Martín-López, B., Watson, R.T., Molnár, Z., Hill, R., Chan, K.M., Baste, I.A., Brauman, K.A. and Polasky, S., (2018). Assessing nature's contributions to people. *Science*, 359(6373), pp.270-272.

Hill, R., Díaz, S., Pascual, U., Stenseke, M., Molnár, Z., Van Velden, J. (2021). Nature's contributions to people: Weaving plural perspectives. *One Earth*, 4(7), 910-915. DOI: 10.1016/j.oneear.2021.06.009

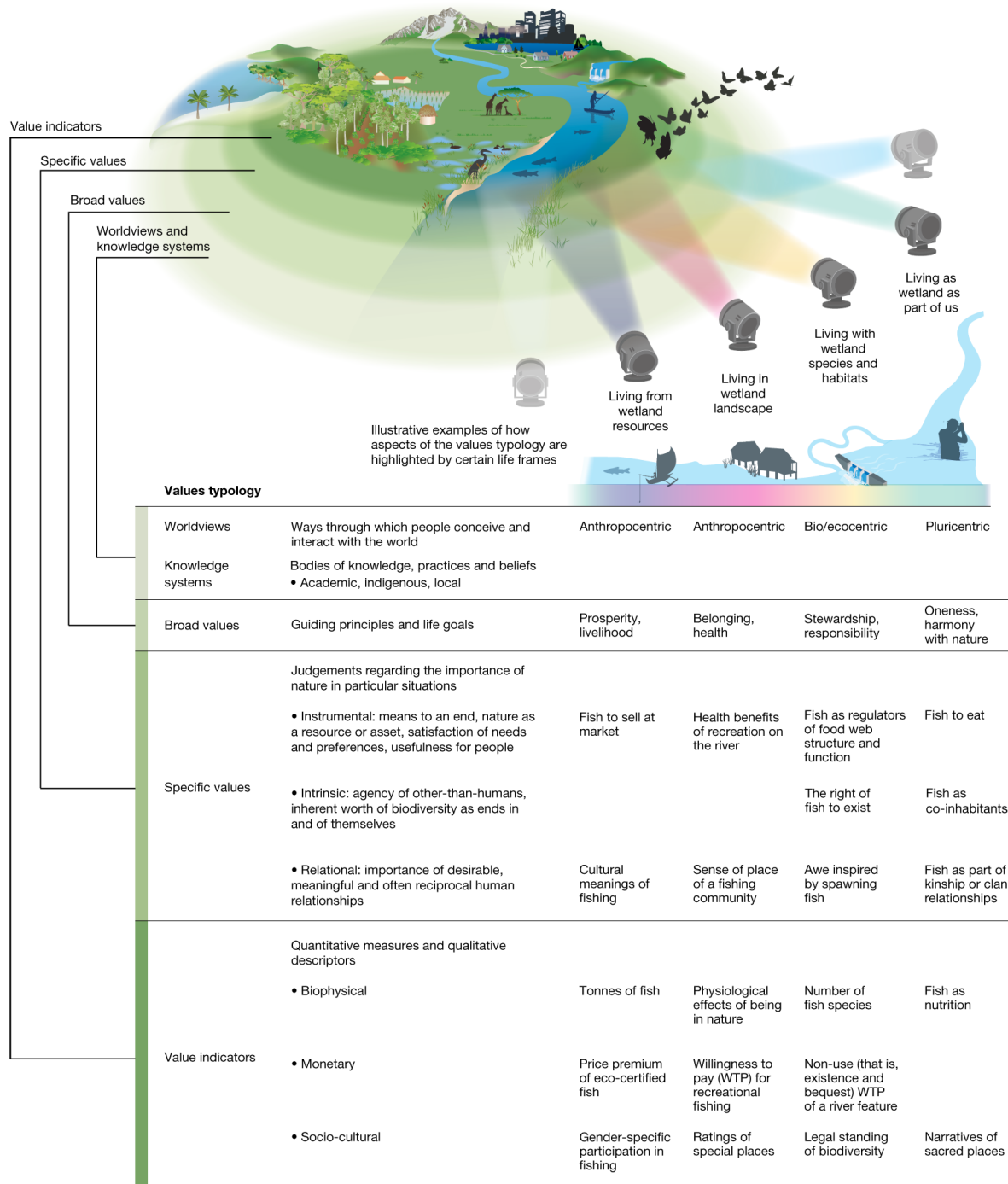
### 3.2.2. IPBES Values framework

The IPBES-CF emphasises the plurality of values about nature and NCP. But the ways people form and express values are complex. This led to the Values Assessment (VA) of IPBES which has put forward a conceptual approach to understanding value plurality (IPBES 2022a, 2022b). The VA provides an inclusive conceptual framework based on a cross-epistemic approach to help recognise and operationalise nature's diverse values in research and decision-making.

The framework is akin to a typology of nature's values (Pascual et al 2023; Raymond et al 2023). It contains four conceptual value layers. The first one, 'worldviews', encompass the ways people conceive and interact with the world, expressed through 'knowledge systems' (bodies of knowledge, practices and beliefs associated with culture and language). Worldviews are classified as anthropocentric (prioritising human interests) or biocentric and eco-centric (emphasising living beings or nature's processes as a whole). Pluri-centric is also used in the typology to encompass those worldviews with no single 'centre' (focusing on several intertwined relationships among humans, other-than-human beings, nature's components and systemic processes). The second layer, 'broad values' (e.g., justice, stewardship, unity, and responsibility) entail the moral principles and life goals held and expressed by individuals, groups and through the institutions (norms and rules) that guide people's interactions with nature and with each other. The third layer, 'specific values', refer to how judgements regarding the importance of nature and its contributions to people are justified in 'specific' contexts. Within specific values the VA emphasises "instrumental values" (nature as a means to a desired human end), "intrinsic values" (value of nature, considered and expressed by people, as an end in itself), and "relational values" which refer to how people express the importance of meaningful relationships between people and nature and among people through nature such as reciprocity and care. The fourth layer, 'value indicators' are quantitative measures and qualitative descriptors used to denote nature and people-nature relationships and nature's contributions to people (NCP) typically in biophysical, monetary or socio-cultural terms.

The values conceptual framework for transformative change lies in navigating interactions within and among its value layers and value types within each layer. This is particularly useful for identifying the ways in which people express divergent or overlapping values for the same elements or entities (e.g., biodiversity, ecosystems). Identifying other types of interactions among value layers can help for instance understand how broad values emerge from worldviews and subsequently express contextually as specific values measured by appropriate indicators (Raymond et al 2023).





**Figure 2.** An inclusive typology of the many values of nature (Pascual et al 2023).

Recommended readings:

Pascual, U., Balvanera, P., Anderson, C.B. et al. Diverse values of nature for sustainability. *Nature* 620, 813–823 (2023). <https://doi.org/10.1038/s41586-023-06406-9>

IPBES, 2022a. *Summary for Policymakers of the Methodological Assessment of the Diverse Values and Valuation of Nature of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. Pascual, U. et al. eds. <https://zenodo.org/record/6522392>

IPBES, 2022b. *Methodological Assessment of the Diverse Values and Valuation of Nature of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. Balvanera, P., Unai, P., Christie, M. & González-Jiménez, D. (eds). <https://doi.org/10.5281/zenodo.6522522>

Raymond CM, Anderson CB, Athayde S, Vatn A, Amin A, Arias- Arevalo P, Christie M, Cantu-Fernandez M, Gould RK, Himes A, Kenter JO, Lenzi D, Muraca B, Muali R, O'Connor S, Pascual U, Sachdeva S, Samakov A, Zent E, 2023: An inclusive values typology for navigating transformations toward a just and sustainable future. *Curr Opin Environ Sustain*. <https://doi.org/10.1016/j.cosust.2023.101301>

### 3.2.3. Complex adaptive systems framework

Typically SESs are conceptualised as complex adaptive systems that follow six organising principles (Preiser et al., 2018; Clements et al 2023): Complex adaptive systems (1) are inherently relational, that is, the behaviour of social-ecological systems are mainly determined by the interactions among their components and this (2) allows them to adjust and adapt to changing conditions in a continuous fashion; (3) involve (non-linear) dynamic processes that can lead to negative feedbacks that maintain a system in its current state, or positive feedbacks that push it into an entirely different state (this also implies that small changes can lead to large and possibly surprising events that are difficult to predict). Social Ecological systems (4) are open and hence it is typically a challenge to know which elements are inside the system and are outside its assumed boundary; (5) are contextually determined so that when the context changes, the system typically changes as a result; and (6) involve emergence of novel qualities through complex causalities (i.e., cause and effect are often unclear and not unidirectional). Together these principles imply that emergent system properties are factors that allow to trigger novelty, creativity, novelty, adaptation, and coevolution of system components.

Within this way of conceptualising social-ecological systems, the notions of resilience and regime shifts are key. Early definitions of ecological resilience focused on the degree of change a system can absorb without affecting its basic structure and function - i.e., without undergoing a regime shift. This interpretation has evolved to reflect the capacity of a system to persist in the face of disturbance and change, while continuing to adapt and develop, or transform in order ways that is sustainable (i.e. can sustain human well-being). This implies that resilience is thus now understood more as a normative way to reflect the capacity of systems to navigate shocks, uncertainty and change, to facilitate desired outcomes (Moser et al., 2019).

#### Recommended readings:

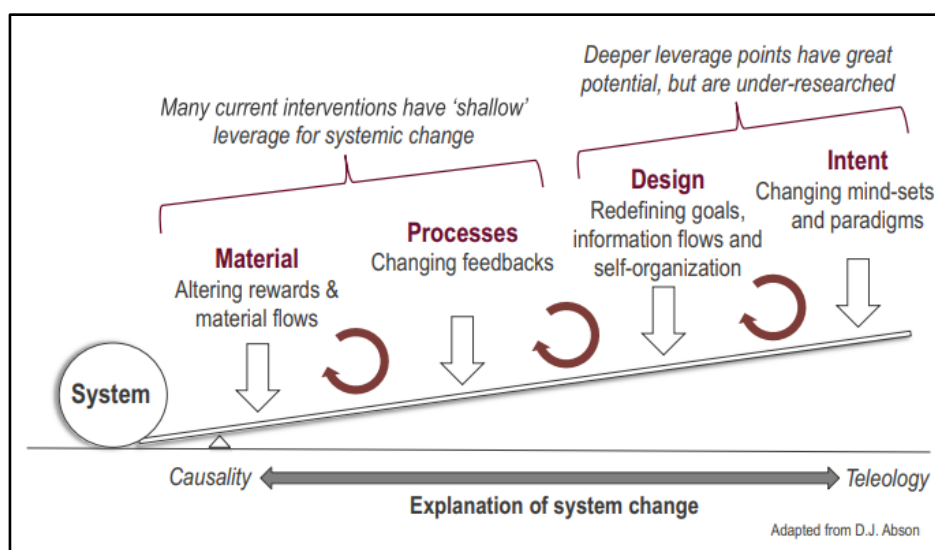
Hayley S. Clements, Reinette Biggs, Maïke Hamann, Odirilwe Selomane, Nadia Sitas. *Social-Ecological Systems Thinking and Biodiversity*. Encyclopedia of Biodiversity (3rd edition)

Moser, S. *et al.* (2019) The turbulent world of resilience: interpretations and themes for transdisciplinary dialogue, *Climatic Change*, 153(1–2), 21–40.

Preiser, R. *et al.* (2018) Social-ecological systems as complex adaptive systems: organizing principles for advancing research methods and approaches, *Ecology & Society*, 23(4), 46.

### 3.2.4. Leverage points framework

The leverage points framework comes from a perspective of systems thinking. It describes places within a complex system “where a small shift in one thing can produce big changes in everything” (Meadows 1999). Donella Meadows (1999) first defined twelve of these places to intervene in a system. Later these were synthesized by Abson et al. (2017) into four categories in increasing order of effectiveness: parameters, feedback between variables, system design, and the intent of a system. Parameters refer to modifiable characteristics (such as taxes and standards) or physical elements (such as material stocks and flows). Feedback refers to the interconnections between elements of a system (reinforcing or dampening feedback loops). The design characteristics are the information flows, power relations and rules in a system. Lastly, the intent of a system refers to the norms, values and goals embedded in the system and the mindset/paradigm out of which it emerges (Abson 2017).



**Figure 3:** Schematic illustration of four realms of leverage (Source: Fisher & Riechers 2019)

Depending on what kind of system property an intervention acts upon it can lead to transformative change or more superficial changes (Abson et al. 2017). The ‘shallow’ leverage points can be tackled quite easily but do not alter the fundamental functioning of the system. ‘deep’ leverage points, on the other hand, are difficult to influence but result in a transformative change to the system (Meadows 1999).

Applied to sustainability, this framework helps to explain why despite the considerable attention paid to the matter in both science and politics, we have not managed to change any of the main societal trajectories towards sustainability. An atomized focus has led to policy interventions that target specific parameters (such as carbon pricing), while failing to address the underlying structures, values and goals that shape the direction of the overall system – for example the belief in the possibility and desirability of boundless economic growth (Abson et al. 2017).

### Recommended readings:

Abson, D. J., Fischer, J., Leventon, J., Newig, J., Schomerus, T., Vilsmaier, U., ... & Lang, D. J. (2017). Leverage points for sustainability transformation. *Ambio*, 46, 30-39.

Fischer, J., & Riechers, M. (2019). A leverage points perspective on sustainability. *People and Nature*, 1(1), 115-120.

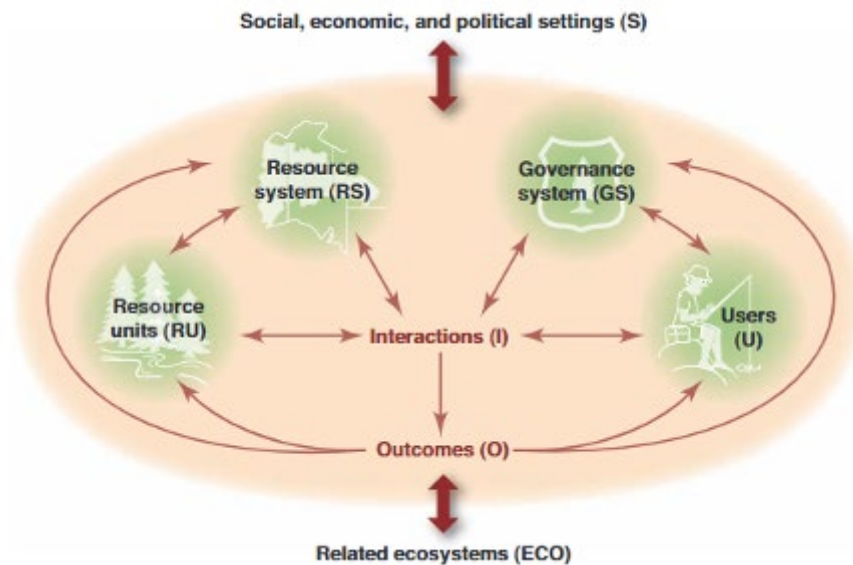
Meadows, D. (1999). Leverage points. *Places to Intervene in a System*, 19, 28.

### **3.2.5. Ostrom's SES framework**

The social-ecological system framework (SESF) is an interdisciplinary diagnostic tool for the study of complex SESs designed by Ostrom (Ostrom, 2007, 2009). Ostrom's model is characterized by a flexible structure, that can be combined with grounded theory. Based on decades of research on common property governance and derived from the institutional and development (IAD) framework, the SES framework suggests that social-ecological outcomes such as sustainability of a resource system are a function of the complex interactions among the diverse social and ecological components of that system (Vogt et al., 2015).

Ostrom developed the SESF to improve how case study data is reported and it can be used for cross-case comparisons. With the data and results from SESFs work, the SES theory can be enhanced and improved. The SESF consists of six groups of variables (figure 1) (Ostrom, 2009). The social system is composed of resource users (actors) and the governance system that influences the actions of the users by defining rules as well as monitoring and sanctions mechanism. The ecological system is conceptualized from an anthropocentric perspective as resource system, e.g., water, forest, and corresponding resource units, e.g., water quantity, tree. Ostrom's framework can be used to specify which variables constitute and characterize their cases, and/or which variables explain outcomes in the cases ([Villamayor-Tomas et al. 2020](#)).

SESF's focus is on local communities and resources and often neglects broader scales. These different scales within a system often interact. Therefore, neglecting these scales risk to ignore cross-scale power dynamics and the relationships between power, efficiency, sustainability, and effectiveness (Cumming et al., 2020). While SESF includes a variable on the political-economic context, it lacks a variable on power distribution. This is an important notion to be aware of when using SESF.



**Figure 4:** The core subsystems of Ostrom's SESF (Ostrom, 2009)

Recommended readings:

Cumming, G. S., Epstein, G., Anderies, J. M., Apetrei, C. I., Baggio, J., Bodin, Ö., ... & Weible, C. M. (2020). Advancing understanding of natural resource governance: a post-Ostrom research agenda. *Current Opinion in Environmental Sustainability*, 44, 26-34.

Ostrom, E. (2007). A diagnostic approach for going beyond panaceas. <https://www.pnas.org>

Ostrom, E. (2009). A general framework for analyzing sustainability of social-ecological systems. *Science*, 325(5939), 419-422. [https://doi.org/10.1126/SCIENCE.1172133/SUPPL\\_FILE/OSTROM.SOM.PDF](https://doi.org/10.1126/SCIENCE.1172133/SUPPL_FILE/OSTROM.SOM.PDF)

Villamayor-Tomas, S., Oberlack, C., Epstein, G., Partelow, S., Roggero, M., Kellner, E., ... & Cox, M. (2020). Using case study data to understand SES interactions: a model-centered meta-analysis of SES framework applications. *Current opinion in environmental sustainability*, 44, 48-57.

Vogt, J. M., Epstein, G. B., Mincey, S. K., Fischer, B. C., & McCord, P. (2015). Putting the "E" in SES: Unpacking the ecology in the ostrom socialecological system framework. *Ecology and Society*, 20(1). <https://doi.org/10.5751/ES-07239-200155>

### 3.2.6. Landscape geography

The concept of landscape has old roots in Germanic languages and has various meanings in other linguistic contexts (Olwig 1996). Academically, landscape is most strongly tied to the discipline of geography, not the least since Carl Sauer in the early 20<sup>th</sup> century, who emphasized the role of culture in shaping the physical surface of the earth, where the environment acts as medium but not as determinant (Sauer 1925). Since then, work in landscape geography has taken this term further, through regional geography with a strong descriptive focus, the critical humanistic and phenomenological work on landscape as ideological representation (e.g., Cosgrove 2006), landscape as institutional community (Olwig 2002) to more-than-human materialism (Whatmore 2006).

The last decades and coupled with a relational turn in the wider human sciences, landscape as a relational concept has become popular. This conceptualization emphasizes a landscape as the temporary result of the coinciding of different entities and processes, both material/immaterial, abiotic/living and individuals/collectives. A delimited landscape is affected by a variety of forces on different scales which are manifested locally (Stenseke 2018). An important difference between a relational landscape approach and social-ecological systems approach though is that the starting point is the totality of relations in an area, as opposed to analyzing the relations between specific resources and practices. Approaching landscape as an arena where different and not necessarily related activities occupying the same space, enables a fuller understanding of complexity, including conflicting interests, intentions and processes (Stenseke 2023).

While there has been important critique raised against the landscape approach for an inability to address power relations (Mels & Setten 2007), critical cultural geography has used the concept to analyze how forces of power and global capitalism shape landscapes (Mitchell 2008). Importantly, this entails a careful look at the different forces/processes that underpin the superficial, where the production of for example 'exclusivity' in one area might be dependent on appropriating another. Don Mitchell exemplifies this by an exclusive suburb with a strong place identity, but which existence has been a function of the existence of 'other' less affluent landscapes through a forceful history of segregation (Mitchell 2017).

#### Recommended readings:

Cosgrove, D. 2006. Modernity, community and the landscape idea. *Journal of Material Culture* 11 (1-2) 49-66.

Mels, T. & Setten, G. 2007. Romance, practice and substantiveness: what do landscapes do? In *Geografiska Annaler: Series B, Human Geography*, 89:3. 197-202.

Mitchell, D. 2008. New Axioms for Reading the Landscape: Paying Attention to Political Economy and Social Justice. In: Wescoat, Jr. and D.M. Johnston (eds.), *Political Economies of Landscape Change*. Springer, 29-50.

Mitchell, D. 2017. A relational approach to landscape and urbanism: the view from an exclusive suburb, *Landscape Research*, 42:3, 277-290, DOI: [10.1080/01426397.2016.1267129](https://doi.org/10.1080/01426397.2016.1267129)

Olwig, K. 1996. Recovering the substantive nature of landscape, *Annals of the Association of American Geographers* 86, 630-653

Olwig, K. 2002. *Landscape, nature, and the body politic: from Britain's renaissance to America's new world*. Madison: University of Wisconsin Press.

Sauer, C. O. 1925. "The Morphology of Landscape". *University of California Publications in Geography* 2

Stenseke, M. 2018. Connecting 'relational' values and relational landscape approaches. In *Current Opinion in Environmental Sustainability*, 35, 82-88.

Stenseke, M. 2023. *Diorama—An Opening for Addressing the Global Challenges*. Tijds. voor econ. en Soc. Geog., 114: 212-218. <https://doi.org/10.1111/tesg.12568>

Whatmore, S. 2006. Materialist returns: practising cultural geography in and for a more-than-human world. In *Cultural Geographies*, 13. 600-9.

### 3.2.7. Biophilia

The term Biophilia was coined by the German psychologist and sociologist Erich Fromm in his book *The Heart of Man* (Fromm 1964). Edward O. Wilson later independently developed the term in 1984, focussing on affiliation with non-human nature (Wilson 1984). For Fromm, however, Biophilia is defined as “the passionate love of life and of all that is alive” (Fromm, 1973, p. 406), encompassing both “love for humanity and nature” (Fromm, 1994, p. 101). Biophilia is thus not only required to create a harmonious relation between humans and the biosphere that can combat biodiversity loss, but it is essential for solving an existential human need for unity. Humans are a part of the biosphere, but industrial society has altered humanity’s relatedness to nature into a destructive relationship, which results in a strong fear of isolation and meaninglessness (Gunderson 2014). The “experience of union with another person, with all men, and with nature” (Fromm, 1955, p. 37), in contrast, enables people to “overcome the sense of isolation and separateness” (Fromm, 1956, p. 17). Although Fromm sees biophilia as “intrinsic to human biology” (Fromm, 1973, p. 407), he warns that certain conditions in the social and natural environment are required for it to be realised. In other words, we have an innate potentiality for biophilia, but environmental circumstances translate this predisposition into behaviours, dispositions and personalities (Barbiero & Berto 2021).

This is part of his notion of the *character*, “the relatively permanent system of all noninstinctual strivings through which man relates himself to the human and natural world” (Fromm 1973, p. 255). Such a notion of the character is widely used in orthodox Freudian psychoanalysis. But as a sociologist, Fromm recognised that it is not just “childhood libidinal development” that forms character, but that it is instead a dynamic process shaped by the socioeconomic demands of society (Gunderson 2014, p. 189). Fromm therefore expanded the term character into a sociological category, the *social character*, which “[a]ddress[ed] the problem in Marxist theory as to how, exactly, material conditions mold ideologies” (Gunderson 2014, p. 189). A social character is a character structure which most members of a particular culture have in common. The purpose of this social character is to “shape the energies of the members of society in such a way that their behavior is not a matter of conscious decision as to whether or not to follow the social pattern, but one of *wanting to act as they have to act*” (Fromm 1962, p. 84-85). In his influential book *The Art of Loving*, Fromm had defined four aspects of a loving relation to life: care, responsibility, respect, and knowledge (Fromm 1956). His main interest, however, did not lie in laying these out as ethical guidelines for individuals to adhere to, but to understand what material conditions and social relations are needed to make biophilia the *social character* (Gunderson 2014). In Fromm’s view, there are three societal conditions for biophilia (Fromm 1964, p. 52): (1) Security (the material basis for a dignified life is ensured), (2) Justice (the absence of exploitation), and (3) Freedom (the opportunity to participate in a meaningful and creative way in society).

When it comes to empirical research on Biophilia and its preconditions, studies have largely focussed on affiliation with nature, rather than the more encompassing notion of Fromm. Nevertheless, empirical studies seem to have confirmed Fromm’s hypothesis that humans have an existential need for connection to nature, associating a lack of contact with nature with negative mental health impacts (Ulrich 1991; Kapla 1998; Chawla 2014). Concerning the preconditions for developing biophilia, empirical research has shown consistently that early childhood experiences are fundamental (Wells & Leckis 2006; Dadvand et al. 2015) and that it requires direct and frequent exposure to nature (Barbiero & Berto 2021).

### Recommended readings:

- Barbiero, G., & Berto, R. (2021). Biophilia as evolutionary adaptation: An onto-and phylogenetic framework for biophilic design. *Frontiers in psychology*, 12, 700709.
- Chawla, L., Keena, K., Pevec, I., & Stanley, E. (2014). Green schoolyards as havens from stress and resources for resilience in childhood and adolescence. *Health & place*, 28, 1-13.
- Dadvand, P., Nieuwenhuijsen, M. J., Esnaola, M., Forn, J., Basagaña, X., Alvarez-Pedrerol, M., et al. (2015). Green spaces and cognitive development in primary schoolchildren. *Proc. Natl. Acad. Sci.* 112, 7937–7942. doi: 10.1073/pnas.1503402112
- Fromm, E. (1955). *The Sane Society*. New York: Premier Book.
- Fromm, E. (1956). *The Art of Loving*. New York: Harper and Row
- Fromm, E. (1962). *Beyond the Chains of Illusion: My Encounter with Marx and Freud*. New York: Pocket Books.
- Fromm, E. (1964). *The Heart of Man: Its Genius for Good and Evil*. New York: Harper and Row.
- Fromm, E. (1973). *The Anatomy of Human Destructiveness*. New York: Fawcett Crest
- Gunderson, R. (2014). Erich Fromm’s ecological messianism: The first biophilia hypothesis as humanistic social theory. *Humanity & Society*, 38(2), 182-204.
- Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of environmental psychology*, 15(3), 169-182.
- Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A., and Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *J. Environ. Psychol.* 11, 201–230. doi: 10.1016/S0272-4944(05)80184-7
- Wells, N. M., and Lekies, K. S. (2006). Nature and the life course: pathways from childhood nature experiences to adult environmentalism. *Child. Youth Environ.* 16, 1–24.
- Wilson, E. O. (1984). *Biophilia*. Cambridge, MA: Harvard University Press

### **3.2.8. Connectedness with nature and related constructs**

People experience positive outcomes when spending time in nature or witnessing some elements of the natural environment. To highlight a few, these include relaxation or active engagement, the rejuvenation of physical and mental well-being (such as faster recovery after illnesses, enhanced health, diminished health risks, reduced stress and heightened cognitive abilities); some people simply care for nature of its intrinsic value (Capaldi et al., 2014; Pritchard et al., 2020; Wicks et al., 2022) and thus enjoy spending time in nature. To add, people have reported the importance of natural settings for them to reflect and regulate their emotional states (Herzog 1997; Korpela et al. 2001) or experience transcendence beyond the self which can satisfy a need for connection and feeling part of a larger whole (Williams & Harvey 2001). The above suggests that people tend to seek connection with nature or parts of it.

In conservation psychology *connectedness with nature* - the extent to which people perceive themselves as being part of the natural environment (e.g., Schultz, 2002) -



became a unifying concept sheltering variety of constructs representing people-environment relationships in general and people and nature relationships in particular. Conservation psychology explores the relationship between people and nature conservation and the extent to which people's actions lead (or not) to nature conservation (Clayton & Myers, 2009). Conservation psychology could be considered as subfield of a broader discipline of environmental psychology. Over the course of a several decades a number of connectedness with nature concepts were developed. Examples include inclusion with nature (Martin & Czellar, 2017) and implicit connection with nature (Schultz & Tabanico, 2007), emotional affinity towards nature (Kals et al., 2014; Mayer & Frantz, 2004), connectivity with nature expressed via empathy and compassion towards nature (Dutcher et al., 2007); commitment to the environment (Davis et al., 2009), disposition to connect with nature (Brügger et al., 2011), among others.

*Self-concept theory* serves as the primary origin for these constructs (Rosenberg, 1989), suggesting their common theoretical descent and strong relationships (Balunde et al., 2019). Despite their shared elements and common theoretical roots each of these constructs capture distinct aspects of connectedness with nature. Some constructs focus on how people experience nature and its elements or how they feel about being in contact with nature (Nisbet & Zelenski, 2013). Other constructs focus on what attitudes people hold towards nature (Brügger et al., 2011) or how they experience physical connection with the natural environment (Nisbet et al., 2009). In addition to this, connectedness to nature could be expressed not only via feelings of connectedness, but also as caring for nature and commitment which in turn should lead to nature conservation in many different ways (Schultz, 2002). Studies indeed suggest that the more people feel connected to the natural environment the more they engage in multiple nature and environment conservation actions (see Vesely et al., 2021 for a review).

The construct of *environmental identity* also shares theoretical commonalities with the connectedness with nature and has been found in multiple empirical accounts to be strongly interconnected (e.g., Balunde et al., 2019, Frantz & Mayer, 2014). Yet at the same time environmental identity is a distinct theoretical construct from other constructs representing human-nature relationships; it puts stronger emphasis on the extent to which nature or its elements are incorporated into people's sense of self (an important part of who they are) based on people's past experiences, the degree of emotional attachment to nature and (dis)similarity to nature or its elements (Clayton, 2003).

*Place identity* – the importance of specific places to one's sense of self – is yet another construct representing people-environment relationships. It refers to a substructure of self-identity which consists of memories, ideas, feelings, attitudes and values, related to physical settings in a person's day to day life (Proshansky et al., 1983). Highly cohesive communities with strong sense of place identity, hold stronger environment friendly attitudes and act more environmentally friendly as opposed to communities with lower cohesion and weaker place identity (Uzzell et al., 2002). It is also suggested that strong place identity can lead people to take places targeted threats (including environmental threats) more seriously, although the geographic limitation of place identity can lead people to support simply moving these threats to another place (Clayton & Meyers 2015).

*Place attachment* – people's emotional bond to meaningful places - might seem close to place identity. Yet, it is conceptually distinct construct capturing interaction of places, people and processes via which people bond to places (Altman & Low, 1992). People's strong sense of place attachment can benefit multiple aspects of well-being and contribute

to nature conservation; yet at the same time it can yield negative outcomes such as unwillingness to move in the event of danger or when conservation efforts disregard or displace local people to protect non-human species (see Lewicka, 2011 for a review).

Recently, a new construct was introduced to the conservation psychology literature that goes beyond the exploration of broad people-nature relationship. The new construct focuses specifically on the *link between biodiversity and people's perceived health and wellbeing* (Irvine et al., 2023). Exploring the people-biodiversity bond is particularly relevant to BIOTraCes project.

The multitude of these constructs paints a comprehensive picture of people's connection with nature, encompassing cognitive, affective, behavioral, social, temporal, geographic and biodiversity dimensions. The theoretical accounts discussed above are relevant to the goals of BIOTraCes because they suggest that by fostering a connection between people and nature, one can inspire others to feel a part of nature and empower them to conserve it. This motivation should stem not solely from the services nature provides but also from recognizing nature's intrinsic importance.

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#### 4. A grounded approach to discover notions of the SES in BIOTraCes: Examples from the Case Studies.

Where suited to the research process and dynamic of each case studies' characteristics, research teams already conducted first workshops to understand the contextual notions of the social-ecological system. In the following, we give first hints of dynamics between society and nature, power dynamics and institutional lock-ins for transformation in BIOTraCES' different case study contexts.

##### VIGNETTE 1. Urban Schoolyards-Biodiversity Lab, Vitoria-Gasteiz, Spain



This case study is centred around the re-wilding of schoolyards in the city of Vitoria-Gasteiz, Basque Country, Spain. The municipality has begun a project of small greening interventions in eight schools which include interventions like the replacement of pavement with permeable materials, planting grass, shrubs and trees and installing elements that create ecological niches such as insect hotels or bird feeders. The main actors involved in this case are the institutional actors providing funding (such as the Basque government), different departments of the city hall of Vitoria-Gasteiz, parents' associations, children, teachers, the school councils, neighbours surrounding the schools and the architects and external companies carrying out the practical design and construction.

BC3 conducted a first participatory system mapping workshop with institutional actors, including participants from the CEA (Centre for Environmental Studies), the city hall departments of education and of maintenance. During the workshop, participants discussed different meanings and functions of nature in the schoolyard context, such as the rewilded schoolyard as a tool for climate change adaptation (as a heat shelter or to reduce flood risks), a measure for enhancing biodiversity, or as a tool for education and local food production and a broader discussion about urban nature as a form of manicured greening vs. more eco-centric approaches.

Furthermore, it was discussed how different actors influence and react to this change in the SES. Teachers have shown widely varying attitudes towards the greening initiatives and parent engagement varies to a similar degree, partly depending on the social-economic profile. Possible connections were established between the naturalisation of schoolyards and gender relations among the pupils with the hope that naturalisation could lead to a more inclusive setting in comparison to the previous setting dominated by paved football fields. An open question for the future remained how people living in the neighbourhood

of the schoolyards could benefit from them and in how far they could function as a public green space.

BC3 is planning to explore these issues over the course of BIOTraCes drawing on political ecology, degrowth and the plural values framework. Further, the first workshop resulted in a co-produced SES with institutional actors. Those described their perspective of the studied SES as one wherein nature is merely seen as a tool, which became apparent in the language used, such as “nature-based solutions”, “ecosystem services”, or “climate change adaptation”. We are hence interested in plural notions of the local SES in question and hence are planning workshops with diverse actors.

## **VIGNETTE 2. Freeing river by removing dam, Anykščiai, Lithuania**

There is a widespread agreement among local and international policy makers that removing outdated and malfunctioning dams from rivers is a simple way to restore natural ecosystems, enhance biodiversity, improve water quality, reconnect fish populations, decrease flood risks, reduce thermal pollution and enhance sediment transport, among other benefits. In Lithuania, the government has taken steps to implement the European Water Framework Directive by establishing responsible authorities to evaluate and decide on the removal of specific river dams. Two instances of such dam removal projects were carried out at Salantai and Bražuolė rivers. However, we have observed that these initiatives faced resistance and opposition from local communities.

Local communities may have various psychological, social, historical or practical reasons for opposing river dam removal. For instance, residents living near the dams might have emotional connections to the dams and the reservoirs they create. They might resist removal due to the belief that these dams hold historical or sentimental value. In some cases, dams might have cultural significance to the local community, linking them to their identity, heritage or traditions, making their removal a contentious issue. Additionally, communities may lack trust in government agencies or organizations advocating for dam removal, fearing that their interests are not being adequately considered in the decision-making process. Furthermore, removing a dam can feel like a loss of local control over vital resources and infrastructure, with residents preferring to maintain control over dam operations and maintenance.

MRU has planned a participatory system mapping workshop, intending to invite representatives from various sectors, including national and regional policymakers, local communities, NGOs, activist organizations, local businesses, artists, ethnic communities and local schools. However, after implementing participatory observation around Šventoji river dam location in Anykščiai, reviewing media sources, videos, broadcasts and public opinions of policymakers, as well as communication strategies related to informing local communities about potential dam removal, we have realized that it may currently be too early to bring representatives from these diverse groups together. This is because their views and perspectives on river dam removal differ significantly, which could lead to resistance and conflicts among groups. This, in turn, could have negative consequences for biodiversity outcomes and the possibility of unravelling plural views as well as constructing dialog among stakeholders.

Currently, we are exploring methods and strategies to eventually enable the inclusion of representatives from each stakeholder group in a joint workshop. However, we first need to ensure that individuals in different positions of power can express their opinions and

positions equally. At this stage, we are planning individual interviews with each stakeholder group and conducting historiographical research within different age groups of the local communities to better understand and co-design the (research) path forward.

### **VIGNETTE 3. Nature Inclusive Building, The Netherlands**

This case study is about nature-inclusive building (including transformations in planning, design, project development, cooperation, or building processes) and is related to the biodiversity high impact sector 'urbanisation'. Nature-inclusive building is becoming more and more important in the Netherlands, both from a societal and policy perspective. According to the Minister, in the coming years one million houses are to be built. Moreover, the Netherlands are facing a transformation of rural landscapes with specific farm-based natural values into cityscapes. This process leads to habitat fragmentation, due to loss of connectivity that come along with more roads, more pavements and more presence of people and their cats and dogs. The gradients, present in agricultural landscapes, between nature reserves and cities are gradually disappearing, which leads to unintended ecological degradation by border effects.

The WR case study is not necessarily built around one ecological area but oriented around a domain. For that reason, the case study consists of several focus points and actors:

1. An initiative to realise an eco-community called The Beuk in Wageningen, which represents five different collectives that want to realise a nature-inclusive eco-community. This initiative is related to an actual location, and it is interesting to follow what kind of leverages and barriers they encounter in realizing their nature-inclusive building initiative.
2. An innovative provincial policy program concerning nature inclusive construction at the province Overijssel. The province of Overijssel is one of the provinces in the Netherlands with the highest ambitions on nature inclusion. Interestingly, their policy is very grounded in practice, meaning it is the outcome of intensive interactions with local (societal) actors (citizens, project developers, municipalities).
3. A national network concerning nature-inclusive building called 'Duurzaam Door' with governmental organisations, business organisations, intermediary organisations and other initiatives concerning nature inclusive building and construction. It is seen as a substantial programme on a national level, for a nature-inclusive and sustainable society, which has a certain level of independence, and often runs at odds with regulations. In conclusion, the focus points and actors are both societal and policy oriented, which could also be seen as ideas for changes from 'outside the system' and 'from within the system' and concern different scale within the domain of nature inclusive building. So, there are several directly involved actors, but also indirectly several actors will be impacted and analysed, such as citizens, project developers, architects and entrepreneurs, municipalities, etc.

In general, this case is about 'if everyone thinks nature inclusive building is such a good idea, why is it hard to actually put it to practice'. Barriers might have to do with various aspects, varying from legislation to different views and values on nature and biodiversity, to how is the domain organized, to what are the ways of thinking and working of key players, to (organization) culture within public administrations. Doing participative research, WR is in contact and cocreating with the various actors (although in various

intensities). At the moment of writing this report, we are most intensively involved with The Beuk (e.g. monitoring the developments of the Beuk by being present at their meetings and sometimes workshops (e.g. Formulating a vision), every 3 weeks, facilitating and monitoring several student and PhD research in the area/concerning the community). We are also responding to their needs, for example by involving students in certain questions they have and asking colleagues to share their knowledge (e.g. On food forests).

#### **VIGNETTE 4. Citizens based alliance for proactive ecological recovery, Sicily, Italy**



In this case study, the UNICT team held first workshops to identify *areas of* emerging biodiversity that constitute both a spatial and geographical indication, as well as a thematic indication; these areas are not the result of analytical mapping, but a conceptual one that can direct the project starting from perceived threats and obstacles to biodiversity but also from potentials that define dense points and areas of possible intervention. To achieve this goal, four workshop activities were designed, a first list also included the creation of a **common vocabulary** that would allow all participants to operate from the same shared knowledge base, this activity was later excluded.

Three moments of activity were therefore maintained:

1. The introduction to the BIOTraCes project had to convey two key concepts: the maximum openness of the research group to the proposals that would be launched by the community; and the desire to decline these ideas in a practical way and thus give a strongly proactive approach of the research group to generate transformative actions.
2. The open mapping phase is designed as a plenary and preparatory moment for the thematic tables. By preparing a large map of the Valley and a legend on how to interact with the map itself; stimulus questions are designed to support interaction with the mappers and these with macro-categories (e.g. Water, Agriculture). The aim is to create stimuli for stakeholders to reflect on and identify *areas of emerging biodiversity* and implicitly answering questions about threats to biodiversity and identifying areas for transformative intervention. This mapping action therefore involves facilitators, mixed groups of a researcher and a member of the Presidium, who guide the activity and analyse it in real time to create the subsequent thematic tables.
3. The groups of thematic tables formed after the results of the mapping are linked to thematic affinities and not on an associative or professional basis, trying to

make people who feel engaged on the same theme to work together. Assisted by several facilitators, the research group will try to solicit and answer numerous questions. Some stimulus questions on which the researchers converged are as follows: (1) *What are the perceived threats and how does this compare to the real ones?* (2) *What transformative process(es) to trigger?* (3) *What kind of impact is sought (e.g. physical, economic)?* (4) *Who do you work with (e.g. tour operators, farmers)?* (5) *What are the links and articulations between the river body and urban centres?* (6) *How and whether to develop these joints while remaining centred on the river?*

The scheduled **workshop event** was held on **April 29** in the afternoon at the hall of the former slaughterhouse of Paternò (Catania – Sicily). More than 30 people took part in the event representing different associations (e.g. ViviSimeto, LIPU) and various micro-businesses related to the agricultural world, of which 16 people took the floor in addition to the members of the research group and facilitators.

The research group analysed the raw ideas and produced a general scheme of four proposal that we synthetize here:

1. The **mentality of farmers** constitutes an explicit limit to the growth of biodiversity; a limit that manifests itself in isolation, resistance to change towards different forms of cultivation to which is added abandonment and institutional distance. The intervention proposal therefore aims to introduce new forces in the Valley capable of implementing transformative changes by involving entire agricultural communities in this. The aim is therefore to create advanced laboratories of change that can progressively transform the surrounding area through proximity and contact.
2. **Pollution** is both a sign and a factor of distance from the river basin and reduces environmental quality. It manifests itself in many forms, from illegally abandoned waste to the Motta S. A. (Catania – Sicily) garbage disposal facility which is no less abusive; It also manifests itself in the quality of water where the main danger is represented by untreated urban wastewater. A clear propositional path has not emerged, but it is certainly an important issue because it is very heartfelt and influential on the general state of the river and the Valley. The fact that the issue came up strongly during the Researchers Night also signals a way in which the territory is viewed from a distance.
3. Another theme that has emerged on several occasions, not only in relation to a change and differentiation of synergistic cultivation (e.g. permaculture), but also due to the presence of marginal and spontaneous plant species or typical productions, is the **culture biodiversity** which is partly intrinsic to the territory and partly preserved and increased by some farmers. Uncultivated land is therefore, while remaining in this state, a reserve of biodiversity that can be increased if it is cultivated with the adoption of alternative crops. Listening to the proposals that underlie this theme, there is always a certain pride and uniqueness of the path chosen by farmers and a widespread potential of latent biodiversity to be fully investigated. Also in this case, a clear proposal has not yet emerged, but the theme seems to be one of the most important to investigate and focuses on the dialogic relationship between spaces with a strong anthropic



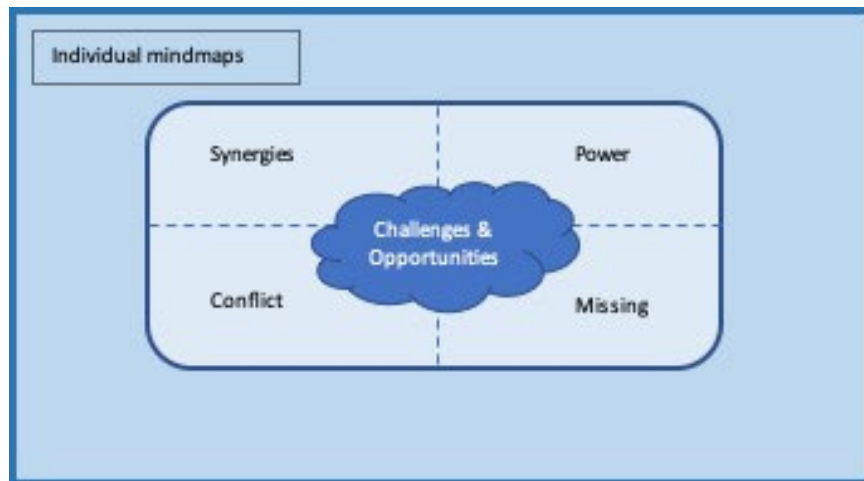
imprint and wild areas and on the specific characteristics they assume in the context of Valle.

4. The **management of the river's water levels**, the minimum flow rate and the presence of dams that are now full for more than 50% of their debris volume, combined with the poor or absent communication with the institutional actors in charge create a lot of concern in social actors. Illegal withdrawals along the entire course of the river and neglect of the upstream sources add to the elements of concern. The proposal, primarily supported by LIPU and the Presidium, is to start discussion tables with the bodies in charge of management to create basin pacts. At the same time, research on hydrometric levels and the state of the water should be initiated, as well as a synoptic survey of the state of the river body.

The **second workshop** was held on **June 17<sup>th</sup>** at the conference room of *Villa delle Favare* in Biancavilla (Catania – Sicily), in the afternoon. This second event recorded a sharp drop in participation, counting just over 15 participants including the research group, can be considered a partial failure in the strategy of engaging the community. The reasons may have been many, starting from the location that does not represent a place particularly lived by the community, to the period of the year now close to the summer break up to deeper reasons and disaffection and distance from the practices of participation. It must in fact be considered that the Simeto Valley has had research activities for years that have created a certain distrust towards any action that does not show an immediate practical response and effects of general improvement of the territory. Going to the conclusions it can be argued that the first workshop (29<sup>th</sup> of April) was an excellent moment to listen to ideas that were still poorly defined, but that it intercepted a need to express itself on the part of the community. The second (17<sup>th</sup> of June) allowed us to critically reflect on the path taken. The general tendency, still to be fully developed, is to closely link research practice and territorial events and ongoing projects, without however binding one to the other, but trying to generate a positive increase in proactive dynamics by combining paths that intercept different components of the community and with different and targeted actions.

#### **VIGNETTE 5: Foodpark Amsterdam, The Netherlands**

On 28 June 2023, a SES mapping workshop was held with the team of the University of Twente and a number of people involved in Foodpark Amsterdam. The objective of the workshop was to go from individual understanding of social ecological systems to a common understanding of underlying causes, threats and obstacles, and the identification of research questions that can support overcoming these causes, threats and obstacles. We used a large table covered with paper (see figure), markers in different colors, and an A3 size paper.



**Figure 3.** Individual mind maps workshop Foodpark Amsterdam

The workshop program was as follows:

09.45-10.00 Create an individual mind map addressing the following questions.

- Who are you in relation to Foodpark Amsterdam?
- How do you relate with nature?
- What actors (human-non human) do you engage with?
- What other partially connected initiatives do you engage with?

10.00-10.15 Present individual mindmaps

10.15-10.45 Identify relations between actors.

- Power: who has power, who lacks power
- Synergies: who is in synergistic relations
- Conflicts: who is in conflictuous relations
- Missing: what actors (human and non-human) and relations are missing?

10.45-11.00 Break

11.00-11.20 Identify challenges and opportunities.

11.20-12.00 Next steps

- Create a list of research needs: what do you need to seize opportunities and overcome challenges?
- Identify next steps for our collaboration: what research needs can we address.
- Introduce objective of the next workshop: Develop a monitoring system to assess progress and harness learning and action pathways for transformation.

The plenary presentation yielded a high diversity of different mind maps of the Foodpark Social-Ecological System. In their presentations each speaker built on the previous.

The next step involved a common discussion in which a number of interesting points were made about the successes achieved by Foodpark. Even if industrialization cannot be stopped in the end a number of things were achieved. One of these is that the city government is visibly struggling with the issue, there is a degree of embarrassment. Also, Foodpark has been able to connect and empower people and lift them out of feeling powerless and isolated. Moving forward will require on one hand focusing on the locality of Foodpark to the city and the local residents and avoid elitism, and on the other hand emphasizing that Foodpark is a symbol of the struggle between the old and the new

economy in order to attract green organizations in Amsterdam and on the national level. Even internationalization, for example through the comparable Barcelona example could be helpful. This discussion leads to the identification and prioritization of important relations between actors.



In the final step of the workshop, key themes and research questions were identified: 1) Tackling Amsterdam Vastgoed. They have a lot of power, and they claim that Foodpark is not possible. But there are also a lot of questions? Why is not possible, who says this, what is the justification, and what is the economic story behind it? Getting at the core of this is important to overcome this challenge, but it can also be an opportunity to mobilise green organisations, including political parties and voters to support Foodpark. 2) Engaging local residents. Foodpark is at a large distance from the local community in nieuw west and this distance is not just physical. Connecting with the residents is an opportunity to broaden support and legitimacy But we cannot just bring them to Foodpark, we need to link up with their actual concerns. 3) Creating an appealing narrative for Foodpark. It is considered complicated, and this is seen as an obstacle. What is the simple story? The story needs to connect biodiversity to economy and well-being, engage residents, convince voters, and mobilize powerful stakeholders and present Lutkemeer as a national and international symbol and example.

This led to a series of research questions, including: What is the social and ecological value of Foodpark for people, nature, wellbeing, health? What is the justification for why Foodpark is not possible? What is this so-called plan schade for example? What is the actual economic case for industrialization, what is the need for the distribution centers? What can we learn from the Barcelona case, how was this made into a success? and How can we connect with the concerns of the residents? How can we keep track of our achievements?

## 5. How this deliverable was created

In order to mirror the needs and expertise of each project partner, we collected a diversity of SES concepts and theories by all project partners on a [padlet](#). Research partners were asked to contribute those concepts they considered most relevant in the context of BIOTraCes and they were planning to use in their own case studies. With this approach we aimed not for an exhaustive list of SES theories and concepts, but to assure usefulness to researchers given their specific case study contexts and mirroring the transdisciplinary character of the project. In addition, we organised an online workshop with all project partners on July 4th, 2023, to jointly reflect about how best to approach the production of this project deliverable.

This was followed by a clustering of each proposed concept and theory in broader epistemic communities by the BC3 team. A first draft was created and shared with all research partners by September 15th, 2023. Research partners were asked for feedback regarding the shortlist of most relevant concepts and theories, and the proposed approach to provide guidance to produce the synthetic review of SES approaches from a pluralistic perspective (see Table 1 and 2). Lastly, we asked those project partners that already engaged in an initial phase of fieldwork to provide a short summary describing the type of ecosystem, the actors directly/ indirectly impacted, first initial findings regarding SES and the SES theories/frameworks they are planning to use throughout the BIOTraCes project (see section 4). A complete draft was sent to research partners on November, 8<sup>th</sup>, including the comments and feedback from research partners on previous draft.

## 6. Final words

This deliverable is meant to be a guidance throughout the plural SES conceptualizations, also to facilitate cross-case comparison, as developed in Task 1.7 and later on in WP2 and 3. Instead of proposing a single conceptual framework, we chose a reflexive and adaptive approach that allows for the plural perspectives of research partner, societal partners and the respective case study context. That is, in order to co-produce locally situated understandings of the SES together with the diverse actors of each case study, a grounded trans-disciplinary theory approach is needed that allows for a process of conceptualising SES as the project proceeds and empirical work unfolds. A predefined conceptualization of SES across diverse case studies may here hence challenge or even hinder plural formulations of the SES and its related biodiversity innovations as it follows normative stances of each researcher.

By summarizing each theory and framework's contribution to understanding society-nature relations, power dynamics and the role of marginalized communities, perspectives and values, we show the strengths but also limitations of previous theoretical and conceptual approaches to examine plural SES. In order to develop a theory of transformative change based on the PEPE principles of politicising, embedding, pluralising and empowering a multi-disciplinary approach is needed that draws on plural schools of thoughts. Taking these strengths and limitations as a starting point, this deliverable is meant to enable a research process towards co-creating an understanding of SES that is plural, nature-inclusive and able to shed light on those power-dynamics that challenge transformative change. It further constitutes the base for Task 2.3, the social-ecological system analysis.

The vignettes offer examples of how SES mapping can be done in practice in a context of action research. They can facilitate cross case learning and capacity building.