



Review of theories of Transformative Change

28 November 2023

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Funded by
the European Union

Technical References

Project Acronym	BIOTraCes
Project Title	BIODiversity and Transformative Change for plural and nature positive societies
Project Coordinator	Dr. R.I. van Dam (WR)
Project Duration	2022 – 2026 (4 years)

Deliverable No.	D1.1
Dissemination level¹	PU
Work Package	WP1
Task	T1.1.
Lead beneficiary	UT
Contributing beneficiary(ies)	MRU, BC3, WR
Due date of deliverable	30 November 2023
Actual submission date	28 November 2023

- 1 PU = Public
 PP = Restricted to other programme participants (including the Commission Services)
 RE = Restricted to a group specified by the consortium (including the Commission Services)
 CO = Confidential, only for members of the consortium (including the Commission Services)

Document history

V	Date	Beneficiary	Author
V0.1	21 November 2023	UT, WUR, BC3, Lithuania	Esther Turnhout (editor), Corelia Baibarac Duigan Audra Balunde, Julia Neidig, Liam O’Riada, Unai Pascual, Tamalone Van der Eijnden, Judith Westerink
V0.2	27 November 2023	UT, WUR, BC3, Lithuania	Esther Turnhout (editor), Corelia Baibarac Duigan, Audra Balunde, Julia Neidig, Liam O’Riada, Unai Pascual, Tamalone Van der Eijnden, Judith Westerink

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1 Introduction

There is a growing recognition that current efforts in the conservation and restoration of nature, even if fully implemented, are not sufficient to bend the curve of biodiversity loss (Leclère et al. 2020). In addition, it is urgent that measures are taken that can effectively halt the continued destruction and exploitation of nature. What is needed is transformative change, which has been defined as the “fundamental, system-wide reorganization across technological, economic and social factors, including paradigms, goals and values” (IPBES 2019).

The BioTraCes project aims to catalyze transformative change by using an action research approach that supports initiatives in their efforts to create change in ways that address the underlying root causes of biodiversity loss and that promote equity and justice for humans and nature. These underlying root causes can vary across different contexts but include social, economic and cultural paradigms and structures that promote the exploitation of nature, overproduction and overconsumption, and the concentration of power and wealth. The BioTraCes theory of transformative change is built around four central principles that have to work in tandem:

- Pluralizing: being inclusive of plural perspectives, problem frames, and knowledges, while respecting differences and disagreement
- Empowering: elevating marginalized voices and supporting their efforts to foster change
- Politicizing: uncovering and challenging power relations, and resulting inequities and injustices
- Embedding: fostering transformation by embedding initiatives in wider institutional, regulatory, and cultural contexts.

The commitment to transformative change is a radical break from past approaches to environment and nature for the following three reasons: 1) it requires actions beyond the traditional nature conservation actors and policy sectors, including for example in industry, finance, infrastructure, mobility, and energy; 2) it directly challenges vested interests that benefit from and continue to accelerate these underlying root causes and will face resistance from these vested interests; 3) it requires the dismantling of existing structures and institutions that promote the destruction and exploitation of nature (Bulkeley et al. 2020).

Despite the widespread recognition that transformative change is needed and that current measures and actions are falling short, there is considerable ambiguity and contestation about transformative change, what it entails, and how it can be achieved. While there is a general understanding that transformative change requires fundamental shifts in ways of thinking (paradigms, worldviews, knowledge systems, and values), doing (actions, practices), and organizing (regulations, institutions) (Frantzeskaki and De Haan 2009), there are marked differences between diverse schools of thought and theoretical traditions in the social sciences regarding how thinking, doing, and organizing are conceptualized, how they are related, and what the best entry point for transformative change is.

In this report we provide a succinct overview of current theories relevant for transformative change in the context of nature, biodiversity and environment. We have clustered these theories according to four main schools of thought:

1. Individualist and behaviourist approaches
2. Institutional approaches
3. Systems approaches
4. Relational and poststructuralist approaches

These schools of thought represent important historical distinctions and debates in the social sciences and, taken together, they provide a broad overview of the current state of the art. It should be noted that although these schools of thought may provide distinct starting points for conceptualizing transformative change, they have and continue to intersect and overlap. By using this structure, the report aims to offer a relatively flexible organizing heuristic, not a fixed taxonomy of theories. The overview is also by no means complete. It was produced drawing on the expertise of members of the project and contains those theories and concepts that will be relevant for the further development of the BioTraCes project.

This report can be used as a source of inspiration and further research to develop conceptual and methodological approaches that are suitable for the diverse case studies of BioTraCes.

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2 Individualist and behaviorist approaches

Individualist and behaviorist approaches to transformation take individuals as their main focus. Environmental or conservation psychology, explores the relationship between people and environment and nature conservation and the role of people's actions therein (Steg et al. 2018; Clayton & Myers, 2015). This perspective makes use of a number of theoretical models that analyse the role of personal, social, and contextual factors to understand why one conserves the environment or fails to do so (e.g., Bamberg & Möser, 2007; Gifford & Nilsson, 2014; Klöckner & Blöbaum, 2010; Ruepert et al., 2016; Stern, 2000).

Personal factors refer to people's psychological characteristics. Examples include normative (e.g., environmental values, personal norms to conserve the environment, perceived social norms on how one should act according to important others; Cialdini, 2003; Cialdini & Goldstein, 2004; Steg & de Groot, 2012; van der Werff et al., 2013), identity (e.g., environmental self-identity, environmental identity; Clayton, 2003; van der Werff et al., 2014; Whitmarsh & O'Neill, 2010), connectedness with nature (e.g., Schultz, 2002), attitudinal (e.g., attitudes towards wildlife; Kellert 1983, 1996), habitual (learned automatic actions in favor of the environment and nature; Verplanken et al., 1997), emotional (e.g., feeling good when conserving the environment; Venhoeven et al., 2020) factors, also various perceptions of self (e.g., self-discrepancy from the desired self; Higgins, 1989) and many others. Social factors refer to the cultural, demographic and societal elements such as community, family, peers, romantic partner, education, religion, economic situation, cultural norms, among many others. Contextual factors refer to external elements emerging in the environment that do not directly depend on the person affected by these elements. Existing of the relevant infrastructure, education system or policies that facilitate the biodiversity conservation behavior are just a few examples of contextual factors.

The way each of these factors shape environment conservation behavior, including biodiversity conservation, are studied in the context of theoretical models such as Theory of Reasoned Action – TRE (Fishbein & Ajzen 1975), Theory of Planned Behavior – TPB (Ajzen, 1991), Norm Activation Theory – NAT (Schwartz, 1977; Schwartz & Howard, 1981), Value-Belief-Norm Theory – VBN (Stern, 2000), Comprehensive Action Determination Model – CADM (Klöckner, 2013; Klöckner & Blöbaum, 2010; Klöckner & Friedrichsmeier, 2011), Values-Identity-Personal norms model – VIP; (Balundé et al., 2019, 2020a,b, 2023; Ruepert et al., 2016; van der Werff & Steg, 2016), among many others. These models take individually held values, beliefs and convictions as an important condition for action. When individuals have strong personal convictions—such as a deep appreciation for nature, a moral duty to protect the environment or established eco-friendly habits—they are more likely to conserve nature. Additionally, when there is significant peer support for conservation and policies that favor biodiversity protection along with effective enforcement of these policies, people are even more inclined to take conservation actions. Various authors state that in addition to psychological characteristics, factors of ability or capability also play a role in relation to environmental behavior (for example in relation to farmers' behavior: Mills et al, 2016; Schoonhoven and Runhaar, 2019; Westerink et al., 2020). Such factors include skills, knowledge, technology and economic resources.

When it comes to the types of interventions, policies, and actions that would derive from this approach, these would target not just concrete behaviors but also the personal, social and contextual factors that influence them. Examples include targeting one's

environmental self-identity by reminding people of their past pro-environmental behaviors in experimental settings (van der Werff et al., 2014; van der Werff & Steg, 2018), strengthening personal norms to act pro environmentally with private commitment strategies (van der Werff et al., 2019), making pro-environmental social norms salient by providing feedback about the behavior of peers (Schultz, 1999), changing the context to make pro-environmental behavior easy and environment harmful behavior difficult to perform (Hartmann-Boyce et al., 2018) and facilitating connectedness with nature to increase engagement in nature conservation (Leung et al., 2022).

Environmental education is a form of intervention that might support addressing the root causes of environmental issues. Such education can target individuals' environmental values thereby changing behavior (Wijngaarden, 2019). This includes educating about nature (Liefländer et al., 2013; Wijngaarden, 2019) and nature-based learning (Collado et al., 2013), which enhance environmental awareness and actions. Some research indicates that environmental education should aim at both children and their parents, using formal and non-formal methods that indirectly involve parents (D'Amore, 2016). Studies have shown that when children are educated about the environment, it not only increases their awareness and motivation but also positively influences their parents. For instance, children's environmental knowledge has been linked to increased parental concern about local environmental conditions (Legault & Pelletier, 2000), improved energy-saving behaviors at home (Boudet et al., 2016), better water-management practices (Damerell et al., 2013), and greater awareness of endangered species (Vaughan et al., 2003). The most recent European Commission policy documents and related reports suggest environmental educations should be accessible not only for school-aged people but across generations and would be life-long learning process (e.g., European Commission, 2021).

Informing people about the environmental effects of certain behaviors and the benefits of eco-friendly choices can encourage more environmentally conscious actions (Ölander & Thøgersen, 2014). However, the effectiveness of such interventions varies. Research indicates that information may primarily influence attitudes and intentions rather than actual behavior. It tends to be more effective for less effortful behaviors (Steinhorst & Klöckner, 2018; Stern, 1999). Not everyone responds equally to environmental information campaigns and labels. For instance, only those with strong environmental values have shown increased intent to reduce bottled water usage and support related policies post-exposure to such campaigns (Bolderdijk et al., 2013). Information campaigns also positively impact conservation donations, but mainly among prior donors (Shreedhar & Mourato, 2019). Conservation marketing, including informational campaigns, has shown some success in boosting intentions to conserve nature and in increasing charitable donations (Chua et al., 2021). However, some interventions have no significant impact on behavior (Abrahamse et al., 2005)

Nudging (or choice architecture interventions) is also worth mentioning because it aims to achieve environment friendly people's choices by making environment friendly options more easily accessible and it does not require people to actively seek out sustainable options or have prior motivation to behave in an environmentally conscious way (Johnson et al., 2012). It is based on the idea that by changing the way choices are presented, people can be 'nudged' towards making decisions that are in nature's best interest, while still preserving their freedom of choice. Nudging have been found to facilitate variety of environmentally friendly behaviors across behavioral domains (e.g., food waste) and populations (e.g., Western and non-Western) (Byerly et al., 2018; Carrel et al., 2023;

Zhang et al., 2023). Yet nudging should be implemented with caution since its effect might depend on product's price (Berger et al., 2022), it can diminish the effect of other important tools such as carbon tax (Hagmann et al., 2019) and can be susceptible to cognitive biases as well as context (Ölander & Thøgersen, 2014).

Another line of research explores what makes people to engage in particularly high-impact environmental behaviors including public participation in policy making, voting for green political parties, participating in environmental movements, supporting environmental policies, taking community initiatives, becoming a member of environmental organizations and how research can also support these behaviors (i.e., impact-focused environmental psychology; Lange et al., 2021; Nielsen et al., 2021; Stern, 2000; van Valkengoed et al., 2021; Wallis et al., 2021).

Within individualist and behaviorist approaches, there is increasing discussion about the limitations of these approaches in addressing the structural dimensions of environmental problems (Arbeitskreis Kritische Umweltpsychologie, 2023; Wallis et al., 2021). Recognizing the need to incorporate complexity, there is a growing emphasis on using critical and community psychology approaches (Kivell et al., 2023; Teo, 2015). Research using these methods seeks to understand how to empower citizens, communities and the broader public to become environmental change agents and reshape established practices and knowledge systems (Cattaneo et al., 2014; Nelson, 2013; Riemer & Harré, 2017). Here, empowerment means equipping individuals and communities with the confidence, skills and knowledge to be proactive in environmental decision-making; but at the same time empowerment means the advocacy of communities and individuals that already are initiating change yet are overlooked or side lined by those in power. This realization has led behavioral researchers to suggest that diverse research approaches are increasingly necessary (Bruhn, 2021; Hanss, 2021; Wullenkord & Hamann, 2021). Recognizing the limitations of top-down policies, researchers now spotlight grassroots initiatives, community-led projects and collective behavior changes.

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3 Institutional approaches

Institutional approaches are in many ways the mirror image of individualist approaches since institutions are often defined as 'everything that influences behavior', including policies and regulation, but also informal shared understandings, cultural or social conventions, and norms (Ostrom 2011). The focus in institutionalism on informal norms points to the importance of culture as one of the important institutions that shape behaviour (Alexander 2012, Burton & Wilson, 2006). For example, Bourdieu, in his conception of forms of capital (1986), describes how cultural capital can be institutionalized in the form of education, diplomas and certificates. Culture is rather resistant to change, and when it changes, it changes slowly (Westerink et al., 2022). Also more generally, Institutional approaches tend to emphasize continuity over change and have examined the tendency of institutions to persist, among others by means of what has been called path dependency. Yet, institutional change can be a powerful catalyst of change since changes in rules and norms have the capacity to instigate change among individuals guided by these institutions (Moore et al. 2015).

Institutional approaches come in many different varieties. For the themes of environment and biodiversity, one particularly relevant scholarly field is environmental economics. This field focuses on creating the conditions for responsible economic behavior (Hanley et al., 2019). For example, such institutions try to remedy 'market failure' and give shape to principles such as 'polluter pays, provider gets', by trying to 'internalise' negative and positive externalities of production (through regulations, true pricing, etc.) and to create a 'level playing field' for sustainable production and consumption (Alavalapati et al. 2004, Hillebrand 2013, Lewis and Tietenberg 2019).

Within institutional economics, one of the most influential scholars is Elinor Ostrom. She studied how communities created institutions consisting of sets of rules for collective action to govern common pool resources such as forests, fishing grounds, grazing areas or irrigation systems (Ostrom 1990). Her study challenged the theory of the 'Tragedy of the Commons'¹ (Hardin, 1968), by showing that commons do not need to be privatized or regulated from the outside, but that communities are able to establish collective action to prevent overexploitation of commons as well as underprovision of ecosystem services. The rules include delineation of the area and the group; rules for congruence of use and management, benefits and costs; monitoring of compliance, sanctioning and conflict resolution; and rules about joint rule making. She developed the Institutional Analysis and Development framework (IAD, e.g. Ostrom 2011) to analyse action situations and behaviours (of individuals, groups, governmental actors, etc.) as resulting from a number of variables including biophysical conditions, attributes of the community and formal and informal rules. According to this work, the design and support of these institutions can foster positive outcomes for people and nature. This is why her work is very influential in citizen movements aiming to transform ways of living together, as well as in attempts to transform governance (Dombroski et al. 2023, Wamsler and Riggers 2018, Schuppenlehner-Kloyber and Penker, 2016).

Given their tendency to persist, changing institutions requires strategy. According to Termeer et al. (2017), it may not be possible to catalyze change that is simultaneously in-depth, large scale and fast. They propose that transformative change must be

¹ It should be noted that the problem with Hardin's original article is not just that it was disproven by Ostrom, the article itself and the theses it articulates are unscientific, unsupported by evidence, and have deeply problematic racist undertones.

continuous and based on what they call 'small wins'; profound but concrete changes in specific policies and institutions. Small wins must not be confused with 'quick wins' or 'best practices', because small wins are not the easy steps nor the end of learning and development (Termeer and Dewulf 2018). According to Termeer et al. (2017), governance interventions can enable, amplify and unblock small wins which can then catalyze further changes, ultimately culminating into large scale change. From this perspective, several interventions to enable small wins are suggested including the creation of conditions for adaptation, learning and improvising, self-organisation, and the creation of safe spaces for open deliberation. Amplification refers to ways to scale small wins so that further changes can be made, including by making sense of patterns of adjustment, actively recognizing and publicizing small wins, and by creating connections between initiatives to stimulate social learning. Unblocking refers to removing barriers for the realization and amplification of small wins. This requires identification of obstacles, lock-ins and vested interested and changing governance practices to introduce new actors and new Termeer et al. (2017).

A different perspective on change from an institutional perspective is the concept of bricolage. Drawing on Levi-Strauss's notions of bricoleurs and intellectual bricolage, Cleaver develops the concept of institutional bricolage to point to the processes of reinterpretation and renegotiation that take as individuals try to enact the diverse formal and informal institutions that are relevant for them. As different bricoleurs bring their knowledge, power and agency to these processes in different ways, this results in the emergence of flexible and fluid institutional arrangements. From this perspective, institutions are enacted in practice through processes of bricolage that are embedded in networks of social relations, norms and practices, in which solidarity and consensus are as important as obtaining optimum resource management outputs (Cleaver, 2002, 17). The notion of bricolage emphasizes the importance of working with what is already there, and as such, it provides an alternative to prevalent modes of innovation which focus on the creation of something new. It reflects an approach to developing ways forward that pays attention to the specificities and needs of a context and its inhabitants. Processes of bricolage involve experimentation with what is locally available (materials as well as thoughts, concepts, cultural and political characteristics of a context). The experimentation involved in bricolage does not have a clear, well-established goal, but rather a vaguely defined project, which is itself subject to change depending on what is available and what is seen as promising (Darnhofer et al, 2016). An important characteristic of processes is the prodding of the imagination on what is 'thinkable', contributing to framing and re-framing the problem at hand, and thus the solution. From the perspective of bricolage, transformation requires allowing spaces (e.g., physical, as well as in the context of policies) for communities to experiment, learn by doing, and imagine alternatives that better reflect their needs and aspirations. Thus, the social context within which institutional arrangements are embedded requires specific attention. This allows placing an emphasis on the power relations at play, the agency of the communities involved in collective processes of managing a resource (e.g., water) and the constraints they may encounter in engaging with formal and informal institutions (Sakketa, 2018).

In relation to change, the concepts of scale or scaling play an important role in institutional approaches. Scaling often tends to be associated with finding 'scalable' solutions to grand challenges that can be pursued through best practices, or local initiatives such as urban experiments or living labs. In this context, scaling is mostly used in a hierarchical sense. The scaling up of local initiatives and related forms of social

innovation, for example, can involve the design of policies and instruments that stimulate others to follow the example of these local initiatives (Moore et al. 2015). This can be facilitated by broadening the framing of the problem to reveal its systemic or root causes as this can engender policy change. While scaling up can have positive outcomes, the idea that resulting solutions can be scaled can also be simplistic, insensitive to local specificities and context, and potentially homogenizing (Pfothenauer et al, 2022). Two other ways of framing the scaling of social innovation that are important to the topic of transformation are scaling out and scaling deep (Moore et al. 2015). Scaling out refers to the process of replicating local initiatives without the involvement of higher-level policy change. It typically involves the attempts of the organisation involved in social innovation through local initiatives to affect more communities and expand to a larger geographic area through replication and diffusion (Westley et al. 2014). Peer to peer learning, and exchange of guiding principles are important vehicles for such scaling out. Scaling deep refers to the way in which changes in practices or institutions can trigger deeper forms of change on the level of values, culture or paradigms. Moore et al. (2015 p.79) suggest that this can be done through “generating big cultural ideas” or “deliberately reframing predominant narratives”. It follows that story-telling can be a powerful method to accomplish such scaling deep. By telling and retelling stories, situations, events or problems acquire new meanings, and these new meanings can open up new possibilities for action that in other narratives were not possible to think or enact.

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4 Systems approaches

Social ecological systems (SES) perspectives to transformative change take as their starting point the complex interrelations, including feedback loops and non-linearities, between diverse components of systems including individuals, collectives, organisations, technologies, and environment (Folke et al. 2011). Yet, as Abson et al (2017, p 32) note, the idea of system inevitably brings challenges of demarcation since systems are defined by “the subjective interests and pre-analytic assumptions of the researcher”. As researchers define and demarcate the system they are interested in understanding, according to their worldviews, values and concerns, they also shape what kinds of solutions are brought into view to manage or transform this system.

Systems perspectives come in different versions using a wide variety of frameworks and concepts, including complex adaptive systems (Holling, Meadows), transition management (Kern and Smith, 2008, Loorbach, 2010, Rotmans et al., 2001), strategic niche management (Kemp et al., 1998, Raven and Geels, 2010, Smith, 2007), and the multi-level perspective on socio-technical transitions (Geels, 2002, Geels and Schot, 2007b, Smith et al., 2010). While the concepts of transition and transformation are often used in similar ways, not all schools of thought in transitions are equally relevant for transformative change, those that are mostly fall into the category of multi-level social-technical transitions. Within this broad field, two main approaches have been progressively coalescing: a) *resilience* thinking, typically applied at the local level, towards making SES to be able to withstand disruptive changes, and b) *transition management* thinking which is mostly focused on achieving desirable changes in socio-technological systems. These two scholarly fields increasingly influence each other as resilience scholars have started to incorporate governance and technological dimensions while transition management studies have started to address biodiversity (Olsson et al 2014; During et al. 2022).

Resilience typically refers to the capacity of a given SES to absorb disturbance and reorganize itself while retaining essentially the same function, structure, identity, and feedbacks (Olsson et al 2004b). Early SES resilience thinking has been criticized as it tended to prioritize persistence rather than transformation and such criticisms raised the question of whether the same socio-economic or political structures that underpin the nature crisis ought to be resilient to pressures for change (Smith and Sterling 2010). This led to renewing theories of SES resilience by accounting for the possibility that SES can fall into rigidity traps (i.e. self-reinforcing adaptation or “maladaptation”). In response, STS resilience thinking has started to move away from the assumption that resilience as something inherently desirable and has started to include governance mechanisms to avoid maladaptation and instead allow the system to undergo desirable trajectories of change (e.g. Leach, 2007). Resilience is currently defined as an attribute of a system that reflects its ability to maintain system structure and function in the face of shocks, including function *for* transformation in the face of long-term stresses (Olsson et al 2014). This clarification also helps differentiate between the idea of SES transformability i.e. the capacities of SES that enable regime shifts, and adaptability, i.e. the capacities to deal with change and stay within a regime.

Adaptability can be fostered through adaptive co-management. This is a management approach that aims at developing desirable functional feedback loops between social and ecological systems to respond to perturbations and uncertainty. An adaptive co-management system is defined as “a process by which institutional arrangements and ecological knowledge are tested and revised in a dynamic, ongoing, self-organized

process of learning-by-doing" (Folke et al 2002: 75). It offers "a flexible community-based system of resource management tailored to specific places and situations and supported by, and working with, various organizations at different levels" (Olsson et al 2004a: p.2). As such, adaptive co-management allows for incremental changes within a given trajectory. In contrast, transformability implies overcoming path dependence and moving out to a different trajectory with different human-environmental interactions (Marshall et al. 2012).

Resilience scholars identify three main phases of transformations in SES: 1) preparing for transformation; 2) navigating the transition; 3) building the resilience of the new direction (Olsson et al. 2004b). The first phase is about mobilizing agency across scales to create conditions for opening up new development options. The second involves connecting actors across scales and scale up niche innovations. The last phase concerns the bridging across organizations to foster the values and knowledges necessary to maintain the newly created context. SES transformability implies focusing on how transformations at one scale occurs in a cross-scale context where, for example, innovation at one scale can be steered by processes that occur at other scales or points in time in the system. This view arises from panarchy theory and its emphasis on the thresholds and tipping points involved in regime shifts as well as their effects on social-ecological interactions (Gunderson and Holling 2002). Although addressing power dynamics has been comparatively understudied in resilience thinking, it is increasingly recognized that reconfiguring power relationships is a necessary condition for overcoming path dependencies and positive feedback loops that lock in SES and that contribute to reproducing the status quo away from investing in transformational agency (Motion 2005).

One prominent area of scholarship revolves around the question of what levers of change can support the formation and change of values (Pascual et al 2023). The recent IPBES values assessment (IPBES, 2022) has focused on how specific sets of values keep systems locked into their current institutional structures and what the transformational potential is of designing interventions that can support the articulation and enactment of sustainability aligned values (Pascual et al 2023). System thinking could help to understand the interactions among the different deep leverage points that could help catalyze deep transformations in institutional structures, human-nature connections, knowledge production and use, and values.

From a systems perspective, change is a multi-level process with top-down as well as bottom-up dynamics. Bottom-up, or niche level, innovations that can result in regime level changes when they scale up to effect institutional change, which can then promote further innovations. Niche level innovations can act as levers that can affect so-called leverage points (Meadows 1999), places in complex systems where a small shift may lead to fundamental changes in the system as a whole. So far, policy interventions have not been able to go beyond reformist or shallow changes and have not addressed the deep leverage points that are required for transformative change (Geels et al. 2015). Abson et al (2017) identify three different types of deep leverage points: 1) connecting people back to nature (re-connect), 2) institutional change (re-structure) and 3) knowledge production and use (re-think) in pursuit of sustainability.

Another perspective within systems approaches is the multilevel perspective on socio-technical transitions. This body of work can give important theoretical insights into how systems operate and where there are possible pathways for innovative transformation (Turnheim et al., 2015). Socio-technical systems that build upon a multi-level

perspective include processes linking niche innovations, socio-technological regimes and landscapes across the micro-, meso-, and macro-level. Technological niches, on the micro level, are so-called protected spaces, i.e., outside of market forces, in which new innovations are developed. Those innovations differ from mainstream regimes and are embedded in a context with less clearly defined or formulated rules. Niches can offer space for learning, a testbed for possible transformative policies and can bring together a broader range of experts. Innovations developed in a specific niche often respond to problems in the related regime (Geels, 2004). That is, niches, if they are able to break through into the broader system, offer possibilities for transformative change. On the meso-level, socio-technological regimes, e.g., the technological regime, policy regime, or science regime, can be defined as common activities, engineering routines, or set of rules that involve specific communities (Geels and Schot, 2007) and refer to specific societal functions and needs (Weber and Rohrbacher, 2012). That is, each regime has their own defined rules, however, regimes can also be interlinked with each other through rules (Geels, 2004). Lastly, niches and regimes are embedded in broader socio-technical landscapes. Those circumscribe the external material environments, cultural norms, beliefs or values, or spatial arrangements. Landscapes make the macro-level, and are those factors that cannot be easily altered, such as climate change or culture changes. However, if the socio-technical landscape changes, opportunities for transformative change arise as it puts pressure on existing regimes and enables the development of new niches (Geel, 2004). In sum, applying a multi-level perspective on socio-technical systems, transitions may then be possible as a result of changes on the different levels, as Geels and Schot (2007) write by "a) niche-innovations build up internal momentum, through learning processes, price/performance improvements, and support from powerful groups, (b) changes at the landscape level create pressure on the regime and (c) destabilisation of the regime creates windows of opportunity for niche- innovations." (p.400).

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5 Relational and poststructuralist approaches

Conceptions of transformation that take a relational and poststructuralist approach derive from diverse theoretical and scholarly fields and traditions, including posthumanism, feminism, environmental humanities, political ecology and political economy, science and technology studies, discourse theory, practice theory, multispecies ethnography and indigenous and decolonial scholarship. While there are many differences between these fields and traditions, they generally are based on a relational ontology that recognizes that worldviews, values, paradigms, individual identities interests, actions, structures, and institutions continuously shape and influence each other (Ingold 2004; West et al; O'Brien and Sygna 2013; Scoones et al 2020). This means they cannot be seen as singular, fixed, or stable, and that they cannot be taken as the cause or effect of the other (Mol 2002, Latour 1993). As such, they are non-essentialist and non-determinist. For relational and poststructuralist approaches, power and agency are seen as relational and mutually constituted. Agency is the product of power and vice versa. They are not a property or characteristic of actors or organisations but emerge in the relations between values and knowledge systems, practices, and structures (Stirling 2016; Sullivan 1995; Hope 2021). In relation to transformation, relational and poststructuralist approaches are not based on consequential and linear relations or on hierarchical ordering between actions, institutions and paradigms and transformative change involves simultaneous shifts in each of them (Scoones et al 2020; O'Brien and Sygna 2013; West et al 2020).

Relational and poststructuralist approaches are a response to the limitations of behaviourist and individualist, particularly those that insufficiently incorporates the societal and economic context of individuals (Moser and Kleinhüchelkotten 2018). These approaches can result in the belief that sustainability problems can be addressed through policy interventions that target people's behaviour through voluntary instruments without addressing wider societal, economic and political structures; a belief that has hitherto been unsuccessful in delivering the changes needed (Chater and Loewenstein 2022). One example of an approach that has developed in response to these limitations is social practice theory (Shove 2010). Social practice theory looks at the individual not as an autonomous agent, but rather as a carrier of a practice, shaped by various forces, e.g., material, social, institutional and infrastructural (Shove, 2010).

Relational and poststructuralist approaches are also a response to the limitations of institutional approaches that focus too much on top-down mechanisms of change where institutions determine behavior. One prominent example within poststructuralism is the concept of governmentality (Foucault 1979; Rose et al. 2006). A governmentality perspective sees policies not as fixed. Rather, its meaning is constituted the relation between the policy's rationalities and the technologies and subjectivities involved in its enactment. Similarly, people's identities, interests and so on are also not fixed. Rather, subjectivities are formed in the relationship between people, policies and technologies (Dekker et al. 2020). In relation to nature and environment, the concept of environmentality has been proposed as a specific form of governmentality that shapes environmental subjectivities that care for nature (Agrawal 2005).

Like systems approaches, relational and poststructuralist approaches emphasize the complexity, non-linearity and unpredictability of change. Yet, compared to systems approaches, relational and poststructuralist approaches are part of what is also known as critical theory in their focus on issues of politics, power, oppression and marginalization. One of these forms of marginalization relates to non-humans. As relational and poststructuralist approaches consider identity as constituted in relations, they decenter

the human and they blur boundaries between human and non-human forms of life (Braidotti 2013; Meesters et al. 2021; Ingold 2004; DeLanda 2006; Debaise 2017; De la Cadena 2015; Descola 2013; Kohn 2013). They foreground this relationality to account for multiplicity and the inherently emergent and dynamic nature of these interrelated views, practices, and institutions (Stirling 2016; Scoones 2016; Scoones et al. 2020; Herz et al 2020; West et al. 2020).

Relational and poststructuralist approaches pay specific attention to the role of worldviews, paradigms, and knowledge systems in the ordering of realities. For example, they discuss how specific forms of knowledge have co-evolved with and shaped how reality is understood and enacted, and with what political and justice consequences for humans and nature (Fisher et al. 2022; Turnhout et al. 2014; 216). Studies have shown how scientific knowledge systems have contributed to the erasure of Indigenous or local knowledge systems and the practices associated with these knowledge systems (Coolsaet 2016; Temper and Del Bene 2016; Fisher et al. 2022). Others have focused on the role of human-nature paradigms that are human-centered and separate humans from nature and how they have co-evolved with and justified colonial and capitalist extractivist practices that are unjust and that harm and nature (Hope 2021; Sullivan 1995, Clark and Yusoff 2017; Braidotti 2013; Herz et al 2020; Yusoff). Importantly, this also applies to paradigms that underlie conservation efforts (Pascual et al. 2021, Büscher and Fletcher 2020; Kashwan et al. 2021; Massarella et al. 2021). In contrast to human-nature paradigms that are based on separation, scholars have proposed terms and concepts such as socionatures, nature-cultures, or biocultural diversity to capture the fundamental entwinement of humans and nature (Harraway 2008; Swyngedouw 1996; Agnoletti and Rotherham 2015).

Others have focused on economic paradigms, including capitalism (and its roots in colonialism), growth oriented, and neoliberal paradigms and their contribution to the exploitation of humans and nature (Schmid 2019; Scoones 2016; Nirmal and Rochelau 2019; Hickel 2021; Feola 2019; Feola et al 2021; Demaria et al. 2019). For this strand of literature, environmental degradation is not an externality, as postulated by mainstream environmental economists, but a fundamental trait of capitalism. This means that transformative change requires the active challenging and unmaking of the institutions and paradigms that uphold capitalism, such as the belief in the possibility and desirability of infinite economic growth (Feola et al 2019). This is seen as a necessary precondition for sustainable alternatives such as degrowth to emerge, since these alternatives are viewed as incompatible with capitalist configurations (Sekulova et al. 2013; Hickel and Kallis 2019).

This strategy of unmaking builds on the work of Castoriadis (1997) and further developed by Latouche (2015) on 'decolonizing the imaginary', which is central to the degrowth debate. This points to the fundamental importance of decolonial and anti-colonial approaches for transformation (Hope 2021; Sullivan 1995; Clark and Yusoff 2017; Nirmal and Rochelau 2019; Hickel 2021; Temper 2018; Todd 2016; Tuhiwai Smith 2019). Importantly, decolonization and transformation should involve not just meaning, but also the redistribution of power (Tuck and Yang 2012, Bluwstein 2021). What is needed is "a diverse range of interconnected and multilevel (individual, social, socioecological) processes that are deliberately activated in order to 'make space' (temporally, spatially, materially, and/or symbolically) for radical alternatives that are incompatible with dominant modern capitalist configurations" (Feola et al. 2019, p. 979). Only by securing equity and pluralism and empowering marginalized perspectives we can prevent that transformation benefits elites only (Stirling 2016; Scoones 2016; Scoones et

al. 2020; Demaria et al. 2019; Braidotti 2013; Zwarteven et al. 2016; Goetz et al. 2020; Pelling et al 2015; Escobar 2020). This has to go hand in hand with the active unmaking and undoing of suppressive institutions and practices, and the paradigms and knowledge systems that support them (Feola 2019; Feola et al. 2021).

For several studies, social movements are seen as important catalysts of transformative change of the way they combine bottom-up mobilisation, the development and nurturing of radical alternatives, and political struggle (Hope 2021, Schmid 2018; Van den Berg et al. 2021; Coolsaet 2016; Meek 2015; Pelenc et al 2019; Fernandes-Jesus and Gomes 2020; Schlosberg and Coles 2016; Yates 2015). Scholars of social movement have long realized that education is key to promote emancipation and build capacities to develop alternatives and engage in struggle against oppression, and the paradigms and knowledge systems that justify this oppression (Freire 1970; Barbosa 2017). Similarly, modes of knowledge production and learning require transformation in ways that promote transgressive learning, engage decolonial and anti-colonial approaches, redistribute power, and include diverse forms of knowledge (Coolsaet 2016; Moser et al. 2016; Liboiron 2021, Temper and Del Bene 2016, Mehta et al. 2016; Turnhout and Lahsen 2022). This can make space for holistic paradigms and practices that recognise that transformation requires justice and equity not just for humans but also for non-human forms of life (Celermajer et al, 2021; Braidotti 2013) and that are built around notions of affect, reciprocity, and care (Puig de la Bellacasa 2017; Van den Berg et al. 2021; Berriane et al. 2021; West et al. 2020).

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6 Conclusion

As we have seen in the previous chapters, different theories place emphasis on different aspects when it comes to understanding and fostering change. In the chapters we have discussed perspectives that focus on among others: understanding what aspects of individuals explain behaviours and actions and how these can be modified; overcoming the inherent inertia of institutions or the obstacles posed by powerful actors and vested interests; navigating cross scale links; and social mobilization.

The approaches discussed in the report are all relevant for transformative change. Going back to the BIOTraCes approach to transformative change, the principle of pluralizing can take individualist and behaviourist approaches as a source of inspiration, to understand individuals, the values they hold and their fears and aspirations and foster reflection on plurality. For empowering, this can be complemented with aspects of relational approaches to foster reflection on relations between individuals and context and this can help develop a sense of capacity and power. The principle of politicizing takes inspiration from institutional and poststructuralist approaches to help identify, question, and challenge existing institutions, paradigms and power relations. Finally, the principle of embedding draws on institutional approaches to help fit desirable changes into existing institutions, and on poststructuralist approaches to consider the important role of paradigms, values and knowledge systems.

The approaches discussed in the report are also fundamentally interrelated. Individual behaviours can change in an enabling institutional environment that makes biodiversity positive actions easy and attractive; these institutions can develop when they are seen as logical in view of dominant cultural and economic paradigms, values and knowledge systems; paradigms, values, and knowledge systems that can take root in individuals through educational or other institutions, these individuals are able to mobilise against those powerful actors that keep paradigms, institutions, and behaviours that are harmful for biodiversity in place, and so on. Although it is possible – and perhaps inevitable - to take different starting points, transformation will only occur if actions and behaviours, paradigms, values and knowledge systems, and institutions and structures all shift in parallel. Focusing too much on individual behaviour or on institutional change risks ending up being reformist instead of transformative. Focusing too much on systems and structural change can lead to paralysis by complexity or fatalism. From this perspective, transformation appears as a step-wise approach of actions that become embedded, or encultured (Stirling 2015), thereby shifting this context and enabling further actions.

Context matters deeply for transformative change. In view of the complexity and multidimensionality of biodiversity, and its intersections with issues of equity and justice (Batel & Küpers, 2022; La Sandia Digital, n.a.; Tupala et al., 2022; Wallis et al., 2021), what is required are theories of transformative change that are grounded in actual practices. This means that they have to take into consideration different dimensions and that engage diverse actors and their perspectives on not just biodiversity, but also on society, and on what changes are possible and desirable, effective, and just. This inherent context specificity of transformative change can be seen as both a challenge and an opportunity. It is a challenge because there can be no blueprint approach to transformative change. It is an opportunity because it opens up space for concrete actions that make sense in specific situations. Any change of the system inevitably starts as a change in the system since we are all inevitably part of and complicit in the systems we aim to transform. Learning, reflection and adaption become crucially important to

ensure that changes in systems grow into changes of systems and prevent that they end of reinforcing existing systems.

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