

Transdisciplinary diagnostic framework for biodiversity decision-making assessment

Deliverable number: D1.7

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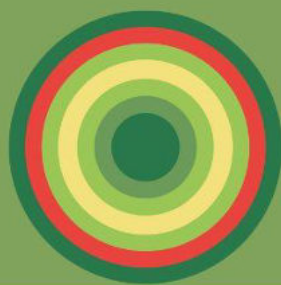
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PLANET4B

BETTER DECISIONS FOR BIODIVERSITY AND PEOPLE



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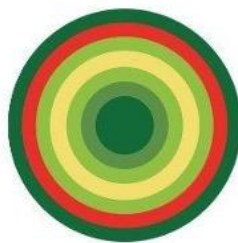
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List of abbreviations and acronyms

Acronym	Definition
CAP	Common Agricultural Policy
CG	CzechGlobe – Global Change Research Institute of the Czech Academy of Sciences
CGE	Culture Goes Europe
CSO	Civil society organisation
CU	Coventry University
DC	Dadima's CIC
ESG	Environmental, social, and governance
ESSRG	Environmental Social Science Research Group
EU	European Union
FiBL	Research Institute of Organic Agriculture
FUG	Forum Urban Gardening
IAD	Institutional analysis and development
IFZ	Interdisciplinary Research Centre for Technology, Work and Culture
KLP	Kommunal landspensjonskasse – Municipal national pension fund
LC	Learning community
LL	Living Lab
LP	Leverage point
LPF	Leverage points framework
MLU	Martin Luther University Halle-Wittenberg
NGO	Non-governmental organisation
NINA	Norwegian Institute for Nature Research
OOF	Oslo og Omland Frilfutsråd – Greater Oslo Council for Outdoor Recreation
PES	Payments for ecosystem services
PLANET4B	understanding Plural values, intersectionality, Leverage points, Attitudes, Norms, behaviour, and social Learning in Transformation for Biodiversity decision making
RCM	Reflexivity-Contextualisation Matrix
RU	Radboud University
SES	Social-ecological-systems
TNFD	The Taskforce on Nature-related Financial Disclosures
UNEP-WCMC	United Nations' Environment Programme World Conservation Monitoring Centre
UNIPI	University of Pisa
WP	Work Package

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Executive summary

This deliverable describes the process of developing a transdisciplinary diagnostic framework for biodiversity decision-making carried out in Work Package 1 (WP1) of the EU funded research project PLANET4B. The aim of the *process* was to help researchers and practitioners in our project become more conscious of the theoretical approaches and languages that may condition the interventions we study and the policy and additional recommendations that we make to societal actors.

The starting proposition for this work was that we as PLANET4B partners come from a wide range of different disciplines and practices. Therefore, we needed a shared learning process of our different theoretical and practical lenses and languages. This is necessary to increase our potential as a project to design for transformational change in Work Packages to follow. We report on our testing of Meadows' (1999) leverage points framework (LPF) as a potential shared conceptual language for transformational change across the places, actors and theories that situate both place-based and sectoral case studies in the project. We report on the opportunities and limitations of the LPF in connecting to (i) theories of change used by research partners in their cases, as well as (ii) bridging conceptually to other "integrating analytical approaches" where PLANET4B has partner expertise; namely "intersectionality analysis", "discourse analysis" and "reflexivity-contextualisation of interventions". The report recognises that these integrating approaches are but a subset of possible systems analysis tools in transformative change research.

The process of understanding and applying Meadows' (1999) leverage points framework achieved some shared language and understanding across research disciplines. It helped us to compare assumptions about transformative change across our different case studies. As such, we think we achieved the "process objective" of this initial stage of PLANET4B of using a common framework to diagnose our case studies. However, case studies and experts on other integrating analytical approaches identified several limitations of the LPF. Limitations include the LPF itself being a particular theoretical systems analysis lens which in some cases could exclude practitioners through its unfamiliar concepts. Furthermore, the LPF was identified as being 'structuralist' or 'mechanistic' in the particular way we tested it in our case studies, not addressing concepts such as agency, power and decision-making. It was critiqued for not being specific to decisions about biodiversity and the related nature values.

To achieve the deliverable objective of a transdisciplinary diagnostic framework for biodiversity decision-making, the above critiques inspired us to review additional frameworks. We reviewed several frameworks developed by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) to address decision-making in the context of plural values of nature, and transformational leadership frameworks to address agency. We conclude that the PLANET4B suite of tools and frameworks – "leverage points", "intersectionality analysis", "discourse analysis" and "reflexivity-contextualisation" – have complementary purposes. We illustrate how a "conscious full spectrum response" (Sharma, 2017) can provide a conceptual framing *for a transdisciplinary diagnostic framework for biodiversity decision-making*, without being exclusive of other frameworks. Complex systems

require analytical lenses and practices working together to lay the foundations for transformative change.

1. Introduction: the purpose of a transdisciplinary diagnostic framework to support the analysis of intervention methods and case studies in PLANET4B

David N. Barton and Yennie K. Bredin

In PLANET4B we aim for “understanding plural values, intersectionality, leverage points, attitudes, norms, behaviour and social learning in transformation for biodiversity decision making”. We do so through a series of partly sequential and partly simultaneous steps, or tasks, organised within six Work Packages (WP1-6):

- WP1. Understanding theories of decision making and intersectionality for a transdisciplinary framework of analysis.
- WP2. Mapping and advancing transformative and creative methodologies to trigger behavioural and institutional change.
- WP3. Learning communities for transformative change.
- WP4. Synthesising transformative pathways and ensuring policy relevance.
- WP5. Capacity building, cooperation, communication, and upscaling to accelerate change.
- WP6. Coordination and project management.

In this report we explain the aim of the PLANET4B project to develop a transdisciplinary diagnostic framework to help researchers and practitioners diagnose their own theoretical starting points, biases, and assumptions that steer choice of research focus on interventions, and possibly condition policy and other recommendations. The proposition is that diagnostic tools to recognise these different disciplinary and practice starting points, will help collaboration between researchers and practitioners to generate more transformative proposals and recommendations.

The need for this work in the PLANET4B project stems from the interdisciplinary nature of our project. Our project group comprises both academic and non-academic partners from a multitude of disciplinary and other backgrounds, spanning social and natural sciences, civil society groups, foundations, and interest organisations. It was therefore clear from the beginning that we needed a platform within our project where we would be able to explain, share and discuss our different backgrounds to form a basis of common understanding across partners. This platform is our first Work Package (WP1 – Understanding theories of decision making and intersectionality for a transdisciplinary framework of analysis).

Work Package 1 has been organised around five different tasks. The first three tasks were designed to explore perceptions of biodiversity among target groups and discourses (Task 1.1), assess theories and practices of behaviour and social sciences that could guide biodiversity prioritisation in decision-making (Task 1.2), and co-create a methodology for context specific multilevel intersectionality analysis to identify vulnerable groups and inequity in biodiversity interventions (Task 1.3). The fourth task (Task 1.4) was to provide a space for discussion among project participants about these themes through a series of three workshops. Finally, to tie the lessons learned

through tasks 1.1-1.4 together, Task 1.5 was to develop a transdisciplinary diagnostic framework for context specific analysis for biodiversity decision-making within subsequent work packages in PLANET4B.

The current report is structured to take the reader through this process, including an introduction to the frameworks and methodological approaches we evaluated. The report only provides introductions and overviews of the different frameworks and approaches. The reader interested in understanding their origins and how they are operationalised in different research practices should explore the references provided.

In **chapter 2** we discuss what we mean by decision-making for biodiversity, transdisciplinarity, diagnostic frameworks, theories of change, reflexivity-contextualisation of interventions, and leverage points. Since Meadows' (1999) leverage points framework is tested as a common conceptual language this chapter also discusses variations that have been developed for different systems analysis purposes.

In **chapter 3** we describe the different methods and materials we used. We summarise deliverables from WP1 (Understanding theories of decision making and intersectionality for a transdisciplinary framework of analysis) which we will 'crosswalk' to the leverage points framework: biodiversity discourse analysis, intersectionality analysis, and the project inventory of theories of change. Our methods include workshops and dialogues with case studies which we also used to evaluate the leverage points framework against other approaches.

If the leverage points framework is to be used as a general diagnostic framework it should be able to encompass other integrating analytical approaches. **Chapter 4** discusses our findings on the conceptual linkages between discourse analysis and intersectionality analysis and the leverage points framework respectively.

If the leverage points framework is to be a general-purpose diagnostic tool, the individual leverage points should make sense for the social-ecological systems in the case studies. **Chapters 5 and 6** report on the place-based and sector-based case study partners' experiences with the leverage points framework. The chapters also report on case studies' evaluations of the reflexivity-contextualisation matrix as a complementary approach for identifying relevant intervention types for their systems. Case studies reveal several useful diagnostic findings from using these frameworks, but also a series of limitations.

Chapter 7 addresses the limitations identified for the leverage points framework, by discussing other systems analysis frameworks that could be used to complement the LPF. The chapter reviews several frameworks developed by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) to address decision-making in the context of plural values of nature, and transformational leadership frameworks to address agency.

Chapter 8 provides a recommendation for *a transdisciplinary diagnostic framework for biodiversity decision-making*, that can flexibly encompass different disciplinary and practice-based approaches that complement one another in understanding and then designing for transformative change.

2. Transdisciplinary Frameworks

David N. Barton

In this chapter we define the concepts and approaches that will be combined into a proposal for a transdisciplinary diagnostic framework for biodiversity decision-support.

2.1 What is “decision-making for biodiversity” and biodiversity policy?

Berit Junker-Köhler

Biodiversity policy involves a variety of strategies and frameworks aimed at conserving and managing the diversity of life forms on Earth. It encompasses the protection of ecosystems, species, and genetic diversity, with considerations of ecological, economic, and social dimensions. These policies are often integrated into the strategies of organisations, businesses, and governments to ensure sustainable development and contribute to a nature-positive society. There is a growing recognition of the significance of biodiversity in policy-making, leading to efforts to establish common frameworks like biodiversity offsets to tackle biodiversity loss (McKenney & Kiesecker, 2010), albeit with limited success.

The primary aim of biodiversity policies is to address various threats such as habitat degradation, pollution, overexploitation of natural resources, climate change, and the proliferation of invasive species. These policies often involve establishing protected areas, implementing regulations for land and resource management, promoting sustainable development practices, and increasing public awareness about the importance of preserving biodiversity (Convention on Biological Diversity ([CBD](#)), United Nations Environment Programme ([UNEP](#)), International Union for Conservation of Nature ([IUCN](#))).

Effective biodiversity policy necessitates a comprehensive approach that includes scientific aspects, communication, and public awareness. Bridging the gap between scientific knowledge and public understanding is crucial for the successful implementation of biodiversity policies (Legagneux et al., 2018; Meinard & Quétier, 2014). To effectively conserve biodiversity and provide ecosystem services, Barton et.al (2017) emphasise the importance of aligning policy instruments. They stress the necessity of a comprehensive approach that integrates various tools to impact both the quantity and quality of biodiversity conservation and ecosystem service provision. This integrated policy mix is essential for tackling the challenges related to biodiversity loss and ecosystem degradation. Additionally, they highlight the significance of utilising a variety of instruments and strategies to improve biodiversity outcomes and ecosystem resilience. They underscore the complexity of biodiversity policy mixes and the need for adaptive strategies to ensure successful conservation outcomes.

Biodiversity policy intersects with other environmental and conservation policies, such as climate change mitigation and land management practices. Integrating biodiversity considerations into various policy domains is essential for achieving positive biodiversity outcomes. Additionally, the role of public authorities and regulatory frameworks is vital in supporting biodiversity goals and driving transformative change (Carroll & Noss, 2022; Penca, 2023; Venter et al., 2013).

What is biodiversity relevant decision-making in the context of PLANET4B? The project PLANET4B aims to understand and influence decision making affecting biodiversity. It recognises the fundamental role that biodiversity plays in sustaining human life and the biosphere, highlighting the urgent need to address the escalating loss of biodiversity. Despite the overwhelming scientific evidence underscoring the importance of biodiversity, it often remains overshadowed by political and other agendas. The project seeks to understand the factors influencing decision-making processes related to biodiversity at both individual and institutional levels. The project emphasises that decisions affecting biodiversity are made daily across various levels, from government policies targeting drivers of biodiversity loss to business investments and personal lifestyle choices.

Understanding the drivers behind these decisions is crucial in the face of biodiversity loss and its implications for human well-being. Factors such as gender, religion, ethnicity, culture, and other variables can influence decision-making processes related to biodiversity. By exploring these critical questions, the Planet4B project aims to influence decision-making processes that impact biodiversity through transdisciplinary research, case studies, and participatory approaches. The project intends to collect and analyse theories, methods, and best practices to bridge knowledge gaps and enhance effective decision-making processes. By synthesising the findings and scaling them up to the EU and global levels, PLANET4B aims to provide valuable inputs for policies, businesses, and civil society to trigger transformative changes that better protect biodiversity, ecosystems, and future generations. This comprehensive approach aligns with the project's goal of influencing decision-making processes to safeguard biodiversity and promote sustainable practices.

2.2 What is transdisciplinary research?

Berit Junker-Köhler and David N. Barton

Transdisciplinary research is an approach to scientific inquiry that transcends the boundaries of individual disciplines to address complex problems that cannot be adequately understood or solved within the framework of any single discipline alone. Unlike traditional disciplinary research, which focuses on specific academic fields, transdisciplinary research integrates knowledge, methodologies, and perspectives from multiple disciplines, as well as insights from non-academic stakeholders such as community members, policymakers, and industry representatives (Figure 1).

By bringing together insights, theories, and methodologies from various disciplines to develop a comprehensive understanding of complex problems, transdisciplinary research fosters the integration of knowledge. It typically engages stakeholders from different sectors and disciplines throughout the research process to ensure that research questions, methods, and outcomes are relevant and useful to real-world contexts. It focuses on producing practical solutions and recommendations that can inform policy, practice, and decision-making and follows an action-oriented approach. Through typically iterative and participatory processes, it emphasises collaboration, dialogue, and reflexivity among researchers and stakeholders to co-produce knowledge and navigate uncertainty (Keitsch & Vermeulen, 2020; Lang et al., 2012; Scholz et al., 2006).

Transdisciplinary research is particularly well-suited to addressing "wicked" problems—complex, multifaceted issues that defy simple solutions – such as climate change, public health crises, and sustainable development. By bringing together diverse expertise and perspectives, transdisciplinary research has the potential to foster innovation, promote sustainability, and address some of the most pressing challenges facing society today (Bernstein, 2015; Pohl et al., 2017; Yeung et al., 2021).

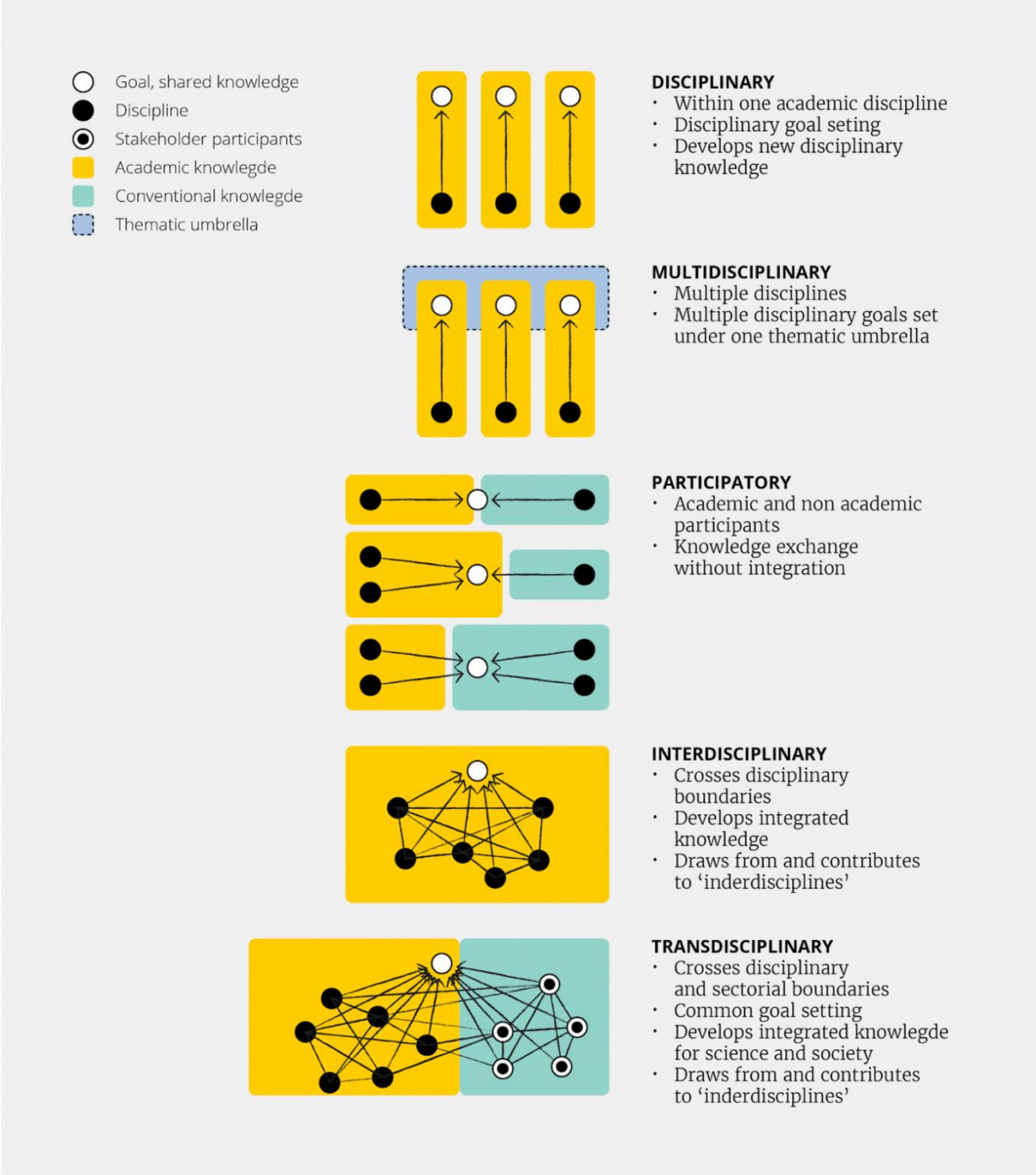


Figure 1. Schematic representation of transdisciplinary research compared to disciplinary, multidisciplinary, participatory, and interdisciplinary research. Adapted from Morton et al. (2015), originally from Tress et al. (2005).

Figure 2 gives a schematic overview of a transdisciplinary research process that connects scientific knowledge production and societal problem handling (larger round

arrows). Often the two processes are not explicitly related (smaller round arrows). The transdisciplinary research process consists of three stages: (1) framing the problem, (2) analysing the problem, and (3) exploring the project's impact. Projects run through the stages in different orders (thin straight and angled arrows). During these stages researchers from different disciplines collaborate and involve societal actors in a joint research and learning experience. The intensity of collaboration and involvement is functional-dynamic, which means that it varies depending on the purpose of the specific stage. Two rationalities (thought styles) meet and have to be balanced in this process: the thought style of science searching for truth and the thought style of practice interested in workability (based on Bergmann et al., 2005; Jahn et al., 2012; Pohl & Hirsch Hadorn, 2007).

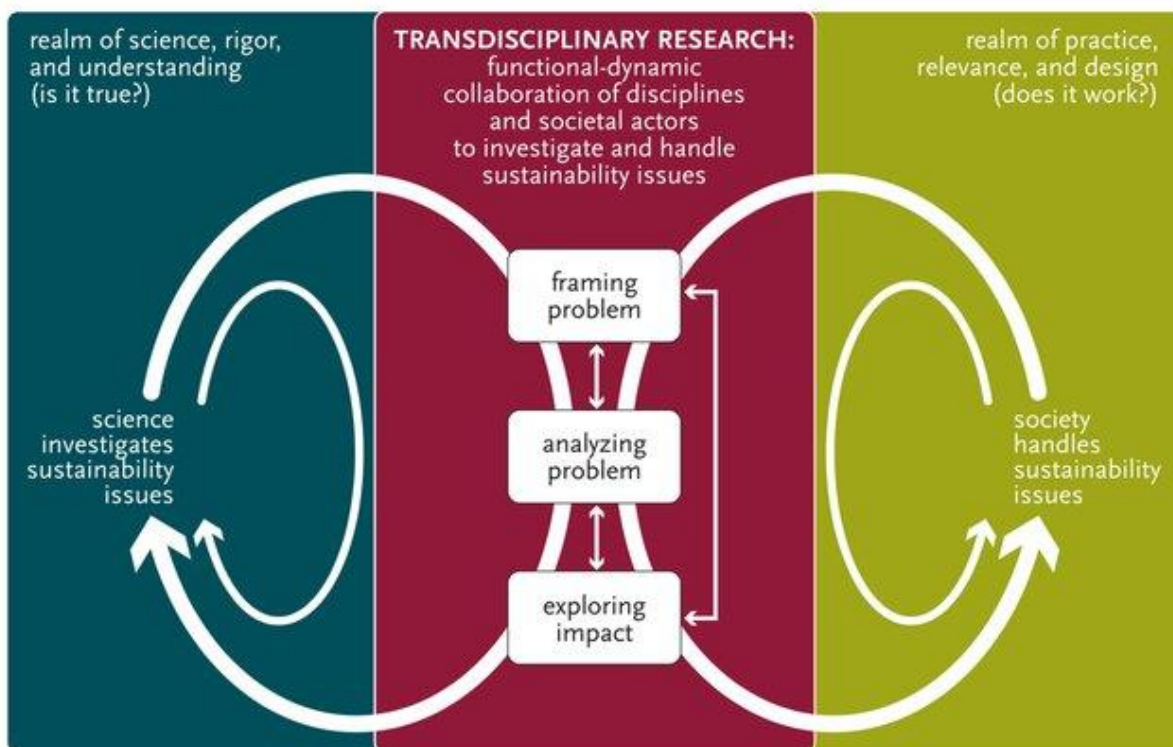


Figure 2. Schematic overview of transdisciplinary research that connects scientific knowledge production and societal problem handling (from Pohl et al., 2017, p. 44).

Transdisciplinarity in applied biodiversity sciences involves integrating different epistemics from science and practice to address complex biodiversity challenges. The concept of transdisciplinarity aims to transcend disciplinary boundaries and merge expert knowledge from various fields to develop holistic solutions (Scholz & Steiner, 2015). In the context of applied biodiversity sciences, transdisciplinarity plays a crucial role in addressing biodiversity loss and ecosystem degradation. By integrating natural, social, and health sciences, transdisciplinarity aims to provide comprehensive solutions to biodiversity challenges (Sell et al., 2022). It emphasises the importance of engaging with non-academic actors and stakeholders to ensure the relevance and effectiveness of biodiversity research and conservation efforts (Hanspach et al., 2020). Transdisciplinary research in biodiversity science seeks to bridge knowledge gaps, promote collaborative decision-making, and trigger transformative changes for e.g. sustainable biodiversity management (Mehring et al., 2017). Overall, transdisciplinarity in applied biodiversity sciences offers a pathway to holistic and inclusive approaches

that consider the complexities of biodiversity conservation. By fostering collaboration, integrating diverse knowledge systems, and engaging with stakeholders, transdisciplinary research can contribute to more effective and sustainable solutions for biodiversity conservation and ecosystem management.

The researchers at the PLANET4B partner institutions conduct science at different intrapersonal, interpersonal, and institutional scales (Figure 3). This research is mainly located within project case studies under Work Package 3. There, Learning Communities, and Advisory Boards work to identify places to intervene (e.g. at the intrapersonal, interpersonal, and institutional scales) to leverage transformative change within their respective systems and sectors. This is work in progress aimed to test and develop a shared diagnostic framework that may facilitate interdisciplinary understanding but also better prioritisation of biodiversity within intrapersonal, interpersonal, and institutional decision-making. As indicated in Figure 3, interdisciplinarity is thus a necessary, but not sufficient aspect of this transdisciplinary process.

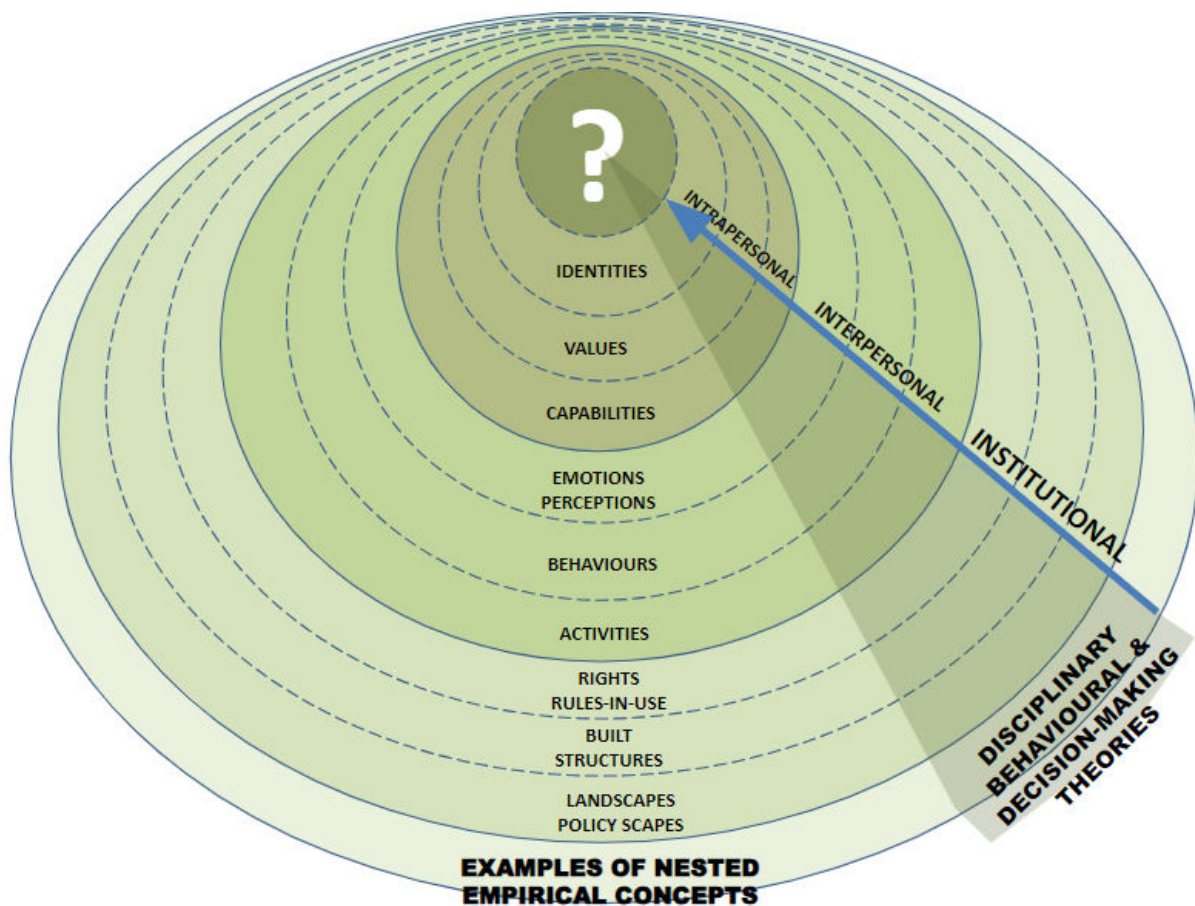


Figure 3. PLANET4B partners collaborated across scientific disciplines at different intrapersonal, interpersonal, and institutional scales.

PLANET4B’s development of a framework for diagnosing case studies has been transdisciplinary in several ways, illustrated through the framework by Fischer et al. (2024).

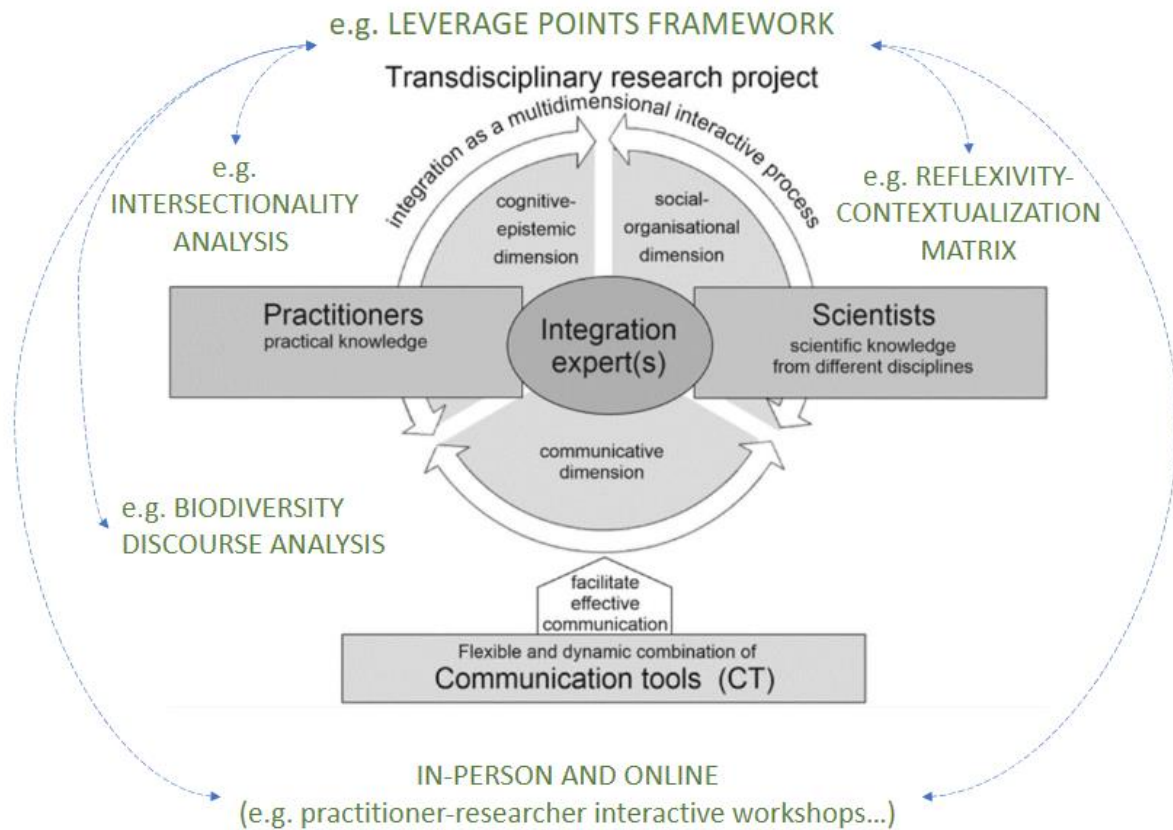


Figure 4. PLANET4B partners’ development of frameworks for diagnosing case studies is transdisciplinary in several ways. Source: adapted from Fischer et al. (2024).

We have followed an interactive process between case study practitioners and researchers in reflecting on the usefulness, or in some cases – as with the intersectionality analysis – necessity, of different frameworks for the place-based and sector case studies (Figure 4), for example:

- Interactive workshops between practitioners and researchers were conducted to exchange knowledge between participants within and between case studies about the usefulness of different conceptual tools and frameworks for identifying interventions and scoping policy relevance of case studies. Technical tools such as Miro boards were used to facilitate interactions (communication tools).
- Intersectionality analysis addressed e.g. how cases include different knowledges and recognise discrimination or oppression of peoples’ identities (cognitive-epistemic dimensions).
- The Reflexivity-Contextualisation Matrix addressed the type of interventions according to social and institutional context of the case studies (social-organisational dimension) considering the situatedness of the interventions’ aspired effect on individual, community, or institutional levels along with the interventions’ reflexivity potentials.
- The leverage points framework was assessed as an integrating framework spanning cognitive-epistemic and social-institutional contexts.

2.3 What is a diagnostic framework?

David N. Barton

A diagnostic framework provides a typology of system components common to a universe of cases, and a positioning of theories that explain the dynamics of the system in relation to those components.

An example is Ostrom (2007) social-ecological-systems (SES) framework, originally developed to compare a wide range of common property resource management systems, which has gone on to be applied in many other socio-ecological systems (Figure 5). In the SES the generic characteristics that can be diagnosed are resource system, resource units, governance system and users. The interactions(I) – outcomes (O) between system components in Figure 5 is an example of a conceptual space in which different disciplines may invoke different “theories of change”.

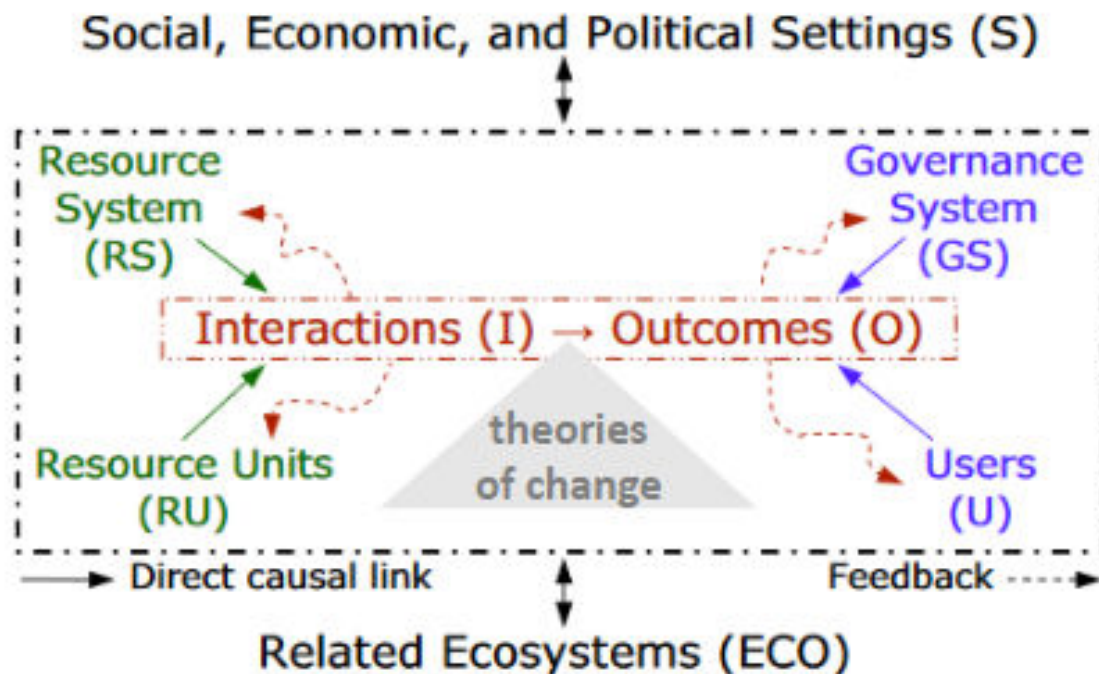


Figure 5. Ostrom’s social-ecological system (SES) is an example of a nested diagnostic framework that can be adapted to different levels of information in empirical cases. Source: adapted from Ostrom (2007).

Ostrom’s SES framework does not prescribe what those dynamics or theories of change are. It can therefore be understood as a diagnostic framework. Its usefulness is to provide a common language for people working in the different empirical cases to self-assess, share their assessments, and learn from other empirical cases. Another aspect of “diagnostic” involves inferring interactions and dynamics causes from observing the outcomes of the case. In the diagnostic metaphor, the system characteristics represent visible symptoms, which can be explained or diagnosed using various theories about the interactions that occur. This represents one interpretation of theories of change (Figure 5).

In some real-world cases, and for some analysis topics, a diagnostic framework may allow us to “go deeper”, beyond the immediately observable. Ostrom’s (2007) SES is a nested or hierarchical diagnostic framework. A nested diagnostic framework provides further typologies within the higher-level concepts. This allows the diagnostic framework to adapt to different levels of detailed knowledge available for each empirical case. For example, nested within the SES framework, Ostrom (2011) has developed the Institutional analysis and development (IAD) theory. The IAD defines the interactions – outcomes in terms of “action situations”. In IAD theory the governance system defines what actions are permitted or sanctioned. The governance system is defined by “rules-in-use”. Rules-in-use provide a further typology to distinguish differences in theories of change (Figure 6).

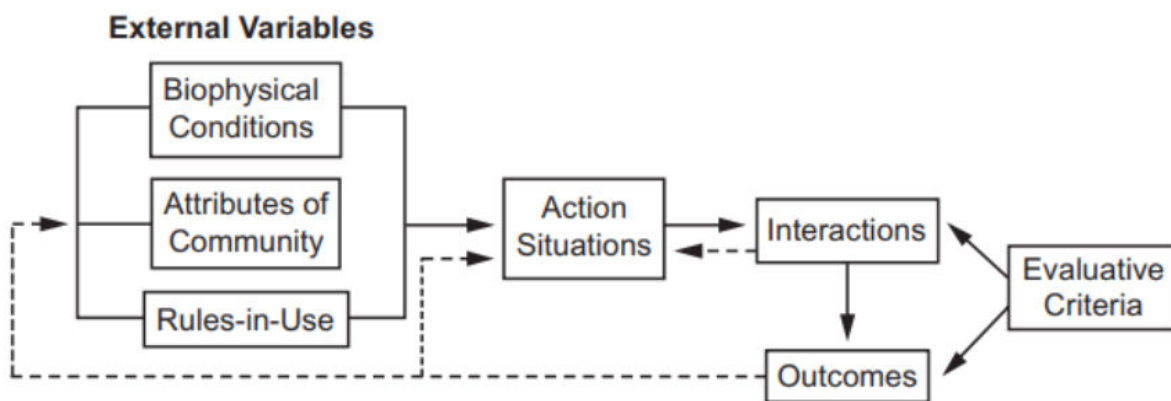


Figure 6. The Institutional analysis and development (IAD) framework – an example of a general framework for biodiversity relevant decision-making. Source: Ostrom (2011).

The IAD theory is also a “diagnostic” tool. It is not prescriptive in the sense of if-then statements about which rules to use to govern action situations, given a particular biophysical and social setting. However, any diagnostic or theoretical framework has elements of “prescription” (as opposed to diagnosis) through its selection of system components deemed significant for their interactions and potential to drive change.

In Ostrom’s IAD framework rules-in-use are the concepts employed to describe the institutions governing the socio-ecological system. Rules-in-use were also developed specifically from a large body of cases focused on common property resource management – resources that are rival in use but non-exclusive (Ostrom, 2011). So, the IAD diagnostic framework has been developed for a certain subset of biodiversity and socio-ecological contexts.

Similarly to SES, the IAD and its rules-in-use has been tested as a diagnostic framework on other socio-ecological contexts. For example, Barton et al. (2017) diagnosed payments for ecosystem services (PES) in Costa Rica, at a different scale and for a wider set of forest biodiversity contexts than the original frameworks universe of common property resource management institutions (Figure 7). At any rate, the IAD diagnosis of what rules-in-use define the policymix governing Costa Rica’s PES programme, may then be used prescriptively in a policy design phase. At the level of prescription – theories of change come into play again, often guided by a disciplinary domain. For example, how large must payments for forest conservation (payoff rules) be to induce a change in forest management practice? For the sake of argument, this

policy design question could be addressed by using only microeconomic theory, e.g. of the ratio of public/private net benefits of forest land use (see e.g. Pannell, 2008). Alternatively, the institutional economic theory of change would consider the interplay of multiple rules-in-use in Figure 7 as determinant of the action taken. Other social sciences may determine whether rules are legally encoded or the social norms and social conditions that give rise to either. Different theories of change are invoked at different levels that directly or indirectly determine the conservation action.

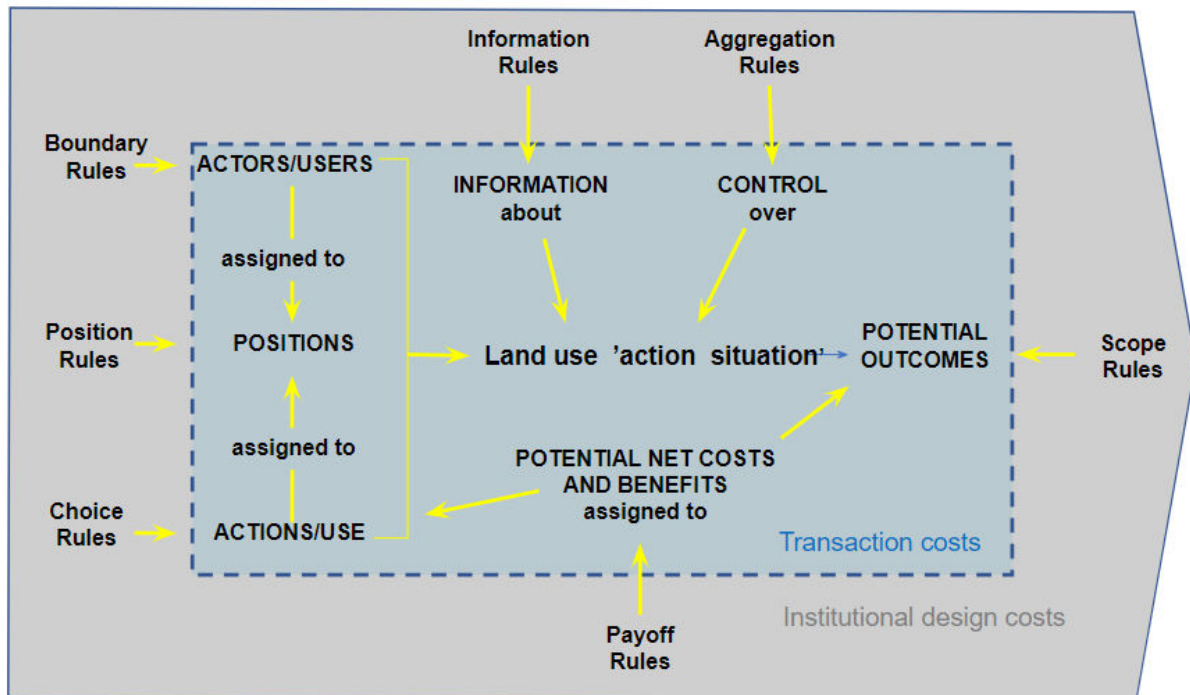


Figure 7. Example of a detailed diagnostic framework for institutions governing decision-making relevant for biodiversity. A typology of “rules-in-use” nested within the IAD framework, nested within the governance system variable of the SES framework. Source: Barton et al. (2017) adapted from Ostrom (2005).

To understand our different theories of change and which systems elements each of us focus on with our respective disciplinary lenses we need a diagnostic approach. Developing a diagnostic framework for biodiversity relevant decision-making in PLANET4B has involved finding and testing frameworks for a language that could resonate with researchers and practitioners across a diversity of place-based and sector-based cases at different scales.

2.4 The Reflexivity-Contextualisation Matrix for intervention choice

David N. Barton

In PLANET4B case studies have been designed to include societal groups and sectors that are not typically considered in biodiversity decision-making. An assumption could be that by including more societal perspectives we may better prioritise biodiversity in decision-making at the intrapersonal, interpersonal, and institutional scales. To this end, place-based cases focus on (non-traditional) transformative interventions within framing/nudging/social norms/emotions, serious games, and creative methods.

Soliev et al. (2023) developed the “Reflexivity-Contextualisation Matrix” (RCM) in order to categorise transformative interventions that could stem from such intervention methods. The matrix is thus designed to guide practitioners and help them select (non-traditional) interventions. It categorises transformative interventions as running across deeper, conscious, and intentional change starting in the individual (i.e. intrapersonal), to more shallow, subconscious changes due to institutionally and top-down defined choice architectures of e.g. policy instruments. The authors highlight that the intervention categories are not exclusive or precise:

“Understanding of transformative interventions most suitable for biodiversity decision-making contexts requires an understanding of 1) contextualisation of interventions and 2) how social transformations can occur in broader terms. We propose a Reflexivity-Contextualisation Matrix (RCM) for facilitating such understanding. Figure 8 illustrates a continuum of interventions that range from interventions in abstract contexts or contexts that emphasise relationships in a society in general to interventions highly contextualised for biodiversity explicitly emphasising relationships around biodiversity, nature, environment on the ground. The assumption [...] is that most challenges related to the prioritisation of biodiversity in society (such as those rooted in intersectionality) in some ways stem from deeper and often non-biodiversity related social issues.[...] Abstract interventions, such as continuous discussions, deliberations, events that are meant to make us re-think the prevailing and more fundamental discourses in a society at a given time (gender, religion, ethnicity, race, age, culture, disability), can be relevant for all representatives in a society and outcomes are more intangible. Highly contextualised interventions on the other hand aim to facilitate change with a very specific or close focus on biodiversity, nature, environment, with specific groups of stakeholders as participants in the decision-making processes, and often in specific locations. Here the interventions such as stakeholder workshops, joint scenario building activities, actions involving co-creation or co-transformation of space, citizen deliberations and alike, take place on the ground within the contexts where transformations are desired, and the outcomes are more tangible” (Soliev et al., 2023, p. 13).

In the context of developing one, common, transdisciplinary diagnostic framework for context specific analysis for biodiversity decision-making within PLANET4B (Task 1.5), the RCM was thus chosen as one of our starting points.



Figure 8. The Reflexivity-Contextualisation Matrix (RCM). Source: Soliev et al. (2023).

2.5 What are theories of change?

Berit Junker-Köhler

In general, theories of change are structured frameworks that outline the causal pathways through which interventions or actions are expected to lead to desired outcomes or impacts. They serve to understand how change is anticipated to occur, the mechanisms through which interventions are expected to work, and the expected results of these interventions (Lang et al., 2012).

In the context of PLANET4B we wanted to assess how changes could be triggered in decision-making to better prioritise and protect ecosystems and biodiversity. Tackling biodiversity loss requires understanding of how values, norms and behaviour are entangled with how decision making within civil society, business and public policy takes place (Nielsen et al., 2021). We therefore collected and examined theories of change and decision-making from the social and behavioural sciences. We hypothesised that established disciplinary preferences could be explained by such underlying theories of change that different practices and disciplines structure their

empirical research around. In PLANET4B we collected and classified from all involved researchers the underlying discipline-specific theories of change, that were linking intervention design to biodiversity impact (Aspøy et al., 2023). This inventory served as a basis for developing a transdisciplinary diagnostic framework within PLANET4B and highlight key dimensions of leverage points, intersectionality, and practice theories (RCM).

2.6 Meadows' original leverage points framework

Elif Tugba Simsek and Patricia Ofori-Amanfo

The loss of biodiversity is driven by complex interactions between nature and society. To tackle this complex issue, the PLANET4B project embraces a transdisciplinary system thinking approach that can help identify the critical leverage points for promoting system transformation.

Systems thinking is an answer to calls for understanding and addressing issues pertaining to complex systems which we find around us (e.g. biodiversity). In contrast to a reductionist and linear view of thinking, systems thinking acknowledges the interconnectedness or interdependence between various elements in a system to offer a holistic approach to understanding and addressing issues. To gain understanding of sustainability issues, systems thinking adopts a systemic view in favour of splitting them into a series of discrete elements to be addressed individually (Abson et al., 2017). We acknowledge that several approaches to system thinking exist, hence different framings of systems. For example, there are systems thinking approaches that view systems as realist objects with boundaries that can be steered such as social ecological systems, and there are systems thinking approaches that view the world as complex and thus uses systems thinking as a tool to unravel that complexity. Overall, systems thinking offers a robust framework for comprehending the world's interconnectedness, complexity, and dynamic nature.

Central to the discussion on systems thinking are the works of the system analyst, Donella Meadows. In her original work she depicts an instrumental framing of a system as a realist object consisting of actors connected through flows of materials and information (Meadows, 1999). Within a systems thinking perspective and using the leverage points framework, Meadows emphasises that systems are not merely linear cause-and-effect chains, but are composed of interconnected elements with feedback loops and nonlinear dynamics. Meadows argues that systems have properties which she describes as leverage points where small changes could lead to large improvements in the system (Meadows, 1999). Meadows ranked these leverage points into a 12-points framework ranging from shallow points, such as parameters and material stocks and flows where interventions could easily be applied but does little to cause change in the system, to deep points of goals and paradigms that hold the greatest potential to cause transformational change (Figure 9).

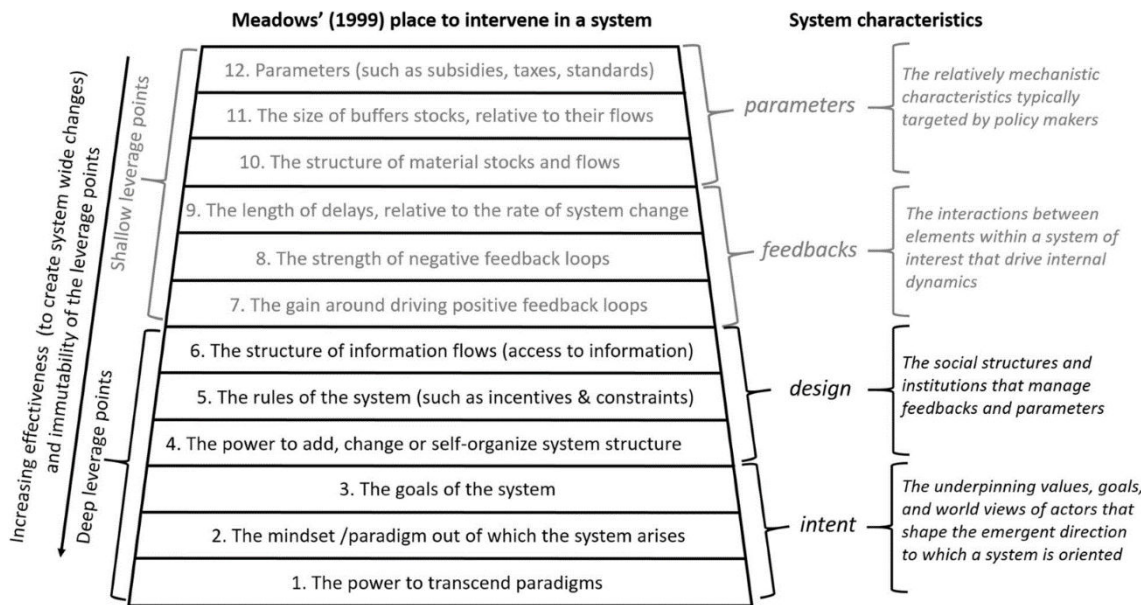


Figure 9. Meadows' 12-leverage points framework in order of increasing potential to cause transformation in a system. Shallow leverage points are identified as points (12-7) and deep leverage points as points (6-1). Source: Abson et al. (2017).

Again, the leverage points concept serves as a boundary object to align knowledge from various disciplines and perspectives from stakeholders to each other (Riechers, Balázsi, et al., 2021). Furthermore, it aids in identifying system boundaries, the actors in a system, as well as the relationship between them (e.g. J. Fischer et al., 2022; Bryant & Thomson, 2021; Jiren et al., 2021). Due to the nested, complex relationships between different systems component and systems, authors have argued for the need for greater clarity as to what system is being intervened with, how, and for what outcome (Davelaar, 2021; Leventon, Abson, et al., 2021). In this regard, leverage points research is framed around interventions in place-based social ecological systems (e.g. Riechers, Pătru-Dușe, et al., 2021) or in other, interconnected systems that shape what happens on the ground, for example policy and governance systems (e.g. Bolton, 2022; Leventon, Dușe, et al., 2021).

Some articles have drawn on Meadows' leverage points framework in addressing issues pertaining to biodiversity (e.g. Arponen & Salomaa, 2023; Leventon, Dușe, et al., 2021). Work drawing on the leverage points concept has been used to critique interventions (e.g. Arponen & Salomaa, 2023; Salomaa & Arponen, 2023; Manlosa et al., 2019) and highlight opportunities for engaging with deeper leverage points (e.g. Bolton, 2022; Horcea-Milcu, 2022). It has also helped in understanding, identifying and designing interventions for sustainability transformations (Abson et al., 2017; Dorninger et al., 2020; Ives et al., 2018; Riechers, Balázsi, et al., 2021). Indeed, as Meadows proposed, the leverage points framework was "a work in progress" (Meadows, 1999, p. 3). Many studies building on her work have emerged over time, and have created variations on how leverage points are conceptualised and used. Appendix 1 provides some definitions and examples of how each leverage point may be used or understood within the PLANET4B context.

2.7 Variations of the leverage points framework

Elif Tugba Simsek and Patricia Ofori-Amanfo

Drawing on Meadows' leverage point framework, Abson et al. (2017) synthesise four categories of leverage points, grouping Meadows' original 12-leverage points. In order of increasing effectiveness of interventions to cause system wide changes, Abson et al (2017) identified "parameters" and "feedback" which mapped to shallow leverage points identified by Meadows with "design" and "intent" mapping to deep leverage points. "Parameters" refer to the characteristics of a system that can be modified, such as taxes, incentives, and standards, or physical elements like the sizes of stocks or rates of material flows. "Feedbacks" are interactions between components within a system that drive internal dynamics or provide information on desired outcomes. "Design" pertains to the structure of information flows, regulations, power, and self-organisation within the system. Ultimately, "intent" is the set of deepest leverage points, and encompasses the system's principles, norms, values, goals, and the fundamental paradigms from which they originate (Abson et al., 2017). Using this four points framework Abson et al. (2017) argued for the need for sustainability research and policies to address deep leverage points (design and intent) in favour of shallow leverage points (parameters and feedback) to achieve transformation towards sustainability. They highlight three realms of leverage that they believe are particularly important for transformational change: institutions and their role in systemic change, people's connection to nature and its impact on sustainability outcomes, and the production and use of knowledge in transformational processes (Abson et al., 2017).

Identifying these "realms" of leverage opens up a broader range of work to draw on in understanding systems transformation. While often not explicitly labelled as leverage points research, there is a wealth of empirical research into framing people's connections to nature (e.g. Ives et al., 2018), and finding approaches to reconnect people to nature (e.g. Klaniecki et al., 2018). Further, there is broad work on rethinking knowledge systems, particularly by framing transdisciplinary research approaches as transformative and deconstructing dominant framings of legitimate knowledge (e.g. Horcea-Milcu et al., 2024; Fazey et al., 2020). To build on existing knowledge, systems thinking and leverage points can act as organising frameworks to pull such extant knowledge together, even where it was not originally created within these frameworks (e.g. Leventon et al., 2022).

Departing from Meadows (1999) and Abson et al (2017) leverage points frameworks, the IPBES Global Assessment (2019) developed an eight points leverage framework and five levers (means of causing changes in the form of governance approaches and interventions) of transformative change towards sustainability (Figure 10). This framework is adapted to complex, multi-scalar global social-ecological systems which manifests in different change agents having contesting purposes (Chan et al., 2020). Authors of this framework highlight its applicability for a broad suite of sustainability objectives and its usefulness in guiding social-ecological practice and policymaking, and explicitly state that it is a deviation from Meadows' framework. The underlying premise of this framework is the need to prioritise and pay due attention to indirect drivers of change (such as formal and informal institutions, demographic and sociocultural factors) when designing interventions for transformation towards sustainability as indirect drivers propel direct drivers of change (e.g. climate change, direct exploitation, invasive species, pollution, etc.).

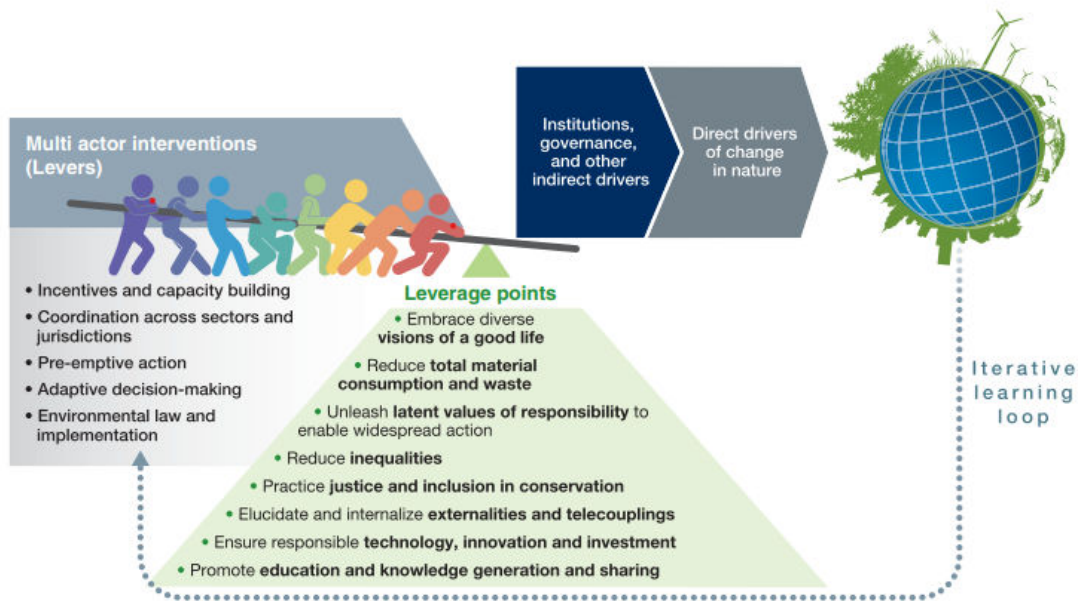


Figure 10. Implementation of interventions (levers) by collaborative efforts of various actors targeted at specific leverage points to cause transformation towards sustainable outcomes. Source: Chan et al., (2020).

A variation on the leverage points framework was also further developed by the IPBES Values Assessment for the purpose of communicating explicit and implicit valuation of nature's contributions to people in bringing about sustainable and just futures (Pascual et al., 2023; Figure 11).

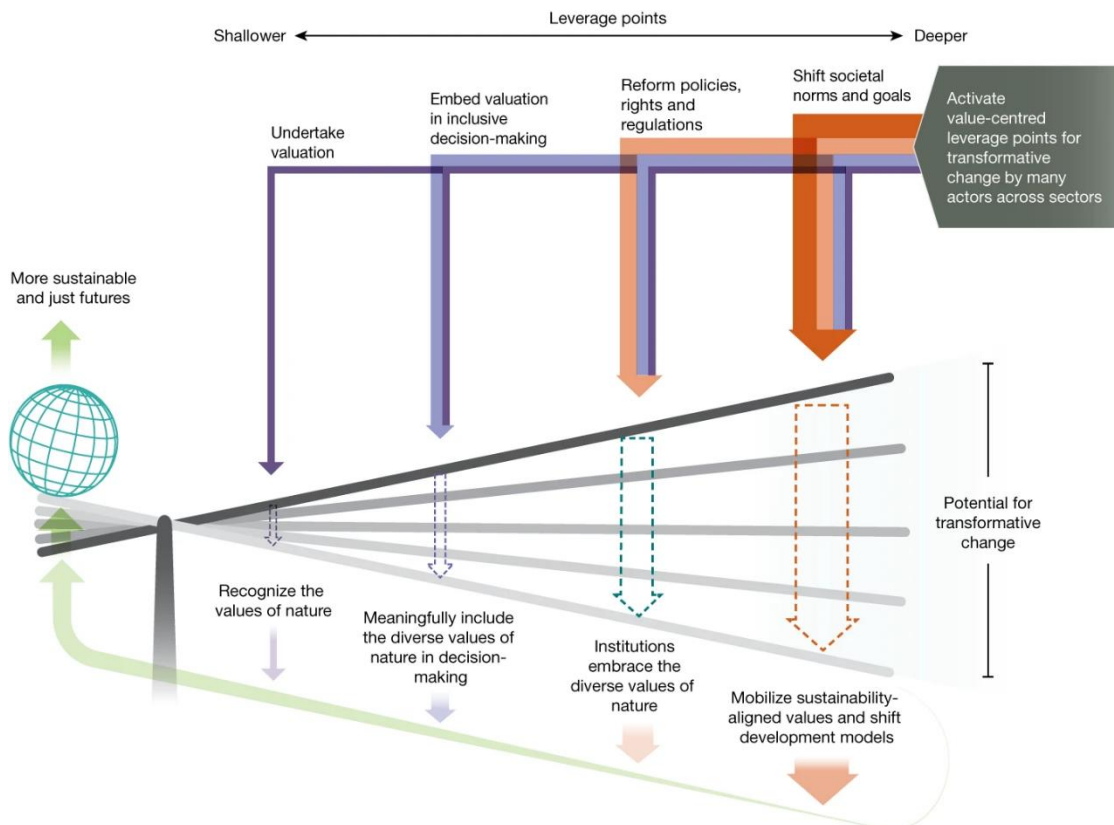


Figure 11. Values-centred leverage points can catalyse transformative change towards more just and sustainable futures. Source: Pascual, et al. (2023).

In this version of the leverage points framework, explicit and implicit valuation of nature's contributions to people is emphasised. Shallower leverage points include explicit valuation through (i) undertaking valuation to recognise the values of nature and (ii) embedding valuation in inclusive decision-making to include diverse values of nature; while deeper leverage points and implicit valuation of valuation of biodiversity comes about through (iii) reforming policies, rights and regulations so that institutions embrace diverse values of nature, and (iv) shifting societal norms and goals by mobilising sustainability-aligned values. In PLANET4B, we practiced understanding Meadows' leverage points framework (1999), as a shared way of articulating policy questions and thinking about scalability of case study recommendations about biodiversity governance.

The leverage points framework has also been taken in a more reflexive direction, as ways to question which system we engage with, whose system counts, and whose sustainability we seek to create. Leventon, Abson, et al. (2021) aimed to clarify this direction by contextualising 13 studies that address leverage points for sustainability transformation. The studies had different opinions on how systems should be defined and what terminology should be used to describe the basic elements of the leverage points framework, such as the system itself, the lever, the leverage points, and the interventions. As per Davelaar's (2021) study, for instance, the key to creating a sustainable future is to change our fundamental way of thinking and understanding the world. Indeed, Davelaar (2021) warns that the metaphor of leverage points has now become the paradigm of the system (Leventon, Abson, et al., 2021). She argues that

shifting from traditional to more holistic perspectives could significantly change how we intervene in systems (Davelaar, 2021).

Eventually, the variety within the leverage points framework can be considered as evidence of the valuable contribution a leverage points perspective can make in understanding how to create fundamental systems change towards sustainability (Leventon, Abson, et al., 2021). Indeed, Meadows' later essay, "Dancing with Systems" (2001), acknowledges the importance of working in harmony with the characteristics of complex systems and our own values, allowing for flexibility instead of attempting to control them entirely.

2.8 Discussion on leverage points

David N. Barton

The perception of the leverage points framework very much depends on its practice. The leverage points metaphor itself can initially be limiting; for example, by only thinking of one leverage point at a time. With further practice it can open for deeper questions.

Figure 12 uses leverage points metaphor to visualise different ways PLANET4B used "theories of change". As we saw above, the leverage points framework of Meadows (1999) has been simplified to four main categories of leverage defined by Abson et al. (2017):

- **parameters** – encompasses i.a. policy instruments such as subsidies, taxes, standards, resource and habitat conservation targets, management practices structuring ecosystem stocks and flows.
- **feedbacks** – encompasses i.a. institutional procedures determining e.g. response times of policy and management, and whether responses generate positive and negative feedback loops in governance systems that strengthen or weaken socio-ecological processes that impact on ecosystem condition.
- **system design** – encompasses i.a. changes to knowledge about the system, rules-in-use defining institutions and changes to power to constitute rules-in-use.
- **intent** – encompasses i.a. constitutional (systems) goals, worldviews and value systems in the minds of actors, opportunities to shift constitutional goals and mindsets.

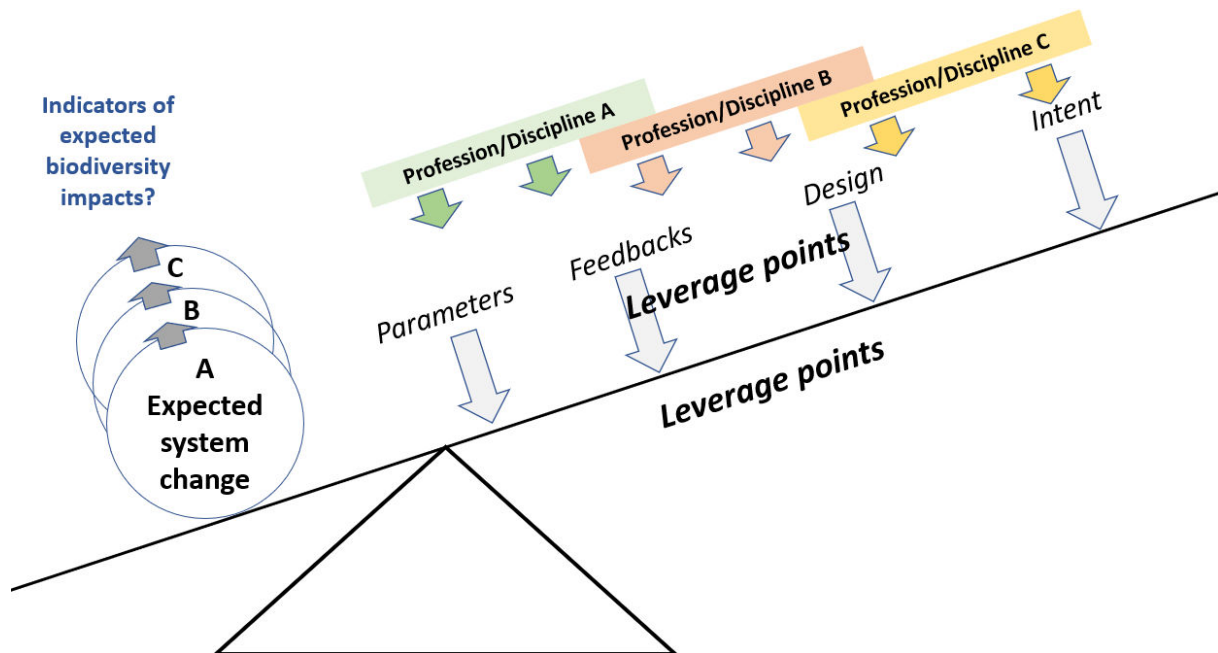


Figure 12. A leverage points perspective on different disciplinary preferences/biases.
Source: adapted from Abson et al. (2017)'s leverage points model.

A hypothesis of the PLANET4B project was that different practices and scientific disciplines of the research partners would prefer to work with certain *interventions* in their cases, and perhaps derive *policy instrument (or other) recommendations* from their case study testing of those interventions, which cluster to “parameters”, “feedbacks”, “design” or “intent”. This will be explored further by Work Packages 3 (Learning communities for transformative change) and 4 (Synthesising transformative pathways and ensuring policy relevance).

An example of disciplinary “bias” towards policy interventions could be taken from environmental economics and *marginal utility optimization* as a theory of change. The theory of change “mechanism” is the perceived utility of the landowner and the assumption that they maximise marginal utility (benefits-costs), which causes increased forest soil conservation practices. Within this theory of change, the intervention may focus on *economic incentives* for conservation, e.g. payments for ecosystem services (PES). PES would be considered a “parameter” of the system, which is the shallowest leverage point. This leverage point doesn’t necessarily address dynamics of feedback, system design rules or policy intent. The outcomes of PES could be measured in *physical metrics* in terms of e.g. forest cover, species composition and/or ecosystem services such as reduced soil erosion, or in terms of “impacts” on forest owners such as increased household income.

This example can be questioned from alternative theoretical perspectives. In what way is PES an example of a leverage point? Could it be interpreted as something other than a leverage point? To the extent that taxes and subsidies are Meadows’ (1999) examples of “parameters” of the system, then PES is in a similar category of economic incentives. Possibly Meadows’ (1999) intended another aspect of taxes to be the example of a leverage point. It may not be the instrument itself that is the leverage point, but the institutional design of the instrument – one or several of the “rules-in-use” (see section 2.3).

We designed the activities of Work Package 1 (WP1) to reveal these underlying theories and connect them to case study design choices. The proposition of WP1—and what we explore further in this report—is that a mutual understanding of these underlying theories of change would help us to understand and respect one another’s research designs better. This might enhance comparability across diverse empirical cases and possibly help develop a shared diagnostic framework.

3. Methods and materials

David N. Barton

This chapter explains the sources of knowledge used for the comparative assessment of frameworks and case study experiences (Figure 13). WP1 developed three different knowledge system deliverables in Tasks 1.1-1.3 (Systematic review on the social, political, and academic discourses on biodiversity; Systematic review of disciplinary theories and practices as a basis for transdisciplinary approach; Applied multilevel intersectionality analysis for identifying vulnerable groups and inequity in biodiversity intervention design), including a biodiversity discourse analysis (Schleiffer et al., 2023), an inventory of theories of change (Aspøy et al., 2023) and an intersectionality analysis (Thaler & Karner, 2023). The content of these deliverables was discussed as part of a series of workshops devoted to theories of behaviour and decision making of relevance for biodiversity in Task 1.4 (Inventory and conciliation of theories of behaviour, decision-making and change among consortium disciplines and partners). WP2 (Mapping and advancing transformative and creative methodologies to trigger behavioural and institutional change) developed among other things the reflexivity-contextualisation matrix, which is also considered in this synthesis. These deliverables and the workshop process form the knowledge base for the proposal of a transdisciplinary diagnostic framework for context specific analysis for biodiversity decision-making (Task 1.5). This chapter also describes the theoretical and methodological linkages to WP3 (Learning communities for transformative change), and Task 3.2 on systems mapping and transformative interventions. Indirectly, through the work done in WP3, the PLANET4B diagnostic framework is also expected to contribute to the WP4 Synthesising transformative pathways and ensuring policy relevance at sector, EU, and global levels.

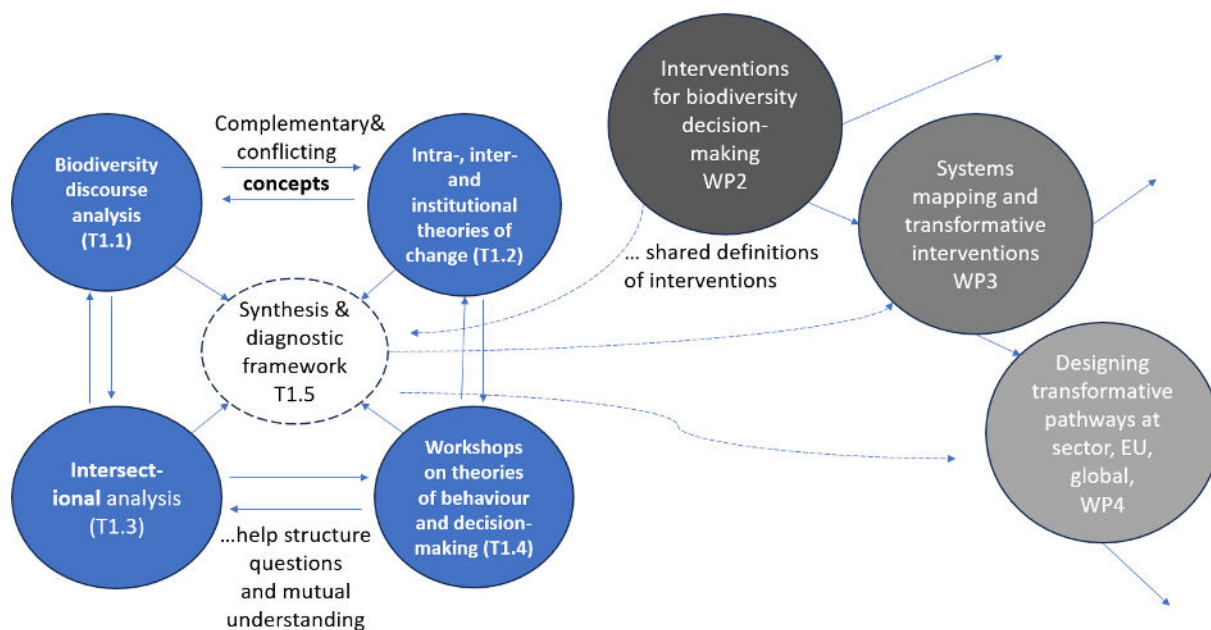


Figure 13. Illustration of WP1 Tasks 1.1-1.4 topics, their integration in the diagnostic framework Task 1.5 and relationship to other Work Packages in PLANET4B.

In this chapter each deliverable and workshop is briefly summarised. The analysis of potential interlinkages between the knowledge domains in the deliverables is discussed in the following chapter 4.

3.1 Biodiversity discourse analysis

Robert Home

The meaning we assign to the world around us influences the way we behave and treat things. Therefore, it is of great importance to better understand how society views and understands fundamental challenges of our time, such as biodiversity loss. How do different social groups perceive and communicate about biodiversity? How do perceptions, communication, and worldviews intersect with values?

The analysis of the biodiversity discourse by the PLANET4B researcher group (Using biodiversity to persuade: A discourse analysis, Schleiffer et al., 2023) has the “aim to gain an understanding of how different social groups perceive and communicate about biodiversity, the worldview this implies, and how perceptions, communication, and worldviews intersect with values”. The authors conducted a discourse analysis using a discourse-historical approach, operationalised through the analysis of published documents from five main actor groups: 1) academia, 2) news agencies, 3) political parties, 4) NGOs and 5) the business sector. The analysis enabled us to identify the main discourses about biodiversity along with the implied values of the actors and how these are instrumentalised by the different groups. In this way, the analysis showed why, and how, these groups use the discourse in their communication to further their goals and how the political stance influences the values highlighted in the discourse. The study reflects on the differences between the Investigated countries.

Key findings from the review:

1. The language that is used and communicated is intended **to motivate action or inaction**.
2. The absence of a common understanding of biodiversity facilitates the strategic choice of rhetoric to further the agendas of interest groups.
3. Two value domains were identified: **anthropocentric (including science-centric) and ecocentric**. Anthropocentric values are most often used when arguing both for and against biodiversity conservation.
4. The biodiversity discourse in the news outlets relies heavily on rhetoric of **“warning”, “calling for action”, “informing”, “persuading”, “accusing” and “othering”** to attract the attention of a wide audience.
5. Political parties attempt to gather political support, and thereby gain or hold power, by using a rhetoric that is centred on **“persuading”, “accusing”, and “othering”**. With this rhetoric, they place themselves as being the solution to biodiversity loss or provide justification for their actions or inactions.
6. The rhetoric of environmental NGOs includes **“calls for action”, “warning”, and “persuading”** their audience to engage with their issues: usually by relating consequences of action or inaction with the effects on humans. The implicit aim is to gain followers and gather support for their activities by **using anthropocentric arguments to further their ecocentric ideologies**.
7. The business discourse is based on a rhetoric of **“persuading” and “raising hope”**, as business and industry leaders present an optimistic picture in which “business as usual” is a viable and sensible option.
8. The rhetoric used in biodiversity discourse differs between countries.

3.2 Intersectionality analysis

Vinicius Mendes and Cristina Y. A. Inoue

To tackle the interlinkage of inequalities in the field of biodiversity in PLANET4B, Thaler and Karner (2023) review the concept of intersectionality with a biodiversity lens (Crenshaw, 1989). Intersectionality underscores how race, gender, disability, sexuality, class, age, and other social categories are interconnected, each contributing to varying degrees of power and oppression. These dynamics are further influenced by forces such as colonialism and neoliberalism (Rice et al., 2019).

The concept of intersectionality does not constitute a theory accompanied by clear methodological guidelines, but rather a framework for analysis and reflexivity. Thaler and Karner (2023) provide insight into relevant theories and methods that can be fruitfully connected to the PLANET4B transdisciplinary framework and document a co-creation process of the PLANET4B consortium to facilitate a shared understanding of how to use the intersectional lens for upcoming biodiversity case studies.

The report presents a co-created framework for PLANET4B case studies comprising three elements:

- Using intersectionality as a starting point of reflexivity of researchers.
- Considering intersectionality and positions of privilege when approaching actors.
- Doing case studies with an intersectional lens.

Each element of this framework is introduced with a guiding principle, which stems from the co-creation workshops, and useful questions. All five PLANET4B place-based case studies explored their intersectional focus through consortium workshops, and also by undertaking supporting literature reviews.

The report provides a series of tools:

- **Self-reflexivity** questions to help researchers use an intersectionality lens to identify their prejudices and stereotypes in the case studies.
- Guidance on approaching actors in biodiversity case studies and **establishing Learning communities** using an intersectional perspective, including alignment of different actors' motives with the case study intervention plans, and communication of benefits for local communities of cooperation.
- Guiding principles on conducting biodiversity case studies, including **the identification of power relations due to dualistic thinking** of humans and nature. This includes processes of "backgrounding," "incorporation," "exclusion," and "objectification."
- **Using multiple knowledges** offering possibilities of re-thinking and potentially changing relations between humans and nature and promoting **multispecies justice** (paradigm shifts).

The report identified some limitations of the methodological framework, including:

- Unclear identification of the case studies' interventions at the time of writing.
- Lack of analysis of systematic causes of inequalities based on intersectionality analysis in the cases at the time of writing.
- Vague expectations of how the intersectionality lens can support changes in behaviour and systems concerning biodiversity, probably due to the absence of clear identification of relevant theories of change by the case study groups at the time of writing.

3.3 Review of disciplinary approaches proposed by case studies and theories of change

Summarised by David N. Barton

The starting proposition was that different disciplines have different interventions and policy responses in the face of global change drivers challenging biodiversity and societies (Figure 14). The review was the first step of a process of understanding the theories applied by case studies to select and test interventions. The review was aimed at starting a process of mutual understanding of how researchers in the different cases understand how we make decisions in terms of biodiversity and/or form expectations about policy and other recommendations to come out of the empirical work. The disciplinary approaches in the theory inventory were classified according to their intrapersonal, interpersonal or institutional conceptual levels, as well as their disciplinary "home ranges". Following the review of disciplinary approaches, cases would then use a common terminology of the leverage points framework (Meadows, 1999) to identify the leverage points that each theory assumes. We expected that this would help understand the choice of interventions and theoretical expectations about their impacts on biodiversity through system change.

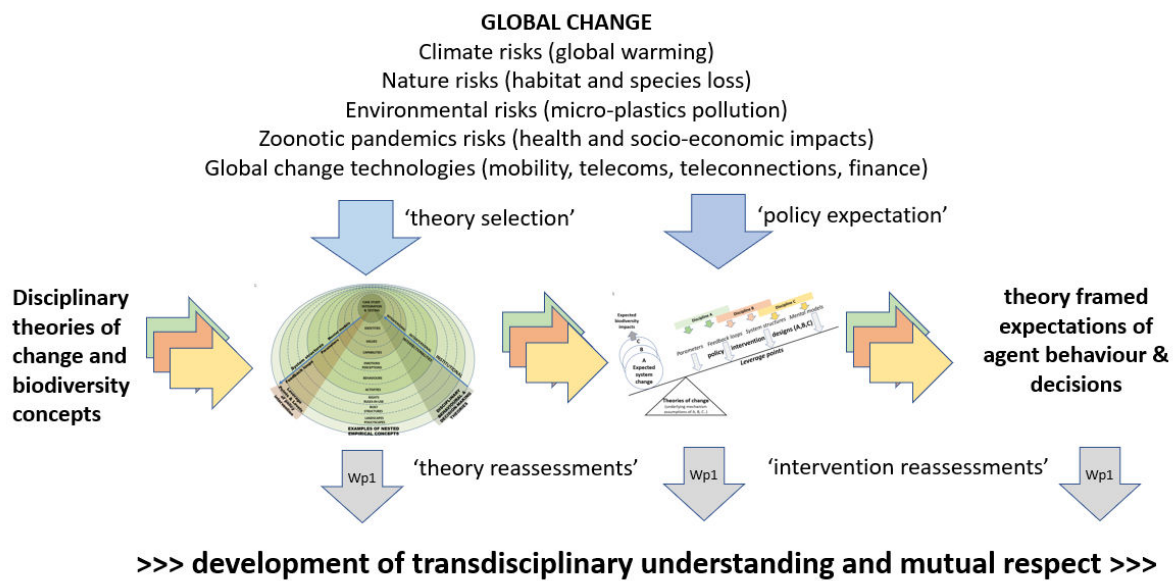


Figure 14. Identifying theories of change as part of a transdisciplinary process for mutual understanding and respect across case studies of different policy interventions and recommendations. Source: Aspøy et al. (2023).

Starting from this framing of the process, Aspøy et al. (2023) carried out a systematic narrative review of the published literature on disciplinary approaches, including frameworks, theories, models, and concepts, proposed by the PLANET4B partners. Their review resulted in an inventory of theories, including behaviour and social sciences, proposed by the PLANET4B partners as potentially applicable for influencing biodiversity decision-making. The report also includes a complementary review of CORDIS database of previous European Union and global projects (grey literature) that have tested behavioural and decision-making interventions for biodiversity decision-making.

The initial review (Table 1) developed by Aspøy et al. (2023) was updated based on discussions in a first workshop on case studies theories of behaviour, decision-making and change (Mendes & Inoue, 2023). As per May 2024, the updated theory inventory contains 290 theoretical approaches considered by the case studies. The extended lists of theories will be available on Zenodo before the end of the PLANET4B project, in October 2025.

Table 1. Inventory of theoretical input based on PLANET4B expert knowledge from the behavioural- and social sciences that may influence biodiversity decision-making. Source: Aspøy et al. (2023).

Discipline	Theoretical input	Intra-personal	Inter-personal	Institutional
Anthropology	Community Action Research		X	
	Cultural-evolutionary theory	X	X	X
	Ontological politics			X
Economics	Behavioural change wheel	X		
	Commons		X	

	Degrowth			X
	Farmer decision-making and behavioural factors ("System 2" thinking)		X	
	Game theory		X	
	Institutional analysis and development framework		X	X
	Institutional change theory		X	X
	Nudging	X	X	X
	Path dependency		X	
	Prospect Theory	X	X	
Human geography	Epistemologies of the South			X
	Integrating local and indigenous knowledge		X	X
	Theory of communicative action		X	X
Interdisciplinary approaches	Leverage points for transformation			X
	Telecoupling			X
	Transformative social innovation and grassroots innovation theory			X
Law	Intersectionality		X	X
Philosophy	Pragmatism/Pragmatist theory of inquiry		X	X
Political science	Nudging	X	X	X
	Commons		X	
	Decolonial theories			X
	Institutional change theory		X	X
	Path dependency			X
	Policy integration			X
	Political ecology			X
	Transformative research		X	X
	Transformative sustainability governance		X	X
	Worlding environmental governance			X
Psychology	ABC (Attitude-Behaviour-Choice) framework	X		
	Behaviour change wheel	X		
	BIT's upstream-downstream model with "EAST" model (easy, attractive, social and timely)	X		
	COM-B (capability, opportunity, motivation: behaviour)	X		
	Human-nature interactions (ecopsychology)	X	X	

	Normative conduct (influencing)/social norms	X	X	
	Nudging	X	X	X
	Prospect theory	X	X	
	Psychological biases	X	X	X
	Psychological theories	X	X	
	Psychosocial frameworks	X		
	Saliency	X		
	Theory of environmentally significant behaviour	X		
	Theory of planned behaviour	X		
	Value-action gap	X	X	X
	5E Model of Environmental Engagement (positive psychology)	X		
Science- and technology studies	Co-production of knowledge		X	X
	Ontological politics		X	X
	Post-normal science		X	X
	Responsible research and innovation		X	X
Social Ecology	Leverage points for transformation		X	X
Sociology	Community Action Research		X	
	Cultural-evolutionary theory	X	X	X
	Epistemologies of the South			X
	Feminist care ethics		X	X
	Nudging	X	X	X
	Social equity		X	
	Social practice frameworks	X	X	
	Social solidarities and collective identities		X	
	Socio-ecological resilience theory		X	
	Theory of communicative action		X	X
	Transformative context-based social investment			X
Sustainability science	Mode 2 knowledge production		X	X
	Leverage points for transformation		X	X
	Transdisciplinarity		X	X
	Transformative research		X	X

3.4 Case study workshop on theory commonalities and conflicts and dialogues with case studies

Summarised by David N. Barton

Mendes et al. (2023) report on the second Task 1.4 workshop, which was conducted to help participants think about the underlying theories of their case studies, the leverage points they aim to address, how they might implement policy and other recommendations, and what achieving their goals entails. The use of the leverage points framework was intended to prepare the bridging from WP1 to WP3 systems analysis with individual cases. All eleven case studies of PLANET4B were tasked with connecting their cases to a theory of change from the Inventory of theories developed by Aspøy et al. (2023) and refined in the first workshop (Mendes & Inoue, 2023). For each theory selected, case study representatives indicated which leverage points would be needed to trigger “transformation” in relation to biodiversity decision-making in the context of the respective case.

The workshop was held in person in Nijmegen. Each case presented a story of change for a potential future in 2050, illustrating potential policy and other recommendations, theories of change, and leverage points that would be compatible with the goals, actions, and desired/expected research outcomes of their cases. By using a storytelling and future scenario approach, each case study was encouraged to think about how theories potentially inform research outcomes, policy and other recommendations at a scale of transformative change. The exercise prompted the consortium members to revisit the updated theory inventory. The workshop helped cases self-diagnose their own research goals and processes. It also helped case studies know more about each other’s cases and provide feedback to their colleagues. The workshop provided a first meeting of case studies with Meadows’ 12-leverage points framework. The initial purpose was for a top-down comparison of the transformative strategies across the wide range of intensive place-based and extensive sector-based case studies (Table 2).

Table 2. Comparison of leverage points addressed by case studies' theories of change, policy, and other recommendations through their stories of change set to 2050 during the second workshop. Source: based on Table 1 in Mendes et al. (2023).

		Workshop #2													
		Theories of change and leverage points													
		Intensive							Extensive						
		Partner	OOF/NI NA	DADIM AS/CU	CGE/M LU	FuG/IFZ	FiBL	UNIPI	ESSRG	ESSRG	FiBL	RU	NINA		
		Country	Norway	UK	Germany	Austria	Switzerland	Italy	Hungary	Hungary	EU	Brazil/EU	International		
		Case name	Children	Minority communities	Urban youth	Edible City	Religion	Fashion	Agrobiodiversity & gender	Education	Migration	Trade	Investment		
Leverage Points	Parameters	12. Parameters (such as subsidies, taxes, standards).						1	1					1	
		11. Size of buffers relative to their flows.						1		1					
		10. Structure of material stocks and flows						1							
	Feedbacks	9. Lengths of delays, relative to the rate of system change.						1							
		8. Strength of negative feedback loops						1			1				
		7. Gain around driving positive feedback loops.						1			1				
	Design	6. Structure of information flows (access to information).	1	1	1			1	1	1		1	1		
		5. Rules of the system (such as incentives, constraints).				1		1						1	
		4. Power to add, change, or self-organize system structure.		1	1			1	1	1		1			
	Intent	3. Goals of the system.				1		1						1	
		2. Mindset or paradigm out of which the system arises	1			1		1			1			1	
		1. The power to transcend paradigms.		1	1			1	1						

Following the second Task 1.4 workshop a series of dialogues were conducted by project colleagues with case studies individually. The aim of these dialogues was to validate the cases' own assessments of which leverage points they were working with to extend their diagnostic of their case study interventions using the Reflexivity-Contextualisation Matrix (RCM; Soliev et al., 2023). Additionally, to conduct a self-assessment of the potential and limitations of the LPF and RCM approaches as tools in the diagnostic framework "toolbox". Dialogue partners summarised these discussions, and their summaries were validated through case study leads reporting them in chapters 5 and 6.

The rationale behind focusing on the RCM and LPF as tools in the diagnostic framework "toolbox" was partly based on their applications within other parts of the PLANET4B project (under WP2 and WP3). Using these methodological approaches as a starting point for our case-by-case discussions thus allowed us to capitalise on ongoing efforts within the PLANET4B case studies. It also provided insights into the usefulness of these tools for evaluating context specific biodiversity decision-making.

The dialogues promoted requests for clarification on the definition of each leverage point by case studies and dialogue partners. This resulted in the development of **Appendix 1** providing further **definitions and examples of each leverage point**.

3.5 Linkages to next steps in the PLANET4B project

Blanka Loučková and Simeon Vaňo

The transdisciplinary framework, incorporating other methodological approaches utilised in the PLANET4B project such as "biodiversity discourse" and "intersectionality" is a valuable tool informing (not only) workshops in Task 3.2 (Systems mapping and transformative interventions). Both the PLANET4B transdisciplinary framework and Task 3.2 will facilitate a project-wide understanding of where interventions should be promoted within the systems and how to achieve broader positive effects in transformative change. The PLANET4B transdisciplinary framework will inform Task 3.2 by enabling a comprehensive exploration of systemic interventions in the involved case studies from diverse conceptual perspectives.

The application of the diagnostic framework in Task 1.5 is complementary to Task 3.2, as both these tasks contain a leverage points framework as the key component. The complementarity is due to different perspectives used in Tasks 1.5 and 3.2. The transdisciplinary, diagnostic framework of Task 1.5 is a multilayer research concept, highlighting a top-down perspective based on dialogues with case leaders identifying leverage points in the respective systems represented by the case studies. In contrast, Task 3.2 complements this view by letting the Learning Communities, i.e. the stakeholders, explore places to leverage change. Task 3.2, hence applies a bottom-up approach. Such design is allowing for comparative analysis between the two approaches, as well as exploring a broader information pool, experiences, and understandings, to generate a more robust knowledge base.

Task 1.5 uses a 12-leverage points framework (LPF), which provides a more structured or technical approach to identifying systems features. Task 3.2, on the other hand, applies 4 LPF (parameters, feedback, design, intent) which leaves more space for

learning communities to explore particular leverage points themselves, without having further predetermined categories. There are two reasons for this. First, the 4 LPF is expected to be more user friendly to explore system change together with case study communities coming from very diverse backgrounds. Second, researchers' intent in Task 3.2 is also to test the different views in which learning communities view systemic change. Applying LPFs across different dialogue platforms, from focused discussions with case leaders using a 12 LPF approach to broader engagements within learning communities employing a 4 LPF approach, will altogether provide rich material for analysis. This kind of analysis can enable comparisons and exploration of potential conflicts and complementarities among various perspectives, offering deeper understanding of systemic interventions from different angles. By examining the results of dialogues and workshops, insights will be gained into diverse understandings and potential interventions within systems, highlighting complexities and opportunities for systemic change.

4. Linking the leverage points framework to intersectionality and biodiversity discourse

David N. Barton

This chapter discusses the LPF in its first usage – as a “top down” transdisciplinary theoretical boundary object aimed at connecting or cross-walking to other theoretical approaches. We evaluated conceptual linkages with two other frameworks applied in PLANET4B: “biodiversity discourse” and “intersectionality analysis”.

4.1 Intersectionality analysis

Vinicius Mendes and Cristina Y. A. Inoue (summarised by David N. Barton)

This section synthesises findings from a review of D1.3, or “Methodological framework for intersectionality analysis” (Thaler & Karner, 2023), using an LPF lens.

The leverage points framework (LPF) helps to identify where to target (which levels, which parts of the system, etc.), what kinds of policies or interventions, and which are the potential outcomes of interventions, policy, or other recommendations to interfere in a given system.

At the same time, the LPF has several general limitations:

1. No evaluation criteria for outcomes in terms of equity, justice.
2. Agency of natural systems and other species are disregarded.
3. Does not consider the relationships of co-constitution between different social levels, e.g. institutions, communities, individuals.

Intersectionality analysis provides a set of guiding questions that can compensate for the general limitations in the LPF – moving from “what/where” questions, to questions of “how” – contributing to a transdisciplinary framework. Intersectional analysis questions can:

1. Guide the biodiversity discourse towards **environmental justice**, recognising and incorporating diverse knowledges.

2. Help researchers and practitioners to better visualise relationships of **co-constitution** across different levels of change – from global to local.
3. Using self-reflection to select interventions that are better **aligned** with communities' identities, values, background, and experience.
4. Help planning, and potentially **assessing the impact**, of interventions at the intersections of different social categories in communities.

Tools and interventions mentioned in relation to “intersectionality analysis” knowledge in D1.3:

Practitioner tools:

- Co-creation workshops.
- Development of a language/vocabulary.
- Mindfulness of language in classrooms/workshop.
- Sharing meals to establish relationships/alliances.

General research tools:

- Interview transcripts with intersectional lens.
- Intersectionality-based policy analysis.
- Co-constructing research question and asking participants for feedback.
- Wheel of privilege exercises.
- Ethnographic methods for sensing policy.
- Community vignettes (narratives that move beyond case boundaries).
- Storytelling.
- Lived experience – actor triads.
- Situated bodies of knowledge (countering extractive relations).
- Multilayered analysis.

Case specific tools:

- Roundtable discussions.
- Pilot activities in nature.
- Nature walks, sharing biodiversity stories.
- Role-playing games.
- Framed experiments.
- Multi-actor activities.
- Spiritual practices.

Which parts of the leverage points (1-12) framework are engaged by the tools and/or interventions identified in the intersectionality analysis?

Most of these interventions target deep leverage points (functions of design and intent):

- LP 6 (access to information). Interventions targeting the collection of different worldviews about biodiversity; or focusing on understanding how different knowledge systems depict Nature (e.g. Indigenous knowledge; or how youth perceive biodiversity); or, still, testing innovative ways of knowing and exchanging information about the environment (sharing stories, Nature walks,

sharing meals, etc.) are important means by which we can restructure access to information.

- LP 2 (the mindset out of which the system arises). Interventions focusing on self-reflexivity; or exercises for calibrating the researcher/policymaker/business actor/practitioner views about privilege and power structures can change the mindset out of which systems arise.

The two frameworks don't easily crosswalk conceptually and use different languages: positivist (LP) in contrast to constructivist (intersectionality). However, the LPF and intersectionality analysis can complement one another:

- Intersectionality is aligned with multispecies justice, while the LPF does not specify any particular worldview or paradigm.
- LPs considers the layers of the social world (intrapersonal, interpersonal, and institutional) as stratified and hierarchic, whereas intersectionality is a relational approach, attuned to the processes of co-constitution and communications across these levels.

While it is difficult to crosswalk concepts from the individual leverage points to Intersectionality analysis principles and guiding questions for self-reflection (reflexivity), both lenses can be used to conduct policy analysis – albeit with different scoping of the system.

To use a photographic metaphor, the LP and intersectionality analysis differ in some way in all the following aspects: standpoint and perspective (values), the lenses (tools of inquiry), framing (system boundaries) and focus (parts of the system emphasised as key to action by theories of change). However, the guiding questions in Intersectionality-Based Policy Analysis (Thaler and Karner (2023) (Table 3) illustrate how intersectionality analysis can provide depth to higher level questions about leverage points.

Table 3. Intersectionality-Based Policy Analysis. Source: Based on the literature review developed in Thaler and Karner (2023)

Guiding principles:	Supporting questions:
<ul style="list-style-type: none"> • Intersecting social categories are co-constituting unique social locations. • The “multi-level dimension of intersectionality” (ibid., p. 35) needs a consideration of inequities across levels of structure, identity and representation. • The relational nature of power can lead to experiencing power and oppression in varying contexts at varying times. • Practicing reflexivity requires ongoing dialogue and deconstruction of positioned knowledges (of all involved actors) and their respective influences on policy. • Privileges and disadvantages change over time and place. 	<ol style="list-style-type: none"> 1. What knowledge, values and experiences do you bring to this area of policy analysis? 2. What is the policy “problem” under consideration? 3. How have representations of the “problem” come about? 4. How are groups differentially affected by this representation of the “problem”? 5. What are the current policy responses to the “problem”? 6. What inequities actually exist in relation to the “problem”? 7. Where and how can interventions be made to improve the “problem”? 8. What are feasible short, medium, and long-term solutions?

<ul style="list-style-type: none"> • Understanding the mechanisms of privileging certain knowledges and the implications of up-taking diverse knowledges. • A social justice approach has the potential to transform social structures. • With an intersectional lens the impacts of the intersections of multiple positions of privilege and oppression are considered. 	<p>9. How will proposed policy responses reduce inequities?</p> <p>10. How will implementation and uptake be assured?</p> <p>11. How will you know if inequities have been reduced?</p> <p>12. How has the process of engaging in an intersectionality-based policy analysis transformed structures of power and inequity; policy development, implementation, and evaluation; effects of power asymmetry in the everyday world?</p>
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4.2 Discourse analysis

Marta Bonetti and Pedro Navarro-Gambín

Tools and interventions mentioned in relation to “biodiversity discourse” knowledge in D1.1.

For two of the categories of actors whose discourses were analysed in Schleiffer et al. (2023), namely political parties and NGOs, the report includes a subsection entitled 'Calls for action' because of the prominence of such calls in their discourse. These calls explicitly mention policies or other actions to promote biodiversity. The report categorises these measures as 'carrots', 'sticks' and 'sermons'. According to McCormick (2017), sticks refer to regulatory measures such as laws, regulations and requirements. Carrots refer to economic or market interventions such as taxes, incentives, subsidies, and licences. Sermons refer to informational measures such as plans, standards, and voluntary agreements. A detailed list of interventions can be found in Tables 4 and 5.

Which parts of the leverage points (1-12) framework are engaged by the tools and/or interventions identified in the discourse analysis of different actors?

A summary of the interventions identified from political parties and NGOs and the leverage points engaged by them can be found in Tables 4 and 5. It is relevant to note that, in undertaking this analysis, we encountered difficulties as interventions, policy and other recommendations may engage with different characteristics of the system. Each intervention can play many different roles within a system and engage different leverage points. Consider for example the recommendation “expansion of protected areas with no human intervention” (Schleiffer et al., 2023, p. 43). This policy recommendation could potentially contribute to enlarging the size of buffer stocks, for example, by increasing the genetic pool of biodiversity in a conservation area (i.e. parameters). It could engage with negative feedback loops, such as keeping 30-40% of Earth’s surface untouched to avoid surpassing the planetary boundary of biodiversity loss (i.e. feedbacks). Additionally, it could be implemented by changing the rules of the system, for example, by explicitly prohibiting human activities in protected areas by law (i.e. design). Furthermore, it could change perceptions about people’s connection with nature and help develop relational values of nature, for instance, having more protected areas allows for environmental education (i.e. intent). Therefore, it was difficult to connect the specific interventions to single leverage points. This difficulty is

exacerbated by the fact that the interventions are already classified and taken out of their original context (i.e. media releases, political programs, etc.).

Table 4. Interventions explicitly proposed by political parties and leverage points engaged by them.

Interventions	Leverage points											
	12	11	10	9	8	7	6	5	4	3	2	1
Legal measures that are binding	X?							X?				
Bans on certain practices (i.e. ban of patents on plants and animals, ban of certain pesticides such as glyphosate)			X									
Improvement of the ecological "infrastructure" in the vicinity of settlements (e.g. in the form of natural hedges, green areas, water bodies, etc.)		X?										
Expansion of protected areas with no human intervention because of their value for the conservation of biodiversity	X?	X?	X?					X?				
Financial incentives in order for companies or private households to voluntarily take measures ("carrots")	X											
Internalisation of external costs so that the market prices display the real costs that occur for society (i.e. introduction of "nature" taxes) based on polluter-pays principle. ("carrots")	X							X				
Biodiversity-damaging incentives to be abolished ("carrots").	X							X				
Agricultural subsidies to compensate the effort for biodiversity	X											
Defining clear targets for biodiversity and species diversity (i.e. area targets where a certain percentage of the area per country needs to serve biodiversity promotion) (target)	X											
Informing and awareness raising measures (only suggested by a few parties)							X					
Map habitats and the state of biodiversity					X	X						

Table 5. Interventions explicitly proposed by NGOs and leverage points engaged by them.

Interventions	Leverage points											
	12	11	10	9	8	7	6	5	4	3	2	1
Expansion of protected areas or greater restrictions in existing protected areas	X	X	X					X				
Bans on harmful practices (i.e. burning peat, use of pesticides in agriculture, gravel gardens) (change of the material structures)			X									
Stricter legislation, to make biodiversity measures binding								X				
More “powerful, legally binding environmental targets” (parameters)	X							X				
Implement legislation across sectors (WWF, NO)								X				
To increase financial resources for protected areas (subsidies)	X											
Scientific studies (feedbacks/information)					X		X					
Environmental authorities (governance)									X			
The removal of biodiversity-damaging (subsidies)	X											
Measures according to the polluter-pays principle (principle)	X							X				
International cooperation and specifically international agreements as part of the COP (governance/institution)									X			
National strategies								X				
Monitor the state of biodiversity and map vulnerable areas				X	X							
To disseminate more information regarding biodiversity							X					

In the discourse conveyed by political parties, there seems to be a predominance of shallow leverage points, such as taxes and subsidies, which can also derive from the previous classification. In comparison, the NGO discourse places more emphasis on broader strategic interventions and the necessity of transforming governance (i.e. deeper leverage points). However, it should also be highlighted that no leverage point within to the broader category “intent” (i.e. LP 1-3; goals of the system, paradigms, and the power to transcend them) is engaged by any of the proposed interventions.

Despite this (the fact the identified interventions do not engage with deep leverage points), discourse analysis may help to identify paradigms and therefore contribute to assess the transformative potential of existing and future policies designed with a focus on leverage points. As recognised in Schleiffer et al., (2023, p. 3): “analysing discourses provides insight into how a group of people understands a certain issue and reveals a common worldview, the values and often beliefs that are attached to the problem, and potential solutions. Thereby discourses can coordinate the actions of large groups of people who subscribe to a shared understanding of the world”. As an example, the report identifies a value-based range of discourses (e.g. utilitarian, solidarity, moral and political obligations, responsibility). In fact, we see that the definition of paradigm and “hegemonic discourse” or “dominant discourse”, which are used in the report, are very similar. Since they could be taken as synonyms (as in the following quote), discourse analysis can be considered a tool explicitly aimed at analysing paradigms.

Proponents of discourses strive to make their understanding of a phenomenon the dominant story or the only true story, the latter being known as discursive hegemony (...) When discourses become dominant, their understood power relations manifest in the real world through structuration and institutionalisation. Structuration describes the process when a certain phenomenon, and how it relates to the world, is repeatedly conceptualized in the same way (e.g. the reference of biodiversity as ecosystem services). Institutionalisation happens when understandings are further manifested in laws, policies, or institutions (...) The availability of discourses in society influences our perception of what is possible and acceptable (...) The analysis of dominant and alternative discourses in society help to understand why certain measures are taken and fostered or not. (Schleiffer et al., 2023, 8)

4.3 Inter-linkages with the leverage points framework

David N. Barton

In this section, we summarise how intersectionality analysis and discourse analysis “crosswalk” to the leverage points framework (LPF), despite their respective shortcomings discussed above.

Leverage Points in Intersectionality analysis. Most interventions discussed in intersectionality analysis target deep leverage points, particularly information access (LP6) and mindset (LP2) (Figure 15). However, authors argue that intersectionality analysis does not easily connect to the hierarchical positivist language at each leverage point; but rather provides ways of inquiry that help understand relationships between leverage points. As such intersectionality analysis potentially also covers shallower leverage points.

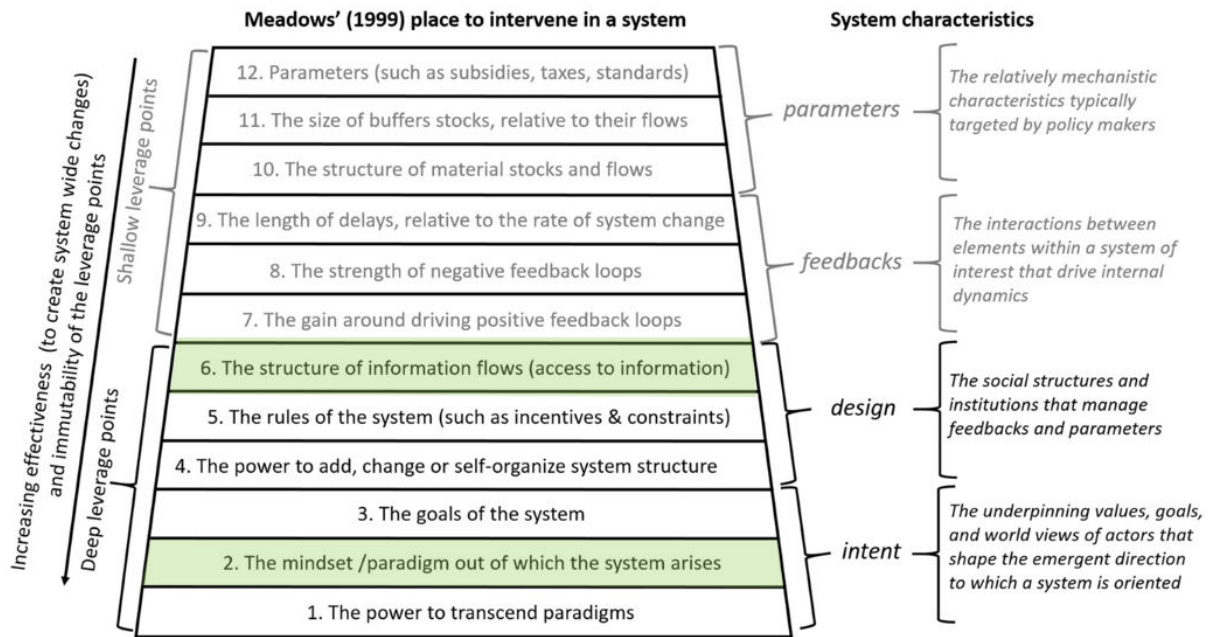


Figure 15. Most interventions discussed in intersectionality analysis target deep leverage points, particularly information access (LP6) and mindset (LP2).

Leverage Points in Discourse analysis. There does not seem to be any inherent limitation in discourse analysis methodologies to address the full range of leverage points. Bonetti and Navarro-Gambín (section 4.2) find many potential leverage points addressed by different actors' discourses (Figure 16).

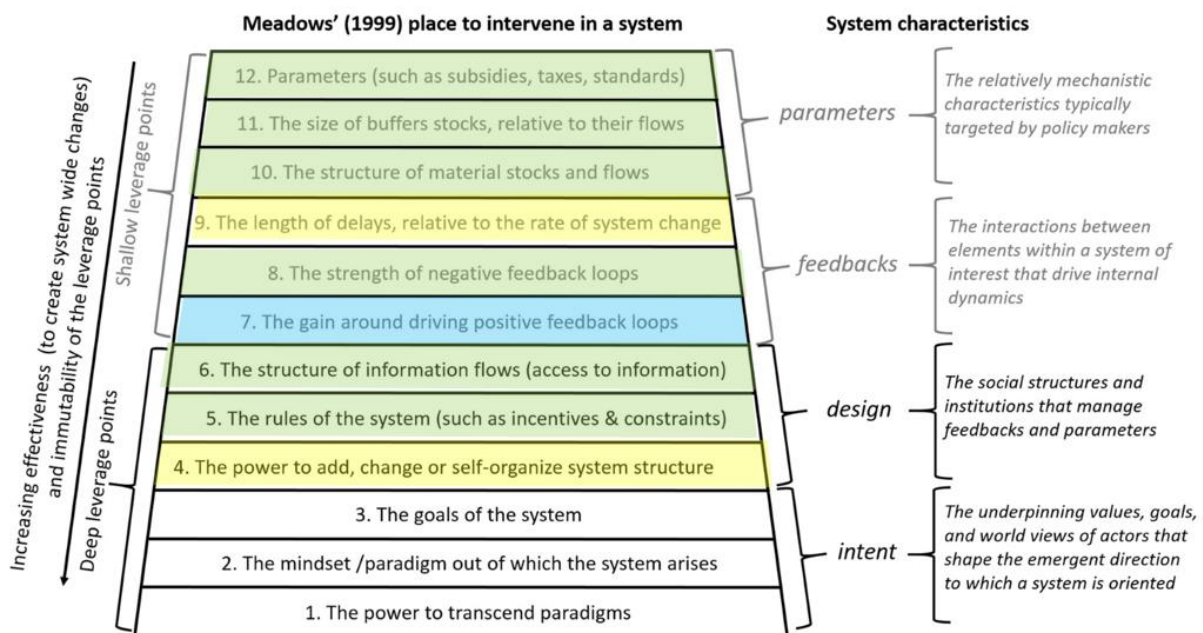


Figure 16. Discourse analysis of policies and interventions discussed NGOs and political parties in Europe show discourse at all leverage points, except the deepest levels. Yellow coding = NGOs only; blue= political parties only; green= NGOS & political parties.

Nevertheless, in the public media and political programme documents that were analysed, NGOs and political parties tended to address shallow leverage points. Neither actor group addressed the deepest leverage points in their discourse. While there is no apparent reason why discussions on the deepest drivers of transformative change cannot become part of political discourses, they may never become the discourse of mainstream political actors, given their transformative nature.

PLANET4B WP1 did not do an analysis of the leverage points framework (LPF) with the same depth as intersectionality analysis and discourse analysis. It could be argued that our use of the LPF diagram as a lens on intersectionality and discourse analysis was somewhat “mechanistic” and “simplistic”. Our use of the LPF may have prompted a structural and hierarchical interpretation when the only hierarchy is in terms of whether a (leverage) point has more (deep) or less (shallow) leverage. For example, the graphical visualisation of a lever in the IPBES interpretation of the LPF suggests that if one leverage point is moved, all others move with it. In workshop discussions with case study researchers, some considered the LPF to lack interactions between leverage points. This last point may be due to the lack of specification and more easily understandable examples of positive and negative “feedback loops” in the LPF, which potentially could consider interactions.

In summary, a framework is not a static concept, but depends for content on its application and practice. To use a photographic metaphor, frameworks may differ across (at least) the following aspects: standpoint and perspective (values), the lenses (methods/tools of inquiry), framing (system boundaries) and focus (parts of the system emphasised as key to action by theories of change).

5. Place-based studies’ theories of change and leverage points for policy

In this chapter, and the following chapter, place-based (chapter 5) and sector-based case studies (chapter 6) self-assess their recommendations for change (in policies and other levels, such as the community level) – and the underlying or assumed theories of change. Where did case study researchers assume they would “leverage” change (through selected interventions in place-based case studies) – at shallow or deep points? What implications can this have for the kinds of policy (or other) recommendations that were expected to come out of cases? What are the strengths and weaknesses of the PLANET4B frameworks used to evaluate interventions and leverage points?

To answer, and reflect on the usefulness/applicability and limitations of the LPF, and the Reflexivity-Contextualisation Matrix, we asked case studies to elaborate on the following four questions:

- (i) What interventions does your case study plan to use and where do they fit in the Reflexivity-Contextualisation Matrix (RCM)?
- (ii) What were the pros and cons of the Reflexivity-Contextualisation Matrix (RCM) for your case study development?
- (iii) What leverage points do the interventions and potential policy recommendations from your case study engage with?

- (iv) What were the pros and cons of the leverage points framework (LPF) for your case study development?

These elaborations are based on dialogues held between case study leaders and PLANET4B partners not directly involved in the respective cases. For the first question (i) it is important to note that only place-based case studies were expected to make interventions. Some sector-based case studies may still have chosen to experiment with interventions, even though this was not required. Therefore, question (i) was retained also in dialogues with sector-based case studies (chapter 6).

The work done by case studies for chapters 5 and 6 represents a first exploration and iteration of systems mapping of leverage points (WP3) and leverage points for upscaling to EU level (WP4). Hopefully, the initial exposure to the LPF, including critical thinking about the concepts and uncovering relative weaknesses in the framework, will allow the following project activities to address remaining knowledge gaps and perform deeper analyses.

5.1 Nature recreation in Oslo, Norway (OOF/NINA)

Yennie K. Bredin, Alexaander E. Aas-Hanssen, Helene Figari, and Vegard Gunderson

(i) What interventions does your case study plan to use and where do they fit in the Reflexivity-Contextualisation Matrix (RCM)?

The Nature recreation case plans for or engages in the following interventions from the upper end of the RCM to target conscious change:

- Arts-based, creative & deliberative interventions: Photos taken by children with disabilities that illustrate important elements of good nature experiences.
- Place-based deliberative interventions: Expert network meetings, a larger seminar/networking event designed to bridge the gap between two sectors that have historically been disconnected – mainstream nature recreation organisations and organisations that operate at the intersection of nature recreation and disability.

(ii) What were the pros and cons of the Reflexivity-Contextualisation Matrix (RCM) for your case study development?

The RCM is theoretical and conceptual whereas our choice of activities and interventions has been bottom-up driven and experience based rather than theory driven. Other important factors in developing our case, not captured by the RCM, have been time and resources.

(iii) What leverage points do the interventions and potential policy recommendations from your case study engage with?

LP 4 – a significant barrier to providing quality nature recreation opportunities is the scarcity of year-round activities accessible to children with disabilities in their local areas. This issue partly appears to arise from a disconnect between the primarily voluntary nature recreation associations, which could offer regularity in activities, and the organisations and individuals equipped to make nature recreation activities

inclusive for children with disabilities. Our interventions therefore strive to inspire the two groups to self-organise across existing system structures to build new alliances that allow for developing regular nature recreation activities inclusive of disabilities.

LP 3 – another major challenge is poor organisation or a lack of adapted nature recreational activities in Norway, potentially due to small population sizes in municipalities. For instance, in a municipality with 10,000 inhabitants, the number of children with disabilities would be relatively low. This demographic reality makes it challenging for the municipality to prioritise this group, especially as public servants are tasked with a broad array of responsibilities. Consequently, finding constructive solutions often relies on the dedication and interest of individuals within the system. Our interventions aim to empower such individuals and organisations, facilitating the development of effective solutions.

LP 2 – the way a person is responded to when inquiring about arrangements or adaptations is important. A general impression is that local actors hesitate to propose solutions for including children with disabilities, possibly due to a fear of doing something wrong or a prevalent perception that people with disabilities are fragile. However, children with disabilities also possess strengths and seek new experiences. They are resilient within their limits and frequently rise to the challenges presented to them. This demonstrates that not everything must be “universally designed” or entirely predetermined. Sometimes, it is equally crucial to plan for flexible arrangements that can adapt to various needs. Through our interventions, we aim to challenge and broaden the stereotypical perceptions of disability.

(iv) What were the pros and cons of the leverage points framework (LPF) for your case study development?

The Nature recreational case is empirically driven, as it draws upon the knowledge and everyday experiences of the members of our learning community. The LPF has provided valuable insights for reflecting on the outcomes. However, the LPF's theoretical nature and specialised terminology make it less accessible to those unfamiliar with the framework. Consequently, familiarising oneself with the LPF can be time-consuming, and applying it in contexts where work is more process-oriented and experiential, particularly with non-academics, proves challenging.

5.2 Opening nature to Black, Asian, and ethnic minority communities in the UK (DADIMAS/CU)

Geraldine Brown, Alex Franklin, Barbara Smith, Geeta Ludhra, and Subash Ludhra

The UK case study is centred around its learning community (LC). The LC comprises 11 individuals, plus case study leads from the associated PLANET4B partner organisations (DC and CU). The membership is primarily from ethnic minority communities, who have participated in Dadima's walks. The LC is being engaged with on an ongoing basis (since the end of year 1, 2023) through a series of community learning spaces (both online and face-to-face). The initial main objective was to create a platform for open communication, self-reflection, and learning. Having now established a solid and sustainable foundation for this, emphasis has since transitioned towards supporting the LC in undertaking a variety of activities aimed at encouraging

participants to share their views and experiences regarding nature and biodiversity. Whilst to begin with the focus has been on sharing within the group, ultimately the aim is that the group will co-create outputs which can be shared with a wider audience of stakeholders. This will include a collaborative citizen science exercise and the creation of a participatory film.

(i) What interventions does your case study plan to use and where do they fit in the Reflexivity-Contextualisation Matrix (RCM)?

This case study draws primarily on creative, arts- and dialogue-based intervention methods, supported by more traditional qualitative research methods (namely, semi-structured interviews and focus groups). The selection of individual methods is informed by the need to firstly, encourage conversations, knowledge sharing and visioning within the LC group, and subsequently, facilitate the co-creation of outputs aimed at increasing understanding and wider stakeholder appreciation of the importance of biodiversity and green space to Black, Asian and ethnic minority communities.

Thus far, creative, arts- and dialogue-based intervention methods, are proving effective in enabling LC members to share their individual and collective stories concerning nature and biodiversity, encourage critical reflection, and promote action. The LC is especially interested in undertaking action aimed at increasing awareness and prioritisation of the importance of intersectional and plural knowledges to achieving widespread prioritisation of biodiversity in decision-making.

Through a series of participatory workshops, LC participants are being invited to share and explore issues related to the concept of biodiversity and its intersection with culture and heritage. Specifically, this includes exploring and critically reflecting on individual and shared stories relating to issues of inequality and social justice. Along with the workshops, an online space has been created where LC participants can share daily nature/biodiversity stories, information, and thoughts in text and visual forms.

This community learning approach fosters dialogue and deep insights into the various ways in which nature and biodiversity are implicated in participants' lives. A film documenting the process and key learnings will be produced and shared with key stakeholders, engaging the LC in a participatory filmmaking process. This creative and collaborative method involves working together with the LC to develop new knowledge and share existing knowledge and insights based on their perspectives and experiences. The film produced will incorporate multiple biodiversity stories, highlight key messages, and document the LC process and engagement in a Citizen Science activity. The goal is to create a film that serves as an intervention for raising awareness and information to support initiatives aimed at facilitating ethnic minority communities' engagement with nature and biodiversity.

(ii) What were the pros and cons of the Reflexivity-Contextualisation Matrix (RCM) for your case study development?

A key concern has been to select and incorporate creative arts- and dialogue-based intervention methods in a manner which respects and remains open to being shaped by the views and needs of our learning community. The same applies with regards to

the use of such intervention techniques as a basis for co-creating a group output – i.e. the participatory film. As such, our approach has been largely inductive in intent, although informed also by the considerable previous experience of some research team members in working with minoritised communities. The RCM in this sense acts more to confirm rather than guide the selection on individual methods. However, we perceive a positive role for the matrix in how it offers a means of supporting others with less experience of research-based intervention, to align method selection with the specificities and characteristics of participant groups as well as the wider case study context.

(iii) What leverage points do the interventions and potential policy recommendations from your case study engage with?

LP 1 – the learning community has led to much reflection and covered areas such as the importance of education and changing mindsets to transcend paradigms. Education was seen as something beyond the UK education system, albeit that it should play a key role. The role of education within families, and communities and how that informed understanding was considered important.

LP 2 – discussion around mindset identified the need to change the mindset of decision-makers, within ethnic minority communities and wider society. Opportunities for spaces that brought people together for dialogue, were deemed important alongside embedding within a wider set of mechanisms information that challenges some of the dominant negative stereotypes associated with ethnic minority communities and that ethnic minority communities may hold about nature and biodiversity. The need for changing mindsets was identified as fundamentally important.

LP 3 – there is an overwhelming understanding within the group about how the system works and the advantages and disadvantages of individuals and groups. The system is viewed as primarily concerned with profit generation and establishing mechanisms that help to sustain and reproduce this goal. The group identified a need for a top-down and bottom-up approach to change in which we see a rethink of the education system and what is taught to children and young people, in tandem with community-led learning spaces that allow for an intergenerational transmission of knowledge.

LP 4 – an area of significant agreement amongst the group is the belief in the power of individuals and communities to be agents of change. Participants share stories about their families, homelands and connections to nature and biodiversity. Reflections illuminate a belief and willingness to make change and a shared view about the role Dadima's plays inspiring them to seek new ways of engaging with nature and biodiversity.

LP 5 – there was a wide-ranging discussion about the role and responsibility of the government in changing rules/laws. There is some agreement amongst the group of a need for the introduction of more punitive measures to support changing the poor practices of big industry; and changing rules around production, quality, and advertising.

LP 6 – structure and Information flow elicited a wide discussion. Effective communication channels within communities and between communities and decision-makers at all levels were deemed important. Participants identified the need to ensure that communication methods were diverse and involved working with communities.

LP 10 – the idea of stock and flows was a little abstract, so this was not an area that led to much discussion. Areas touched on briefly included a need to address the lack of and poor maintenance of green spaces in cities and the need to work with communities to reduce households prioritising concrete over the natural environment.

LP 12 – participants spoke about the role of government and the need for inclusive and socially just policymaking. Measures to improve the quality and accessibility of food were an important area of discussion.

(iv) What were the pros and cons of the leverage points framework (LPF) for your case study development?

The Leverage Framework can provide academic teams with a useful tool to consider various factors related to system change. However, engagement with the framework varied amongst the participants, with more than half of the LC expressing frustration and concerns regarding a potential conflict between their experiential knowledge and the framework's details. Upon reflection, the CU team believes that a context-specific interpretation of the framework and taking time to ensure its meaningful to communities is crucial. While workshops aim to create space for participants to engage with academic ideas, the Leverage Framework proved challenging for participants, they reported that it spoke a different language and reproduced certain ways of thinking and doing, which limited creative thinking.

5.3 Urban Youth in Germany (CGE/MLU)

Maryna Bykova and Ilkhom Soliev

(i) What interventions does your case study plan to use and where do they fit in the Reflexivity-Contextualisation Matrix (RCM)?

The Urban Youth case aims to deploy a range of methods to reach the behavioural change intended, such as:

- Arts-based, creative & deliberative interventions: Hike/Night Hike, Movie Screenings/Outdoor Cinema.
- Experiential games: Biodiversity-Food-Governance Game and potentially the Negotiation Game that is being newly developed.
- Attention experiment: Nudging messages in supermarket carts.

These interventions primarily target the reflexivity aspect by creating space for deeper and deliberate reflections about nature, fostering an emotional connection with nature, encouraging environmental identity, and preparing individuals for viewing pro-environmental behaviour as a continuum. Arts-based, creative & deliberative interventions focus on emotions, as well as social bonding around nature. The experiential games aim at decision-making experiences, reflection, and developing a sense of capacity to contribute towards environmental sustainability – understanding

the consequences of individual and group choices, opportunities, and challenges of dealing with market and political systems. Attention and framing experiments on the other hand are intended to influence behaviour via altering default choices, thus with less reflexivity and more choice architecture. For example, through subtle rearrangement of the choices or activation of social norms bringing forward attention to a choice that considers biodiversity better than otherwise, while not altering the choices available originally.

(ii) What were the pros and cons of the Reflexivity-Contextualisation Matrix (RCM) for your case study development?

In the Urban Youth case study, we have introduced the RCM to the learning community after the intervention methods were selected. Yet, at a later stage the matrix provided the necessary theoretical lens to look at various levels addressed by interventions, from the intrapersonal reflections of individuals participating in activities like night hikes and movie screenings to the interpersonal and institutional engagements through games and policy dialogues.

On the bright side, the matrix assisted in mapping out a pathway for how less conscious changes through experiential activities can gradually lead to more conscious, deliberate actions and attitudes towards better prioritisation of the environment.

CGE and the learning community have encountered difficulties with the RCM's extensive applicability, which, from our perspective, renders it not merely challenging but nearly unfeasible to directly attribute changes in awareness, attitudes, or behaviours to an individual intervention. Instead, we have felt a collective suite of interventions is necessary to bring about transformative change.

(iii) What leverage points do the interventions and potential policy recommendations from your case study engage with?

LP 12 – the Biodiversity-Food-Governance game creates space to discuss tax and whether it is enough for a change.

LP 11 – size of buffer stocks, relative to flow is somewhat too abstract for our interventions perhaps.

LP 10 – structure of material stock and flows are also somewhat difficult to connect directly to our interventions or policy recommendations.

LP 9 – the game for example has an element of delay – how decisions of producers, consumers, political system can affect the state of biodiversity with delay and uncertainty.

LP 8 – the two sets of interventions (arts-based, creative, and deliberative; games) allow space for reflecting on “greater powers” such as markets and political systems that can reproduce both exclusion and under-prioritisation of nature and biodiversity on the one hand, and youth on the other hand from decision making.

LP 7 – the two sets of interventions (arts-based, creative, and deliberative; games) allow space for reflecting on “greater powers” such as markets and political systems that can reproduce individualistic and profit-oriented decision making.

LP 6 – education, mainstream and social media can reproduce historical knowledge on consumption, responsibilities, etc.

LP 5 – our interventions allow discussing and questioning incentives and constraints (market, profit, tax, protected areas, intensive consumption, and production) as well as test how organisation of default choices can alter this.

LP 4 – as a result of testing and learning from various interventions, the case study is planning a policy dialogue which will aim to enable change in community-level decision-making through integrating lessons from the case study in the future relevant policies such as formal and non-formal education.

In our case, the interventions, such as the Biodiversity-Food-Governance Game and outdoor activities like night hikes and movie screenings, are designed to resonate with the participants on both an individual and communal level. These interventions primarily operate at leverage point 4. Realisation and experiencing of the importance of biodiversity and of how people can (self-)organise to influence various levels of decision-making are part of the social learning embedded in these interventions.

LP 3 – our interventions, in the short term the one that aims to alter default choices (attention experiments) and in the longer term the ones that aim to trigger deeper reflections (arts-based, creative, and deliberative; experiential games), are interested in testing whether new social norms can emerge that normalise decision-making with improved nature/biodiversity prioritisation in the society, including young people. In a way this could be a form of adjusting the goals of the system.

Further, the case study aspires to influence the broader EU policy agenda. The aim is to shift the system's objectives to support and enhance the environmental awareness of its citizens, ensuring that sustainability becomes a central tenet at various individual to institutional levels of decision-making.

LP 2 – this paradigm shift is not immediate but is seen as the culmination of the cascading effects of interventions at other leverage points, from altering parameters and rules to reshaping system goals and ultimately transforming the underlying paradigms.

LP 1 – LC members continuously self-reflect and discuss, question many issues, potentially challenging their own paradigms and ones from others at various levels of communication (peers, policy).

(iv) What were the pros and cons of the leverage points framework (LPF) for your case study development?

The LPF might be useful if it is used not as a starting point (as a guide) for discussion but at a later stage as a tool supporting reflection and, perhaps, abstraction. In itself, it does not help to clarify the system, but after delineating the system boundaries, it may

assist in initiating another round of discussion and reflection on the systems dynamics. The LPF also can contribute (used in a later stage) to confront complexity, the complexity of systems and this might act as a learning point for young people engaged. However, time is needed to digest and embrace this complexity which eventually may end up in the ability to consciously design in the future.

On a more critical note: Special efforts were needed to make sense of the LPF beyond the training CG partner has provided. More reading and watching video tutorials assisted the building up of an understanding. However, the LPF has multiple versions that might be confusing. Moreover, the LPF seems to suffer from being hierarchical, even linear, creating an either-or feeling. It seems to convey a message (an implicit assumption) that the higher the better (regarding numbers from 12 to 1). The LPF has a terminology that creates a problem of understanding; its language does not help to make sense of it in practice.

5.4 Edible City and Inclusion in Graz, Austria (FUG/IFZ)

Sandra Karner, Andreas Motschiunig, Anita Thaler, and David Steinwender

(i) What interventions do your case study plan to use and where do they fit in the Reflexivity-Contextualisation Matrix (RCM)?

The Graz-based case study engages two learning communities (LC): A Citizen LC, which encompasses a group of disadvantaged women, and a Policy LC that brings together representatives from municipality departments, CSOs/NGOs, and researchers.

The core intervention activity is the implementation of a Living Lab (LL), where a biodiverse community garden will be initiated with women affected by intersectionality (social/economic status, education, migrant background, age). This pilot is supposed to be the starting point for a wider LL process, namely the step-by-step planning and the realisation of a “biodiverse edible park” beyond the project duration on the overall green plot (1,7 ha), where the pilot garden is located. The LL activities within PLANET4B prepare the ground for a participatory process that considers aspects of biodiversity, social justice and the urban foodscape in the planning and use of urban green spaces. The overall LL process runs from October 2023 to Autumn 2024, and it builds on several activities tailored to the specific context and participants.

Various art-based and creative methods serve to undermine traditional knowledge hierarchies. Tailored activities target the co-production of knowledge by encouraging LC participants to share their knowledge, situatedness and subjective perceptions, reveal normative values, learn from each other, and relate to new knowledge in a reflexive way. The activities focus on intrapersonal and interpersonal change and start from abstract topics (relation to participants’ daily life experiences; existing practices, policies & strategies) to be narrowed down step by step to biodiversity issues.

Information activities and deliberative interventions aim at making linkages from broader topics to biodiversity visible, to raise awareness for the potential benefits of integrated policy approaches, and to reflect on options for more integrated planning

practices. These activities address intrapersonal and interpersonal change, but also institutional change on the long run.

We also plan to implement the Biodiversity-Food-Governance Game (most likely with a student group) to support reflections on the relation of food and biodiversity and raise awareness about the relevance of related decision-making.

(ii) What were the pros and cons of the Reflexivity-Contextualisation Matrix (RCM) for your case study development?

The decision for activities and choice of methods for their implementation was – at least partly – taken before the matrix was set up, as the case study follows on from previous explorations and research work. However, as we aim at highly contextualised interventions, the detailed planning of activities and choice of methods is done step by step within the overall LL process along with the new knowledge we gain about the system and the context. Consequently, some of the original plans were revised and adjusted, which might be the case in the future as well. For this, the matrix represents a useful tool to reflect on what kind of changes we are aiming at, and it helps to give an orientation to which direction the planned interventions and applied methods may address change. For the Graz-based case, a transformation towards a biodiverse and socially just edible city will need to build on change on all levels.

A somewhat confusing aspect within the matrix is the categorisation of “contextual”, which we would use for any aspect that is of particular relevance in our specific location, circumstances, actor constellations, power relations, etc. here in Graz. This goes beyond biodiversity aspects. As we are aiming to identify room for better policy integration, contextualisation means for us to take up those policies/strategies, which are already here, and to explore within the Policy LC how to link them with biodiversity-relevant issues. Finally, it is difficult to consider single activities as “intervention” because we see the overall LL process, which results from many individual activities, as the intervention.

(iii) What leverage points do the interventions and potential policy recommendations from your case study engage with?

LP 12 – by highlighting the relevance of integrating strategies, biodiversity parameters might gain more weight for land use planning, e.g. in the new Agriculture Strategy of the City, and in the subsidies programme for securing urban green spaces.

LP 7 – the PLANET4B media work is benefitting the City of Graz and other local cooperation partners. Citizens benefit from the initiation of the biodiverse edible park, where they can engage.

LP 6 – the LL activities mediate between different knowledge holders and engage them in co-creative settings. Moreover, we will elaborate on the potential resp. recommendations for future trans-sectorial processes of (strategic) planning.

LP 5 – deliberative events that highlight the value of incorporating different types of knowledge into planning processes; the community mapping outcomes for the planning of the whole plot will serve as a showcase.

LP 4 – various citizen LC activities (and the planned follow-up activities beyond PLANET4B) foster the empowerment and engagement of disadvantaged groups, so that they can become active agents in future planning.

LP 3 – deliberative events that highlight the benefits of fostering biodiversity and the relevance of considering disadvantaged citizens' needs in the planning of green urban spaces.

LP 2 – the interactive workshops encourage LC participants to take a new perspective by elaborating on a concept that integrates various topics (biodiversity, green spaces, urban foodscape, urban planning, social justice, etc.) by means of an LL experiment. Exploratory research indicates the openness of a “young generation” of actors within the city of Graz for practices integrating various policy resorts, which our intervention will support.

(iv) What were the pros and cons of the leverage points framework (LPF) for your case study development?

The LPF is complex, and we have some difficulties with separating the different levels as they are often interlinked, respectively the LC activities are touching upon several leverage points.

But dealing with the framework was also helpful because it helped to reflect on the choice of methods. Being forced to go through the leverage points and discuss our perspectives we had this useful side effect to critically reflect on where we can intervene. It was helpful to identify which situation and which part of the system fits into a certain output. It was also useful that IFZ and FUG discussed it together because that made it more tangible, and helped to rethink our mindsets and think of different strategies and actor networks we will need to become more influential and adjust our plan accordingly.

5.5 Swiss attitudes towards agro-biodiversity and religion (FiBL)

Ghezal Sabir

(i) What interventions does your case study plan to use and where do they fit in the Reflexivity-Contextualisation Matrix (RCM)?

This case study is mainly based on primary data collection in the form of interviews with religious/spiritual farmers, a general farmer survey, and stakeholder/expert focus group discussions. During farmer interviews, farmers are additionally asked to provide photos or videos of aspects of their farm that represent their spiritual/religious beliefs.

The interviews brought the possibility of the relationship between religious and spiritual beliefs and biodiversity to the forefront; a concept that may not have existed or may have been latent in the minds of farmers interviewed. Thus, the interview was in itself a form of intervention engaging the farmers in a discussion that allowed pondering over the concept of religious and spiritual beliefs and biodiversity. Depending on the flow of the discussion and religious backgrounds such as those who identified themselves as Catholic or Protestant were shown Pope Francis' encyclical called *Laudato Si* and the

recent apostolic exhortation called *Laudato Deum* to inform them about the stance of the Pope on the issue of biodiversity. The farmers were then asked about their thoughts on the documents shown. This was done to strengthen or bring to focus the connection between religious beliefs and biodiversity.

Additionally, there is the idea of organising a photo exhibition using (among other) photos or videos that were taken during interviews or shared by farmers highlighting how their beliefs influence their farming practices. This could be organised within the framework of a larger meeting (such as the Swiss regional “farmers days” or national “farmers conference”). Alternatively, this exhibition could take place at the Swiss “House of Religion”. The venues are open to change.

(ii) What were the pros and cons of the Reflexivity-Contextualisation Matrix (RCM) for your case study development?

Greater consciousness of spiritual/religious beliefs among farmers may translate into biodiversity action on farms, e.g. by “preserving God’s creation”. At the moment, this connection between farmers’ beliefs and biodiversity is often not recognised and thus practised. To reach greater consciousness, both abstract/higher-level as well as place-based/specific interventions are needed. Specific interventions will achieve results faster. To generate systemic changes in mobilising peoples’ values, systemic obstacles need to change. Making people conscious about the agreement of a changed behaviour with their values helps solidify and internalise the change preventing relapse.

(iii) What leverage points do the interventions and potential policy recommendations from your case study engage with?

LP 12 – religion and nature conservation are supported institutionally, for example through certification programs. In Switzerland, the “Green Chicken” certificate program certifies churches with environmentally friendly behaviour, such as reduced energy consumption and greenhouse gas emissions. In future, the certification could specifically include agricultural criteria, such as sourcing organic certified beverages and food from local farmers.

LP 11 – number of church board members who acknowledge biodiversity protection and promotion as part of religious responsibility.

LP 7 – leadership is important and can start positive feedback loops, reminding religious/spiritual followers of their power to conserve and change. Examples: Pope Francis’ encyclical (*Laudato Si*, 2015) and Apostolic letter (*Laudate Deum*, 2023) supporting care for nature as connected to religion.

LP 6 – taking the catholic church as an example, where Pope Francis is very outspoken in favour of humanity’s responsibility for nature: His message needs to be included in every-day interaction between church leaders and the general population, during mass or in religious classes at school.

LP 3 – build a solid concept of nature stewardship and make it a religious/spiritual obligation.

LP 2 – theologically set values and morals connected to nature and organisms, other than humans, as creatures with rights as well as the instrumental value of biodiversity for humans' well-being (e.g. availability of food).

(iv) What were the pros and cons of the leverage points framework (LPF) for your case study development?

Religion was identified as the topic of inquiry in this case. Initially, it was thought from an individual's perspective, yet broadened to the institutional level throughout the development of the case study work. This shift from individual to institutional, however, would also have happened without the LPF.

5.6 Reflexivity-Contextualisation Matrix (RCM) similarities across place-based cases

Ilkhom Soliev and Agnes Zolyomi

The RCM was reviewed with the case study teams to help cases reflect on their progress and choice of interventions relative to the level of change that they aim for. Based on these reflections (summarised above), the following lessons can be drawn about the relevance and usefulness of the Reflexivity-Contextualisation Matrix.

In almost all cases, PLANET4B partners strive for a mix of changes. These can be placed between conscious and non-conscious changes impacting norms, values and/or behaviours (the reflexivity dimension). They may also be placed between direct biodiversity-specific changes that are specific in contexts and target specific actors or indirect changes that are rather abstract. Such indirect changes may go beyond biodiversity and address more fundamental questions of what is important and what needs to be done how, in any given society (the contextualisation dimension). In the case studies, the changes desired have so far largely defined the interventions used or planned.

When inquired about their approaches to selection of interventions and the use of the RCM to reflect on their choices, PLANET4B's intensive cases provided mixed responses. A few cases (Urban youth in Germany, CGE and the Edible city and inclusion in Graz, Austria, IFZ focusing also on gender aspects) stated that the matrix proved helpful. It helped to understand what change they aim for in terms of the degree of reflexivity and contextualisation, and at which level to facilitate change, so that interventions at different levels can complement and complete each other, as well as multiply their effects. IFZ also noted that this aided them to reconsider their intervention selection following changes in their knowledge about the system. Partners in the case study led by Dadima's similarly stated that the matrix can offer a useful means for reflection about the selection of intervention. However, here the RCM was deliberately not used for selection of interventions at the outset. In this case where the focus is better understanding and bringing in often-marginalised ethnic communities to the decision-making processes around biodiversity, it was of particular importance that the intervention selection was fully guided by the learning community. Moreover, for the case study led by Dadima's, which for the first time focused on linking questions of race, ethnicity, minorities (the key intersectionality dimension of the case study) with biodiversity, it was important to dedicate more time to such discussions without

limitations of any framework. This perhaps might have been different in comparison to the case studies led by CGE and IFZ, where the questions around human-nature relationships had been discussed with the parts of the learning community, at least to some extent, prior to the project.

Finally, the other two case studies led by NINA and FiBL respectively reported that they did not specifically consider the matrix relevant for reflecting on their method selection. However, the reflections by the case study leads provide at least two useful insights for our synthesis. First, the FiBL response to our question on usefulness of the RCM (that for the desired change, both abstract and place-based interventions are needed but systemic changes would need change in values and systemic obstacles) confirms our assumptions in the project – in addressing biodiversity loss, it is very likely that some changes at all levels will be needed, but the ones that are more deliberate and conscious are probably more urgent and likely to be more impactful. However, it is also more likely that achieving such changes will be likewise more challenging, as expected by the original explanation of RCM.

Whether or not induced by reflections on the usefulness of RCM, the authors of the RCM believe these considerations on the degrees of reflexivity and contextualisation on the one hand, and the desired change on the other, are necessary for deciding whether, when and how to intervene. Second, indeed there is a certain degree of trade-off between selecting interventions guided by theoretical relevance and doing so based on the contextual needs. Feedback in the case study by NINA, where institutional ethnography is used for guiding the process of identifying the main themes, scope, and potential intervention methods, provides further indications in terms of RCM usefulness. When not used as a primary tool for selecting interventions, it could still be seen as an overarching tool for identifying potential gaps when change is sought at multiple levels. For example, institutional ethnography, as reported to be the main guide in this case study, is a powerful approach for studying interpersonal and institutional change, but it does not focus on intrapersonal change. Not applying RCM in this case can be seen as an outcome of both its potential strengths and weaknesses as an analytical tool. Its particular strength – it does indeed appear to offer a transdisciplinary frame – one has the chance to think of questions that are of both practical and theoretical relevance. The RCM can also create room for insights from multiple disciplines while reflecting on two main questions of reflexivity and contextualisation, both around whether and what interventions are needed and what the overall package of interventions could include to achieve the desired changes with resources at hand. However, there is also a particular weakness of the RCM. It will certainly be more valuable in cases a) where participants with respective (trans-)disciplinary backgrounds or familiarity with the relevant perspectives towards multiple levels of social change are involved in the process of operationalisation of interventions; and b) without overwhelming academic terminology that could undermine practical applicability of the RCM.

5.7 Leverage point similarities across place-based cases

David N. Barton

The dialogues with case studies about the relevant leverage points of potential interventions and policy recommendations from their case studies represented the

third collective iteration of this topic in the project (after a physical and virtual workshop). The leverage points provided common reference points to compare case studies.

My personal hypothesis starting the work was that place-based cases would tend, more than sector-based cases, towards recommendations on “shallow” leverage points (parameters and feedback mechanisms), given their potential greater knowledge of the local socio-ecological system. The case study dialogues revealed quite the opposite, with all place-based cases using mostly the deep leverage points to consider interventions (Table 6). Dialogues summarised above revealed that interventions were chosen to address deeper transformative change at intrapersonal and interpersonal levels.

Table 6. Comparison of place-based cases in terms of self-evaluated potential leverage points. Rating of principle, possible leverage and stated conceptual uncertainty about the leverage points is based on the authors’ interpretation of case study reports from the dialogues.

		Place-based cases					
		Partner	OOF/ NINA	DADIMAS /CU	CGE/ MLU	FuG/ IFZ	FIBL
		Country	Norway	UK	Germany	Austria	Switzer- land
		Case theme	Children	Minority communities	Urban youth	Edible City	Religion
Leverage Points	Parameters	12. Parameters (such as subsidies, taxes, standards).		★	★	★	★
		11. Size of buffers relative to their flows.			☆		☆
	Feedbacks	10. Structure of material stocks and flows		☆	☆		
		9. Lengths of delays, relative to the rate of system change.			★		
		8. Strength of negative feedback loops			★		
	Design	7. Gain around driving positive feedback loops.			★	★	★
		6. Structure of information flows (access to information).		★	☆	★	★
		5. Rules of the system (such as incentives, constraints).		★	★	★	
	Intent	4. Power to add, change, or self-organize system structure.	★	★	★	★	
		3. Goals of the system.	★	★	★	★	★
		2. Mindset or paradigm out of which the system arises	★	★	☆	★	★
		1. The power to transcend paradigms.		★	★		

Legend:
 ★ principle leverage
 ☆ possible leverage
 ☆ stated conceptual uncertainty

Case studies reflected on opportunities and limitations of the LPF for “self-diagnosis” of their case studies. In summary,

Opportunities – the LPF facilitated:

- **Reflection about outcomes** of interventions.
- Considering various **factors relating to systems change**.
- Later stage **reflection and abstraction** of the case study.
- **Reflection on system complexity**, as a capacity-building tool for activists.
- **Shifting focus** from intrapersonal and interpersonal to institutional.

The LPF has the **limitations** of:

- Having **multiple versions**, making concepts uncertain.
- **Specialised terminology**, making it less accessible.
- **Time needed to digest** and embrace the complexity of the analytical approach.
- Not defining the boundaries and structure of system itself (but points of leverage only).
- Difficulties with **separating the different leverage** levels as they are often **interlinked**.
- Being **hierarchical**, even **linear**, creating an **either-or feeling**.

There were some further caveats to the methodology mentioned during discussion. The idea of upscaling or outscaling the findings of interventions to policy recommendations was not an objective for some of the place-based cases. Conversely, several sector-based cases did not evaluate interventions. The distinction between “intervention” and “policy” also needs further clarification moving forward in the project. For example, is a workshop with an advisory board considered an intervention? Policy recommendations may be given to stakeholders for awareness raising as an intervention in a broader sense – information flow is considered an intermediate leverage point (#6) in the Meadows’ LPF.

6. Sectoral case studies’ theories of change and leverage points for policy

6.1 “From ego-system to eco-system” in fashion in Italy (UNIFI)

Marta Bonetti and Pedro Navarro-Gambín

(i) What interventions does your case study plan to use and where do they fit in the Reflexivity-Contextualisation Matrix (RCM)?

Systemic action research – rather than a type of intervention, it is an approach to research that involves a cyclical and participatory learning process. In our case, the actors in our Advisory Board can be seen as “agents of change” that help co-create the knowledge and policy recommendations that will be the result of our case study, i.e. a “Biodiversity Transition Fashion Agenda”. For that reason, we consider it an intervention. Following the RCM, advisory board meetings and workshops would fit into the place-based deliberative interventions category as a reflective learning methodology in deliberative workshops.

X Curve – this tool functions as a sensemaking tool to explore simplified representations of transitions that explicitly capture patterns of build-up, breakdown, and their interactions to propose potential interventions as part of collectively created narratives. It has proven to be very effective to work with the Advisory Board in a multi-stakeholder setting to jointly explore the design of alternative actions to support fashion system change. It could be seen as a “scenario workshop” within the place-based deliberative interventions.

Excursions/Field Trips – we experienced a one-day “Textile tour” visiting companies in the Prato district that recycle natural fibres. This gave us a better understanding of the opportunities and obstacles of moving towards fashion with less impact on biodiversity. We are planning to organise more excursions/field trips and maybe get students involved. It could be seen as a creative intervention mixing lab and place and an intervention of the building capacity and motivation category.

(ii) What were the pros and cons of the Reflexivity-Contextualisation Matrix (RCM) for your case study development?

The RCM could be informative for us when putting into practice our interventions. However, in terms of case study development, the selection of our interventions was not based on the RCM but on various considerations, including the accessibility of the research field, the competencies of our research group, and the opinion of the advisory group. Our interventions should be focused on promoting change at higher-level and universal issues; therefore, it is more focused on what is called “institutional” change within the RCM. However, from our point of view, the focus of the RCM is not so much on high-level institutional change (e.g. international policy changes) but on more place-based interpersonal and intrapersonal change. Currently, the theoretical approaches or tools under “institutional” seem to us rather influencing interpersonal relations and much less institutional relations. The current content of the matrix does not seem to be useful for understanding institutional change. Therefore, we do not find it very relevant for our case study.

(iii) What leverage points do the interventions and potential policy recommendations from your case study engage with?

LP 12 – better and more clear Indicators of biodiversity loss, reduced quantities of fashion production and consumption (e.g. mandatory production maximum), standards for sustainable and biodiversity-friendly fashion production, incentives, and tax (i.e. according to the principle the polluter pays, or the extensive producer responsibility).

LP 10 – change from fragmented and globalised fibre and fashion supply chains to more local-placed based production and consumption. Changes in the chains of telecoupled impacts (with a more connected consumption and production, the impacts of biodiversity are felt in the same places where consumption takes place). Changes in fashion production and materials (i.e. eco-design; new eco-fibres such as oranges fibre; ban of oil derived fibre).

LP 6 – improved transparency in supply chains, better monitoring and tracking systems to know the origin of the products. As a result, improved consumer awareness about fashion's impact on biodiversity. Changes in advocacy campaigns and education programs (also to fashion professionals and workers) to teach and raise awareness about fashion and biodiversity (e.g. teach about more biodiversity-friendly production practices, visiting fields and factories, teaching children to make their own clothes, teach about the impacts, etc.).

LP 5 – introducing new principles like the polluter pays or the producer's extensive responsibility in legislation. Introducing transformative principles in governance (e.g. participation, inclusion, adaptiveness, etc.). Balancing the rules and regulations to

promote break-out dynamics (i.e. phasing-out the unsustainable and not biodiversity-prioritising system), e.g. constraints, prohibitions, bans, with the ones to promote build-up dynamics (i.e. phasing in the new system), e.g. incentives, subsidies, material support. Balancing mandatory and voluntary governance arrangements. Balancing international, national, and local policymaking and governance.

LP 4 – reconfiguration of North-South dynamics. Reduction in the power of companies to control the supply chain. More empowered civil society (NGOs), workers' unions, and consumers.

LP 3 – currently, a growth-driven and quantity-maximising fashion system. New system should prioritise quality. New goals of satisfying human needs and protecting and regenerating biodiversity.

LP 2 – from an ego-system to an eco-system that puts nature, human well-being, and justice at the front.

LP 1 – PLANET4B.

(iv) What were the pros and cons of the leverage points framework (LPF) for your case study development?

Pros: LPF provided us with a systematic way in which to define the boundaries and properties of our specific socio-ecological system (fashion and biodiversity). It also helped us preliminary evaluate previous policies, make us more aware of the parts of a system which are addressed by current policies, analyse them in terms of their transformative potential, and then identify aspects that needed to be changed to address the “intent” part of the system.

Cons: It is difficult to use LPF without having a deep knowledge about system theory and, therefore, to use it as a common tool for dialogue with people external to the academy (i.e. our advisory board). Moreover, LPF is too hierarchical and does not satisfactorily explain the interaction between the different leverage points and the direction of cause-effect when interventions are implemented. In other words, it oversimplifies change and systems and therefore, after a first preliminary evaluation, we decided to use other frameworks and theories to explore change. Finally, LPF might not be very informative about the practice of policy change and implementation, while it does not offer sufficient insight into the institutional and interpersonal power dynamics that ultimately affect how decisions are made, why, and by whom – i.e. policy change involves power relations, agency, participation, leadership, partisan politics, etc. Since our extensive case is focused on changing policies and institutional change, this limitation is especially constraining for us.

6.2 Agro-biodiversity management in Hungary (ESSRG)

György Pataki and Borbála Lipka

(i) What interventions does your case study plan to use and where do they fit in the Reflexivity-Contextualisation Matrix (RCM)?

Feminist Care Theory seems to be the most relevant theoretical perspective to take based upon our initial understanding coming from the analysis of the expert interviews we conducted with the Hungarian seed system actors. A relational perspective on agrobiodiversity seems to provide us with the strongest explanation to critically understand and transform the seed system. Relatedly, together with our stakeholder board, we decided to apply arts-based methods for our interventions. Engaging with arts carries an intrapersonal transformative potential. Moreover, collective arts-based activities can engage a diversity of actors that might result in interpersonal transformations through their joint artistic activities and collectively lived experiences.

(ii) What were the pros and cons of the Reflexivity-Contextualisation Matrix (RCM) for your case study development?

The RCM, at this point of our research, seems to provide no clear support. It seems to us that there is a risk that this framework reduces complexity. It provides too separate categorisation compared to what we feel relevant in our case story (more overlapping, fuzzy, hybrid than this matrix proposes).

(iii) What leverage points do the interventions and potential policy recommendations from your case study engage with?

We see a series of LPs to be relevant to act upon for the sake of systems change. These LPs were derived from our learning from the expert interviews. More specifically, we claim the following LPs to be relevant:

LP12 – financial support for (i) regenerative agriculture and sustainable water management, (ii) disseminating good practices, (iii) community seed banks, on-farm programs, national seed bank, (iv) compensating farmers participating in research; increasing the number of varieties adaptable to ecological farming.

LP11 – conserving and increasing of the gene pool of cultivated plants.

LP10 – access to landraces, farmers' varieties; seed production for landraces, farmers' varieties.

LP9 – less bureaucratic registration process for open pollinated varieties.

LP8 – small market niche, no effective demand.

LP7 – cooperative seed-saving by farmers; decreasing meat consumption and food waste; significantly reduced subsidies for conventional agricultural practices.

LP6 – access to knowledge and know-how (seed saving, cultivation technology, processing).

LP5 – reduced administrative burden if someone uses diverse seed in one's own farm; agricultural subsidy reform; promotion and subsidy for local, community-based solutions; integrating the agrobiodiversity topic into agricultural studies at university level and vocational training; professional forum that engages multiple representatives of local stakeholders.

LP4 – country-wide network of seed banks; creation of a network of small seed-producing companies; participatory projects funded (on-farm testing, breeding, seed CSAs).

LP3 – short food supply chains; diversity as primary value (e.g. diversity adapted restaurant menus); healthy, affordable, and culturally appropriate food for everyone.

LP2 – experiential attitude; open mindedness; agroecology, permaculture, systems thinking; non-violent communication.

(iv) What were the pros and cons of the leverage points framework (LPF) for your case study development?

The LPF was very useful to analyse the expert interviews we conducted. Basically, the LP categories were used to code our interview texts and this exercise proved useful in the sense of bringing new insights and a clear structure that we will share with our stakeholder board for further reflections. We feel that a network of LPs is significant, not a couple of ones or a single one. We also feel that this complexity (the networked nature of LPs) is important and if one wants systems to change, then all – or at least several – LPs are needed to be acted upon at the same time.

6.3 Environmental awareness in Education in Hungary (ESSRG)

Kármén Czett and Eszter Kelemen

(i) What interventions does your case study plan to use and where do they fit in the Reflexivity-Contextualisation Matrix (RCM)?

School gardens and participatory theatre are being implemented as interventions orchestrated by established stakeholders, allowing us to trace their effects. The theories behind these methods are rooted in eco-psychology and human nature connectedness.

An experiential game focusing on biodiversity is integrated into one instance due to the keen interest of a teacher, while in another, it was chosen to align better with the cognitive development of the age group compared to the theatre production.

Emphasis is placed on fostering intrapersonal and interpersonal transformations, with less emphasis on affecting institutional changes. This approach considers the challenging landscape of policy alteration in Hungary, given its authoritative governance structure – however, we hope to scale out and spread best practices through school and expert exchanges.

Each methodology is intricately woven around the topic of biodiversity, particularly evident in the case of school gardens, which cultivates a deeply rooted, place-based relationship.

(ii) What were the pros and cons of the Reflexivity-Contextualisation Matrix (RCM) for your case study development?

It helped us to narrow down the potential methods based on what kind of change we are aiming for, and to see how much we could fit into the scope of this project. However, not all methods proved feasible with this setting and our available resources, and in such cases, we had to make some modifications (e.g. we are applying participatory theatre with a partner institution instead of the role play we originally chose).

(iii) What leverage points do the interventions and potential policy recommendations from your case study engage with?

The interventions and potential policy recommendations from the case study engage with several leverage points within the system. They target the structure of information flows by fostering interactive classes grounded in systems thinking, promoting outdoor education, and facilitating access to external experts in schools. Furthermore, they address the power to add, change, or self-organise system structure by enhancing the freedom of choice in teaching methods and fostering cross-school learning. Finally, they aim to reshape the goals of the system by advancing biodiversity education to encompass more than just acquiring lexical knowledge, but also to deepen human-nature connectedness. Through these strategies, the interventions aim to influence the culture in schools and the goals of the system towards a more holistic and interconnected approach in biodiversity education and environmental awareness.

(iv) What were the pros and cons of the leverage points framework (LPF) for your case study development?

We used the LPF as an overall conceptualisation of barriers and enablers identified in the expert interviews. While it helped us identify some specific nuances, it proved challenging to apply effectively in guiding our case study. Difficulty arose particularly in translating the significance of shallow leverage points, such as means of buffers, to the specific context of the case. A primary shortcoming identified is that the framework is predominantly rooted in natural science and follows an engineering logic and provides less support to grasp internal (personal) processes. This limitation hinders its applicability in addressing complex socio-environmental issues, indicating the need for a more holistic and interdisciplinary approach to leverage points analysis.

6.4 Sectoral case – Agriculture and migration in the EU (FiBL)

Lina Tennhardt

(i) What interventions does your case study plan to use and where do they fit in the Reflexivity-Contextualisation Matrix (RCM)?

This case will not employ any intervention. Selected methods include a participatory system mapping, interviews, and system analysis workshops. We are currently in the process of collecting data.

(ii) What were the pros and cons of the Reflexivity-Contextualisation Matrix (RCM) for your case study development?

Not relevant.

(iii) What leverage points do the interventions and potential policy recommendations from your case study engage with?

Potential policy recommendations derived through this case: Promising policy interventions to address systemic barriers and enablers for biodiversity-friendly practices in (labour-intensive) farming systems across the EU, such as CAP or Sustainable food systems framework. These might address the following LPs:

LP 12 – in the future, agricultural subsidies/direct payments for farmers in Europe are mostly paid according to farmers' contribution to environmental outcomes, and conditional on social criteria, such as workers' rights.

LP 11 – better coordination between farmers to select similar biodiversity-conservation measures (e.g. improve connectivity through green belts and wildlife corridors across multiple farms within the same landscape).

LP 5 – through policy integration and system thinking, the green and fair transition of the European agricultural system are integrated within European policies.

LP 4 – advancements in networking (e.g. social media) allow that seasonal migrants organise, such as in workers' unions, to improve working conditions.

LP 3 – instead of prioritising production quantities and supporting exports, the goals of the European agricultural systems are efficiency, consistency, and sufficiency following transformative sustainability governance (e.g. Sustainable food systems' framework for fair prices)

(iv) What were the pros and cons of the leverage points framework (LPF) for your case study development?

So far, the identified LPs under the LPF depict our – the researchers' – views, priorities, and future visions. What a desired future which we, as a society, should work towards highly depends on the actors involved in the definition. Especially when it comes to migrant workers and sustainable agriculture, the views diverge to a large degree.

Once we have completed data collection and included other stakeholders, we will have a better understanding of how the LPs identified by them integrate within this framework.

6.5 Trade & GVCs soy/beef from Brazil to the EU/Netherlands (RU)

Vinicius Mendes and Cristina Y. A. Inoue

(i) What interventions do your case study plan to use and where do they fit in the Reflexivity-Contextualisation Matrix (RCM)?

In our case, we selected the following methods: literature review, document analysis, and interviews working on all three. However, we want to go further, and carry out (participant) observations in the field (Brazilian Amazon) (to be confirmed depending on the availability of funds – we are currently applying for grants to fund this aspect of the research). If this field research materialises, we will manage to involve local communities and use creative intervention methods (based on images/photos), besides organising one or two workshops in the field.

In this context, our intervention methods (currently applied) are more aligned with the transformation through reflexivity (upper part of the RCM). In the x-axis of the matrix, our work interventions include Abstract aspects, emphasising intrapersonal change and broader relationships beyond biodiversity (also including, for example, development and justice), but also Contextual aspects, emphasising place-based relationships in the Amazon.

(ii) What were the pros and cons of the Reflexivity-Contextualisation Matrix (RCM) for your case study development?

One positive aspect of the RCM is that it provides initial “food for thought”, i.e. a series of methods to reflect upon before selecting interventions for the case study. However, there are many more methods beyond those included in the matrix. For example, how can we use the RCM to guide interventions in our extensive case, which *a priori* uses traditional social science research methods (interviews, document analysis, literature reviews), based on the idea of “broadly defined” interventions? In this sense, it looks like the RCM is much more aligned with the work being developed in intensive cases.

(iii) What leverage points do the interventions and potential policy recommendations from your case study engage with?

Potential policy recommendations from our case: EU trade policies that pay attention to biodiversity, human rights & intersectionality in the sourcing countries producing commodities imported by the EU; implement degrowth in the monocultural agro-commodity sector; design and implement mechanisms to listen to the communities where commodity production take places; a broader concept of forests and deforestation/habitat loss to include other biomes and impacts like pollution and human rights threats adopted by EU Deforestation Regulation. Based on these potential policy recommendations, and the previously discussed interventions, we would engage more with the following LPs:

LP6 – as our case can provide more information to policymakers on the impact of soy/beef trade. Also, local communities & NGOs, instead of companies alone, could be sources of traceability/due diligence information, or at least validate it.

LP5 – because our case suggests the relevance of policies and regulations that tip the power balance, reducing the power of big companies/farmers, and increasing the power of local communities, in agro-commodity trade regulations.

LP4 – in this case, desirable system-wide transformations include the following two: First, the global agricultural system would adapt itself to global biodiversity loss and inequality by increasing local value chains, and degrowth in the monocultural agro-commodities sector. Second, the global trade system would tackle global biodiversity loss and inequality by adopting policies that improve sustainability & intersectional justice in international trade.

(iv) What were the pros and cons of the leverage points framework (LPF) for your case study development?

The LPF helps understand potential places to intervene in the system(s) connected to our case. However, because of its hierarchical nature, it provides little space for out-of-the-box thinking when it comes to alternatives, innovative bottom-up solutions to the problems we are tackling (beef/soy-driven deforestation in the Amazon and other social-environmental challenges along the supply chains, including in the EU/Netherlands). Reflexivist ontologies and critical theory (power imbalances, injustices), which are central in our case study, are not easily connected to the LPF.

6.6 Sustainable investment behaviour Global-EU-Norway (NINA)

Rafal Chudy

(i) What interventions do your case study plan to use and where do they fit in the Reflexivity-Contextualisation Matrix (RCM)?

The case study investigates the impact of cognitive biases on sustainable investment behaviour, especially amidst the complexities of environmental, social, and governance (ESG) uncertainties. Employing a systematic literature review and semi-structured interviews with stakeholder board members, the study will provide an understanding of how various biases influence decision-making in the realm of sustainable investing practices. The mix of literature review, discussions with stakeholder board members (coming from organisations such as TNFD, UNEP-WCMC, KLP, Eika Group) and desk-based research aims to triangulate data from multiple sources, providing a robust foundation for understanding the influence of cognitive biases on sustainable investment decisions amidst ESG uncertainties.

This analysis aims to offer valuable insights for researchers and companies relying on ESG scores in their analyses, providing an opportunity to enhance internal policies to mitigate biases in investment decisions. Additionally, it may prove instrumental for companies involved in shaping ESG standards, improving the credibility of ESG scores, particularly in areas like biodiversity, and fostering more informed and responsible investment practices.

(ii) What were the pros and cons of the Reflexivity-Contextualisation Matrix (RCM) for your case study development?

No specific intervention was selected in our case, as it is an extensive case and focuses on dialogues with the stakeholder board. Consequently, this case study has not used the RCM and has no substantive feedback to this question.

(iii) What leverage points do the interventions and potential policy recommendations from your case study engage with?

Policy recommendations will be focused on companies' internal policies about improving the system in place, the actors in the chain, the consideration of biases (e.g. home bias to invest in markets known for the investor) and limit these through improved decision-making. Recommendation will also include to have standardised ESG scores of biodiversity (currently many independent actors and consultant carry out the assessment with limited standardisation). The optimal outcome of implementing these policy recommendations would entail companies enhancing their internal policies to address biases in investments, elevating ESG (Environmental, Social, and Governance) standards, and integrating biodiversity considerations into their institutional activities.

In this case study, we have selected three theories of change and connected them to leverage points (LPs). The theories include:

- Prospect theory – describes how investors make decisions under risk and uncertainty; therefore, incorporating improved data and parameters (LP12) to characterise biodiversity's status, investors could shift capital away from businesses causing significant harm to biodiversity and towards those with lesser detrimental impacts. By proper monitoring of biodiversity, i.e. what is happening on the ground compared to metrics describing the biodiversity state investors can gain (LP7) by minimising the materiality and risk to their portfolios. They also push for better information flow and access to biodiversity data provided by 3rd parties (LP6). Since investors pay for biodiversity metrics/data/various ESG scores that include biodiversity evaluation in "E" – they have also negative strength on 3rd parties that should work towards improvement of biodiversity metrics (LP8).
- Portfolio theory – investors want to maximise returns and minimise risks; however, up to now the risk coming from climate change and biodiversity loss has not been included in financial analyses – therefore, modern portfolio theory that includes ESG scoring and general shift of the investors mindset and inclusion of ESG scores in investment analyses may change the system (L2). In other words, modern portfolio analysis that includes ESG factors may identify knowledge gaps and challenge the model assumptions previously accepted.
- Theory of Planned Behaviour – when resources become scarce, the consequences of climate change and biodiversity loss become more serious (material for businesses), and people working for these businesses are more educated regarding the importance of nature in human sustainable development goals – the transition of paradigms may take place (LP1), and different goals for financial sector can be drawn (LP3) and measured (including obligatory reporting of biodiversity materiality to the company).

(iv) What were the pros and cons of the leverage points framework (LPF) for your case study development?

The LPF proved to be helpful to consider the case focus. In the context of sustainable investment behaviour, leverage points are critical because they highlight opportunities for investors to enact meaningful change towards sustainability goals. Nevertheless, there are several critiques and challenges associated with leverage points in sustainable investment behaviour, including its impact on biodiversity. Those include: short-term focus (many investors, particularly in mainstream finance, often prioritise short-term financial gains over long-term sustainability objectives), complexity and uncertainty (identifying and effectively targeting leverage points within complex financial systems can be challenging), trade-offs and conflicting objectives (sustainable investment decisions may involve trade-offs between financial returns and environmental, social, or governance (ESG) considerations), lack of standardisation and metrics (the lack of standardised metrics and reporting frameworks for ESG factors makes it difficult for investors to assess the sustainability performance of companies and investment products consistently), greenwashing and tokenism (certain sustainable investment practices, such as greenwashing or tokenistic ESG integration, may undermine the effectiveness of leveraging points for sustainability and biodiversity benefits).

6.7 Reflexivity-Contextualisation Matrix (RCM) similarities across sector-based cases

Ilkhom Soliev and Agnes Zolyomi

Like the findings reported in the section on intensive cases, the ongoing work between the coordinators, work package/task leads, and the case study partners, as well as the dialogues on the usefulness and relevance of the RCM provided valuable insights that could help future research and action to better prioritise interventions. The experiences however have not been universal across all case studies.

Due to the different nature of focus on the needed change in the extensive case studies (hence, interventions), where entire sectors are at the centre of the analysis, some cases (FiBL, NINA) stated that they have not consulted the RCM to reflect on their intervention selection. Reflections by the ESSRG case on agro-biodiversity management in Hungary highlight the potential limitation of the RCM. The matrix seems to reduce complexity with separate categorisations compared to overlapping, fuzzy and hybrid complexity experienced in the respective case. Such a reflection is however in line with the RCM's intended usefulness – it does not aim at selecting one specific intervention (or list of detailed interventions) that fully fits the complexity of the case. It does however aim at reflecting at the higher or meta level about the type of change desired in the case study or mixes of changes, particularly given that the resources and entry points for inducing change are limited. Nevertheless, the feedback that the RCM gives such an impression is indeed helpful for its further development and description beyond this period.

RU suggested the RCM could be very helpful for preliminary consideration of various methods. Nevertheless, from a rather traditional academic perspective where a task is often to analyse case studies via interviews, document analysis, literature review, or

alike, it was not directly helpful for the selection of methods. This useful feedback raises a question with a significance beyond this project. Namely, how we understand *and* induce change or to what extent this can be done simultaneously. While the authors of the RCM in its development focused on the methods that can bring about change, the conventional focus in social research is more on the methods of understanding change. Similarly, how the authors of the RCM and the case study leads understood “interventions” seem to have slight but important differences. The authors of the RCM understand interventions as any deliberate action that can result in change. Academics, whose calling is often to provide as “objective” information and evidence as possible, tend not to think about their “research approaches” as interventions (particularly those involving people such as interviews). One should note however, the debate on whether such “objective” information and evidence exists goes back as far as the social sciences do – although we believe there is an overall agreement about the value of striving towards exclusion of bias and misrepresentation.

Pisa University leading the fashion industry case study suggested that the framework supports a reflexivity process and the development of conversations, for researchers to reflect upon and better understand the differences between approaches and methods. However, they reported that RCM was not useful for a direct application in stakeholder discussions. They also raised a critical concern in terms of whether RCM has insufficient focus on high-level institutional (e.g. conventional, and particularly international policy changes). The RCM however seems to encourage rather more place-based interpersonal and intrapersonal change. This is of course the result of the specific focus of PLANET4B that places a specific emphasis on non-conventional interventions (that go beyond laws, markets, information) and ones that can facilitate understanding and channelling plural values, intersectionality, attitudes, norms, and social learning. Thus, the focus is stronger on less-understood and less-applied forms of interventions that can trigger change rather from bottom-up but still with the chance of institutionalisation. As a result, currently, the theoretical approaches or tools under “institutional” seem to influence more interpersonal relations and much less institutional relations in the short term. This is particularly true in the form of formalised policies with the working assumption that institutional change that come from within as a result of internalisation of new norms, values and beliefs (rather than externally imposed and top-down institutional change that might lack this internalisation of new norms, values and beliefs) is what is needed for the desired changes to be truly effective and sustainable. The case study leads reported that RCM could be informative when putting in practice for example the biodiversity-food-governance decision-making game and the other stakeholder workshops the case study aims to pursue. This indicates that, when looking at the version of RCM presented in D2.1, the focus can sometimes be on the discussion of the specific examples of interventions rather than the meta level discussion it aims to facilitate on the dimensions of interventions and desired types of change.

Overall, our synthesis reveals there can be an important added value of RCM by using it for meta-level discussion of selection of directions for interventions; questioning the types of desired social change and identification of what might be missing in a mix of interventions; or reflection on one’s own role as a participant in the research and action. RCM and its use could however be more valuable by making the links with the conventional interventions explicit (e.g. laws, markets, information are still very powerful and should remain part of the discussion when considering any intervention

mixes), as well as crystallising the arguments about the levels of discussion (meta, rather than detailed), and where between research and action it can be particularly helpful (how we understand “intervening” and whether we reflect on the impact of our research methods that might not appear to be an “intervention”).

6.8 Leverage point similarities across sector-based cases

David N. Barton

My hypothesis for sector-based cases studies before starting this work was an affinity to working with deeper leverage points. I realise now this was based on an implicit theory of change of deeper transformative change only being possible at the policy level and with institutions. The comparison of place-based and sector-based reference to leverage points show that it is “scale neutral” in the sense that paradigms, system goals and power to self-organise can take place across intrapersonal, interpersonal, and institutional scales.

Table 7. Comparison of sector-based and place-based cases in terms of self-evaluated potential leverage points. Rating of principle, possible leverage and stated conceptual uncertainty about the leverage points is based on the authors’ interpretation of case study reports from the dialogues.

Leverage Points		Place-based cases					Sector-based cases						
		Partner	OOF/ NINA	DADIMAS /CU	CGE/ MLU	FuG/ IFZ	FiBL	UNIPI	ESSRG	ESSRG	FiBL	RU	NINA
		Country	Norway	UK	Germany	Austria	Switzer- land	Italy	Hungary	Hungary	EU	Brazil/ EU	Inter- national
		Case theme	Children	Minority communities	Urban youth	Edible City	Religion	Fashion	Agrobiodivers- ity & gender	Education	Migration	Trade	Investment
Parameters	12. Parameters (such as subsidies, taxes, standards).		★	★	★	★	★	★				★	
	11. Size of buffers relative to their flows.			★	☆		☆						
	Feedbacks	10. Structure of material stocks and flows		★	★	★			★	★	★		
		9. Lengths of delays, relative to the rate of system change.			★	★			★				
	Design	8. Strength of negative feedback loops			★	★			★				★
		7. Gain around driving positive feedback loops.			★	★			★				★
		6. Structure of information flows (access to information).		★	★	★	★	★	★	★	★	★	★
		5. Rules of the system (such as incentives, constraints).		★	★	★	★	★	★	★	★	★	★
	Intent	4. Power to add, change, or self-organize system structure.	★	★	★	★	★	★	★	★	★	★	★
		3. Goals of the system.	★	★	★	★	★	★	★	★	★	★	★
		2. Mindset or paradigm out of which the system arises	★	★	★	★	★	★	★	★	★	★	★
		1. The power to transcend paradigms.	★	★	★	★	★	★	★	★	★	★	★
Legend: ★ principle leverage ☆ possible leverage ☆ stated conceptual uncertainty													

Case studies reflected on opportunities and limitations of the LPF for “self-diagnosis” of their case studies. In summary,

Opportunities – the LPF facilitated:

- A systematic way in which to **define the boundaries** and properties of our specific socio-ecological system.
- Overall **conceptualisation of barriers and enablers.**
- Awareness of the **parts of a system** which are **addressed by current policies.**
- Understand potential **places to intervene** in the system(s) and analysis of **transformative potential.**
- **Coding** interview texts bringing new insights and a clear structure.
- Thinking about **network of LPs**, rather than individually.

The LPF has the limitations of:

- Requiring deep **knowledge about system theory**.
- **Translating** the significance of **shallow leverage points** for the case.
- Being too **hierarchical** and does not satisfactorily explain the interaction between the different leverage points.
- Predominantly **rooted in natural science** and follows an **engineering logic**, with less support to grasp internal (personal) processes.
- Highly **depending on which actors are involved** in the definition of leverage points.
- **Oversimplifying change** and systems.
- **Insufficient insight** into the institutional and interpersonal **power dynamics**.

There were some further caveats to the methodology. Two case studies stand out in the table for their transversal use of the LPF with learning communities: to structure group conversations (UK minority communities) or as a protocol to code individual interviews (Hungary agrobiodiversity & gender). Other cases may have connected with additional leverage points had they applied the framework interactively.

Across place- and sector-based cases they struggled to operationalise the socio-ecological systems concepts of feedback loops, rates of systems change, stocks, flows and buffers. This may be due to a combination of lacking definition and examples, but also a relatively limited scope on ecological systems components in both place-based and sector-based case studies (resource units, systems, interaction in Ostrom's SES framework).

7. Discussion: integrating frameworks with feedback from case dialogues, workshops, and reviews

David N. Barton

This chapter discusses how to develop a transdisciplinary diagnostic framework relevant for biodiversity decision support from the dialogues and publications reviewing different methodological approaches in WP1. This chapter contains a series of “explorations” of ways of cross-walking and conceptually connecting the different theories, approaches and models considered.

7.1 Intrapersonal, interpersonal, and institutional lenses

David N. Barton

A framework that has accompanied the project since its inception in the project proposal is the distinction of intrapersonal, interpersonal, and institutional theories, visualised as nested concepts. From our reviews of the leverage points framework and the reflexivity-contextualisation matrix we see that leverage points and intervention types span all these scales (Figure 17). Similarly, intersectionality analysis and discourse analysis span all scales of analysis. These three concepts and their nesting have proved robust to the different frameworks and case study varieties they have been “exposed to” and should probably be retained in some way in a transdisciplinary diagnostic framework developed as a result of WP1.

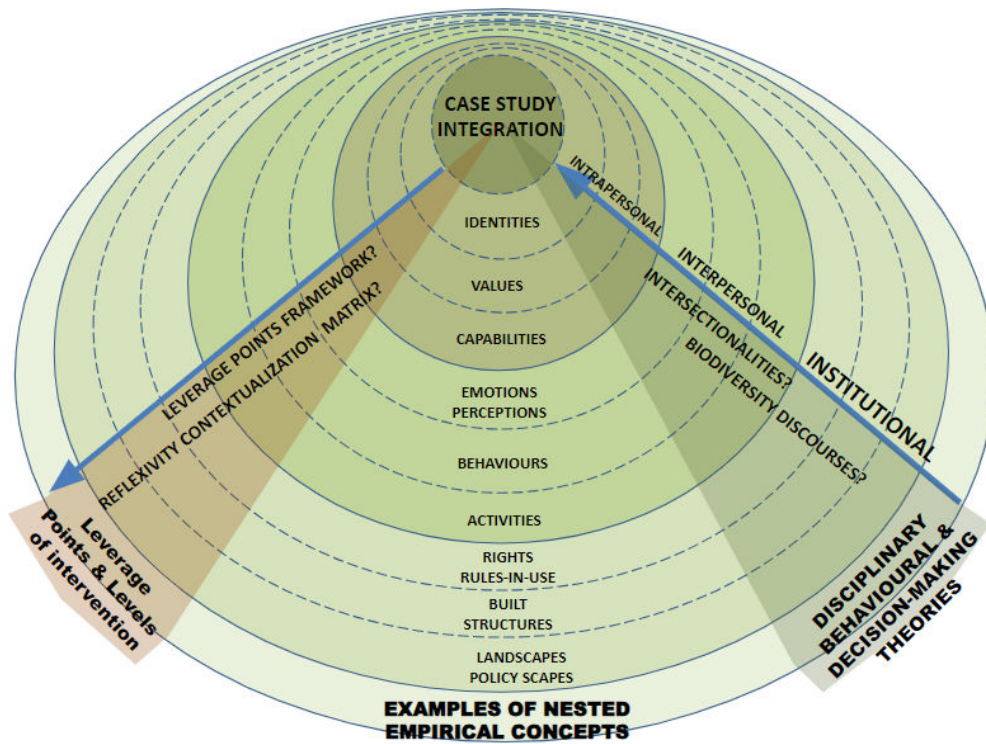


Figure 17. PLANET4B case studies evaluated the capabilities of Meadows' leverage points framework (1999), intersectionality analyses (Thaler & Karner, 2023) and biodiversity discourse analyses (Schleiffer et al., 2023) to facilitate communication across disciplinary scales in the project.

7.2 Extensions and limitations of the leverage points metaphor

David N. Barton

We hypothesised at the beginning of PLANET4B that established **disciplinary preferences for interventions and policies** could be explained by underlying “theories of change” that different practices and disciplines structure their empirical research around. Furthermore, that these disciplinary preferences could be compared using a leverage points framework (Figure 18). We tested this lens with case studies. We considered it as an alternative/complementary systems analysis lens to intersectionality and discourse analysis. This gave rise to further extensions of the leverage points metaphor and highlighted some limitations of the metaphor.

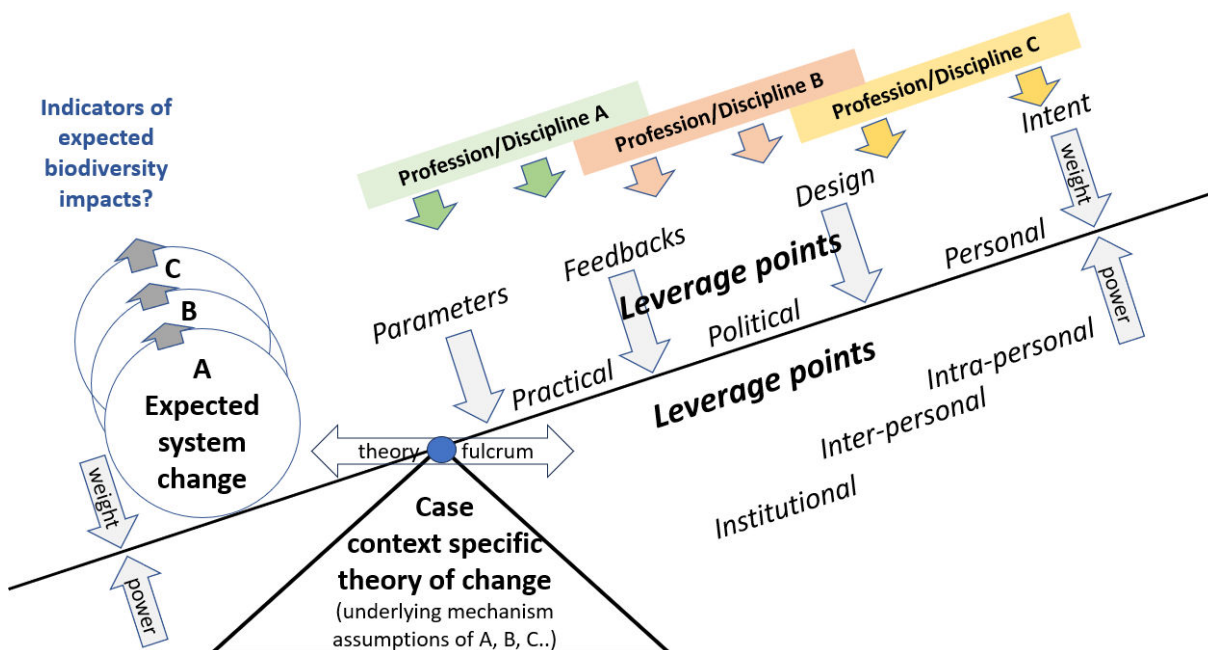


Figure 18. A leverage points perspective on the definition of theories of change. Source: adapted from Abson et al. (2017) leverage points model.

Using the leverage points lens to define theories of change means that theories could be distinguished by (Figure 18):

1. The **leverage level** that they tended towards (shallower to deeper).
2. **Types of leverage points** (parameter, feedback, design, or intent).
3. **Outcomes or impacts** in the socio-ecological systems; e.g. observed and understood change in different ecological, social, and economic parameters, values and their metrics.
4. **Mechanisms assumed** to make policy and interventions lead to outcomes and how systems change is understood. In the mechanistic metaphor of leverage there is an implicit question of whether sufficient weight or power can be applied at any particular leverage point to shift the system. There is an implicit physics of many shallow leverage points (e.g. a “policymix”) potentially having the same weight or power to shift the system as a single deeper leverage point.
5. **Competing theories of change.** The LPF itself was seen by some researchers as imposing a “worldview” on cases through its structuring and language. While

this “meta-theoretical” critique cannot be addressed within the LPF itself, the question of competing theories of change can be accommodated to a certain extent with the leverage metaphor. **The positioning of the “theory’s fulcrum”** relative to leverage point gives it more or less ‘effect’, ‘weight’ or ‘power’ relative to the other leverage points. Some theories only look at a particular leverage point. Other theories implicitly or explicitly **position the theoretical fulcrum**, thereby shifting the power of change they assume their theory to have. For example, micro-economic theory on its own may assume that economic incentives are far from the “theory’s fulcrum” giving them more effect or weight. It may or may not recognise the relative importance of e.g. institutional economic theory and the researcher may be ignorant of theoretical leverage points further out. Some research on payments for ecosystem services recognises the political economy of this incentive in relation to other regulatory, informational, and economic policy instruments. For example, in their legal foundation, enforcement potential and access to funding mechanisms (different sources of power).

6. **Role of agency and power.** Some case studies commented on the LPF lack of tools to understand agency and power in transformative change. The LPF initially communicates that it is physical **inertia** of the system that must be shifted by “proactive” forces acting at the leverage points. The leveraging bar metaphor opens for “opposing power/force”, “counteraction”, “push back” on the fulcrum. Some lenses – including the intersectionality and discourse analyses – have different interpretations of communication and interpersonal and institutional positioning and power relations.

There is never a single interpretation of a framework. It becomes useful in terms of the questions it helps pose for self-reflection. The intrapersonal, interpersonal, and institutional lenses are easily accommodated within the leverage points framework. The 12 shallower and deeper leverage points provide diagnostic richness and help mobilise researchers’ and practitioners’ reflections on their theories of change.

However, the LPF lacks further tools to understand different values and worldviews that explain why theories of change may complement or compete with one another. Furthermore, agency and actor power cannot be explored in depth within the LPF. Both the intersectionality and discourse analysis provide lenses on (discrimination of) actors’ social positions, their potential as agents of change, and their discursive power from those positions.

7.3 Leverage points about system “intent” – plural nature value typologies

David N. Barton

The leverage points framework does not offer any typology of different paradigms or worldviews specific to biodiversity decision-making. A typology for plural values of nature may be a complementary diagnostic tool to address this. The IPBES Values Assessment used the concept of life frames as different lenses on the plural values of nature (Pascual et al., 2023; Figure 19).

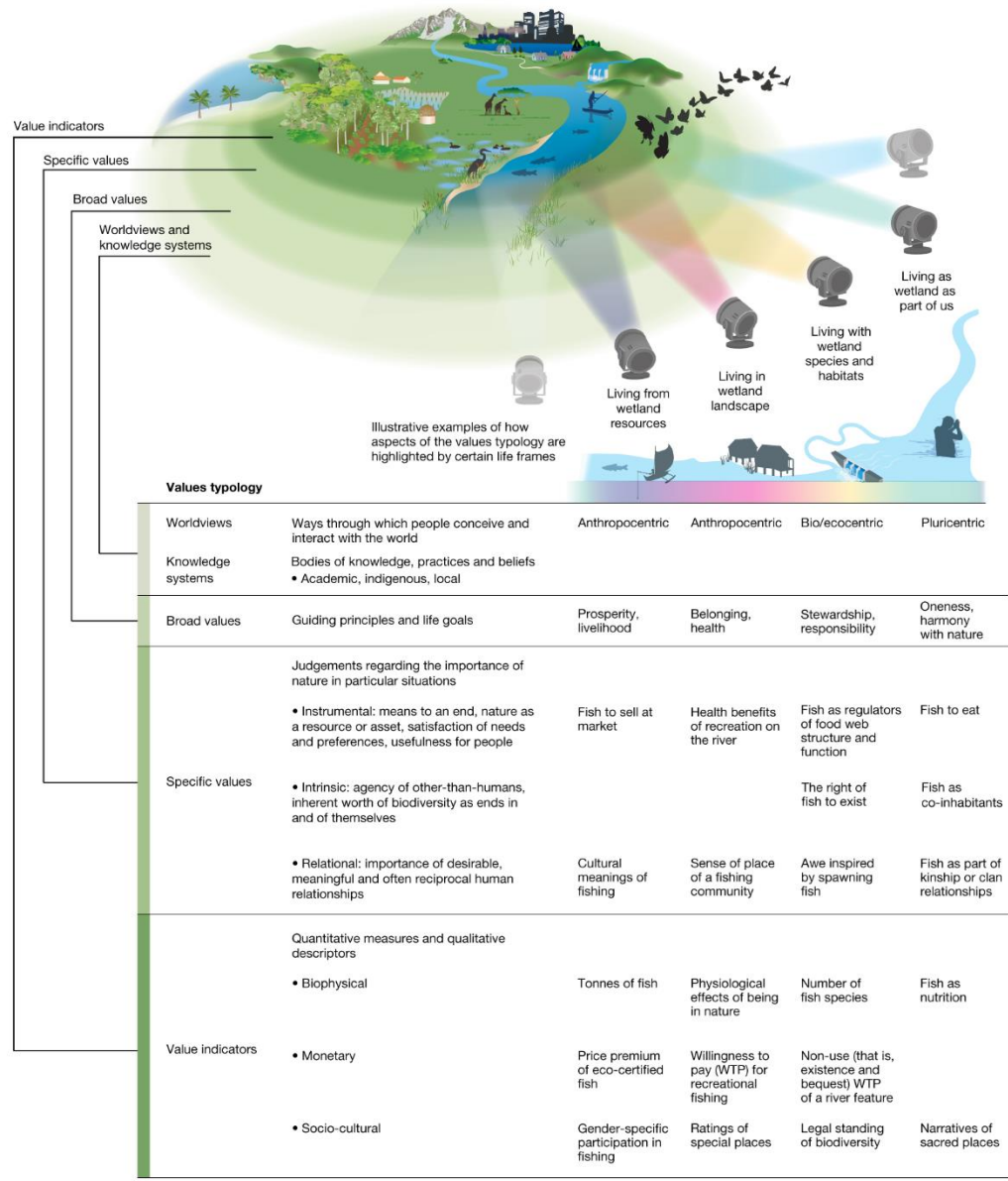


Figure 19. Life frame “lenses” on plural values of nature. Source: Pascual et al. (2023).


Different life frames are tied to different worldviews and knowledge systems that are tied to specific values of nature and its biodiversity. The metaphor of different “life frame lenses” (Pascual et al., 2023) may help recognise and potentially reconcile differences in these discourses. Different worldviews and knowledge lenses on nature and society can apply more broadly to any framework. The distinction between anthropocentric, biocentric and pluricentric “worldviews” and knowledge systems, broad values, specific values, and value indicators are additional useful concepts to help distinguish both the origins of different theories of change and the political discourses we relate to as researchers and practitioners. The IPBES plural values typology in Figure 19 helps detail differences in the deep “intent” related leverage points.

7.4 Actor and decision-types related to biodiversity policy

David N. Barton

Some sector-based case studies found the leverage points framework too abstract relative to the sector-specific and biodiversity-related issues they are addressing. Can a decision-making typology help compare PLANET4B policy and other recommendations from cases to the national and EU policy levels? Based on work done for the IPBES Values Assessment, and using an institutional economics lens, Vatn et al. (2024) developed a decision-making typology (DMT, Table 8) to broadly describe types of policies and types of actor interactions.

Table 8. Decision-making typology (DMT), adapted from Vatn et al. (2024). PA stands for political actors. EA stands for economic actors. SCA stands for civil society actors. PD stands for political decisions. ED stands for economic decisions. SCD stands for socio-cultural decisions. The numerals (1 to 12) refer to our hypotheses about Meadows' 12-leverage points (1999).

  Actors Decisions	Political actors Hold the authority to define rules for economic activity as well as the rules for policymaking processes themselves. PA	Economic actors Comprise producers and consumers – i.e. actors who hold rights to different assets, including natural assets used for production, financial actors and people as consumers of these goods and services derived from nature. EA	Civil society actors Citizens in general, membership-based organizations and social movements organized around values that serve the interests about the nature of a given collective. SCA
Political decisions PD Defining and protecting rights with respect to access to and control over natural assets and associated values Mandate/allocate obligations, rights.	Government (national to local) and traditional authorities' regulations – e.g. allocation of rights including ownership to land, design (dis-)incentives (pollution limits, green taxes), establishing protected areas. 5,12?	Private rulemaking (e.g. product standards). Influence through formalized structures between political and economic actors; lobbying; threats with respect to moving production abroad. 5, 6, 12?	Protest, demonstration, lawsuits against regulations perceived as unjust or unsustainable. Election support for specific legislations aligned with the values attributed to nature. 3-5?
Economic decisions ED Covers production and consumption decisions over goods and services including investments and disinvestments in natural assets.	Decisions on public spending (e.g. infrastructure development, producing goods and services from nature for public service). 12?	Decisions on investments, production and consumption (e.g. where to source natural resources, what to produce) by public or private firms, financial actors, collective associations or individuals. 10,11?	Campaigns against/boycotts of firms or products misaligned with civil society's values attributed to nature. 3-4, 12?
Socio-cultural decisions SCD Regard the cultural dimension in the sense of forming, maintaining or changing people's identity and human–nature relationships.	Governments and/or traditional authorities setting rights-based approaches for the stewardship of territories and protection of local people's identity and/or defence of territory (e.g. infrastructure development in the context of living in harmony with nature). 5?	Decisions by firms, associations, and consumers oriented around supporting ways of life aligned with values attributed to nature (e.g. community-supported agriculture, purchasing agreements with co-ops). 4,7?	Communities (e.g. Indigenous peoples, religious groups and others) and social movements acting for the defence of human or territorial rights, or to protect relevant resources associated with their use or relationships with nature, including, for instance, spiritual connections. 3-4?

The DMT provides another lens on the challenges of operationalising leverage points to types of decisions/actions by different sectoral actors in biodiversity policy making

and action. In Table 8 we have suggested some possible linkages to specific leverage points (Meadows, 1999).

The following examples of quadrants in the DMT, and a crosswalk to the LPF, illustrate some of the challenges in defining a generic framework for decision-support:

- Political decisions-Political actors: “Government and traditional authorities’ regulations such as allocation of rights to land, design of (dis-)incentives (pollution limits, green taxes), establishment of protected areas”. Meadows identifies “rules of the system” (incentives and constraints) as LP5, while subsidies, taxes and standards are classed as shallow “parameters” LP12. These parameters all have an incentive effect, potentially conflating the definition of LP5-12.
- Economic decisions-Economic actors: “Decisions on investments, production and consumption (where to source natural resources, what to produce) by public or private firms, financial actors, collective associations or individuals”. These decisions affect the structure of material stocks and flows (LP10) but may also be based on knowledge about the size of natural resource stocks relative to planned resource extraction (LP11).
- Socio-cultural decisions-Civil society actors: “Communities and social movements acting for the defence of human or territorial rights, or to protect relevant resources associated with their use or relationships with nature”. The decision to act to defend rights may refer to “rules of the system” (LP5) or “the power to self-organise” (LP4).

Other quadrants in the DMT raise further questions which are not developed here. The conceptual cross-walk between decision-making types (Vatn et al., 2024) and the specific leverage points (Meadows, 1999) is challenging. While the decision-making typology is very broad it explicitly refers to different types of agents and action and decision domains. A conceptual difficulty is the LPF ambiguity about agency – the ability to decide and act. Only LP4 has language explicitly referring to agency (“the power to add, change or self-organise system structure”). The lack of an agency dimensions in the LPF, suggests that it needs to be complemented by other frameworks.

7.5 Power in the context of policy for plural values of nature

David N. Barton

Vatn et al. (2024) nest their decision-making typology within a generic framework for decision-making that also addresses power (Figure 20). New concepts relative to previous frameworks are “discursive power” drawing from worldviews, and “structural power” defined by norms and rules. Another novelty compared to the frameworks discussed earlier in this report, are the indications of different types of interactions and feedback between “layers of influence” in decisions represented by worldviews, broad values, and institutions (Figure 20; arrows a-g).

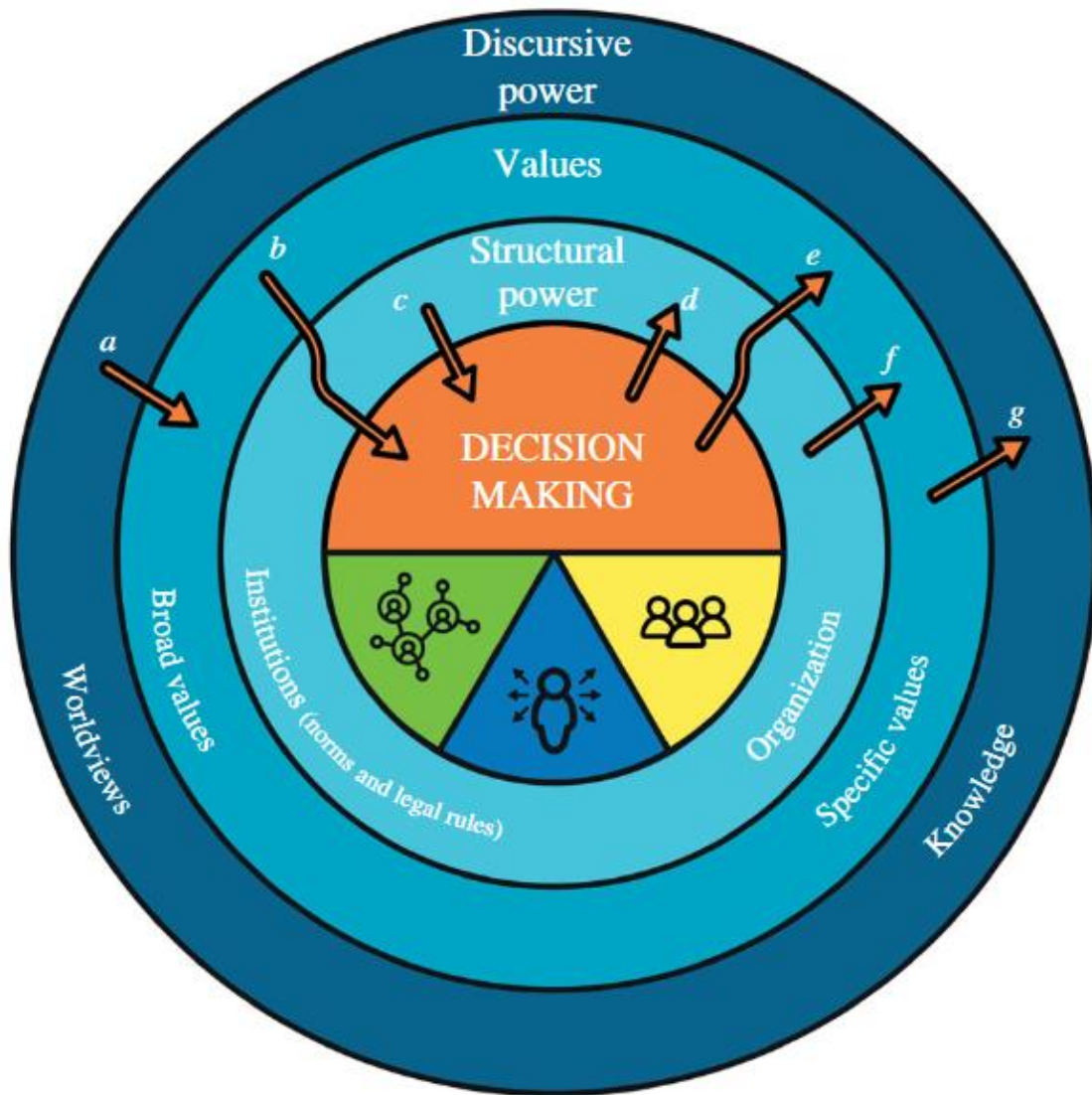


Figure 20. Generic framework to analyse the way nature’s values influence decision-making. Source: Vatn et al. (2024).

Following Vatn et al. (2024, p. 4), “Discursive power in the form of producing or reinforcing Worldviews and Knowledge systems frames what values become important to different groups in society (arrow a). Values are assumed to influence Decision-making as ‘filtered’ through a structural layer, constituted mainly by the institutional context (norms and legal rules; arrow b). Structural power also influences the Decision-making process itself by defining how it should be undertaken — e.g. who participates and how decisions should be made (arrow c). There is feedback from Decision-making to Values and the other outer layers of influence: directly as decisions may change Institutions and organizations—the Structural power layer (arrow d). Over time, Decision-making and the associated institutional change may impact”

The nesting of the “layers of influence” on decision-making is somewhat similar to the hierarchy of the deep leverage points in Meadows’ (1999) framework. These interactions address case study critiques of the leverage points framework that it does not elucidate interdependencies between leverage levels/points.

7.6 Three Spheres of Transformation framework and Conscious Full Spectrum Response

David N. Barton

In learning and testing the leverage points framework in PLANET4B, case study researchers commented on it being “mechanistic”. This contrast with the intention of Meadows (1999) to provide a framework that could address complex systems. In this section (7.6), we look at two further frameworks that have some commonalities with Meadows’ leverage points framework (1999), as well as the decision-making typology (Vatn et al., 2024), discussed in the previous section. However, their application is different. The following frameworks are used in training on radical transformational leadership, to help people realise their potential as agents of change. In this practice they address agency very directly.

Sharma (2007) originally developed a Three Spheres of Transformation approach, based on her work in the Leadership and Capacity Development Initiative of the United Nations. The framework was later adapted by O’Brien and Synga (2013) (Figure 21).



Figure 21. Three spheres of transformation (O’Brien & Synga, 2013, after Sharma, 2007).

The following definitions of the spheres follow O'Brien and Synga (2013, pp. 5–6):

PERSONAL sphere *“where the transformation of individual and collective beliefs, values and worldviews occur. [...] Changes to beliefs, values, and worldviews can influence the types of actions and strategies considered possible in the practical sphere.”*

POLITICAL sphere *“represents the systems and structures that define the constraints and possibilities under which practical transformations take place [...] the political sphere also involves the management of ‘natural’ systems, such as ecosystems, the climate system, water systems”.*

PRACTICAL sphere of behaviours and technical responses is *“where outcomes have an observable and measurable influence on [...] policy goals [...]. It can be considered the ‘outcome’ sphere, where the numbers, parameters, and indicators are most often measured”.*

The three spheres reference Meadows' leverage points framework (Meadows, 1999) with shallow (behaviours & technical responses) and deeper (systems/structures, worldviews) leverage points. Meadows' leverage points framework visually suggests choosing a single leverage point, rather than simultaneous points. The three spheres' model *“recognizes that transformations involve integrated responses that simultaneously address multiple dimensions of change”*, shifting from partial responses to full spectrum responses (O'Brien, 2021, p. 116).

The three spheres framework may be considered a meta-level above the individual leverage points in Meadows' framework. O'Brien (2018) discusses how the leverage points address “practical” behaviour and technological responses; “political” responses to changing systems and structures and “personal” responses to beliefs, worldviews, values and paradigms (Figure 22).

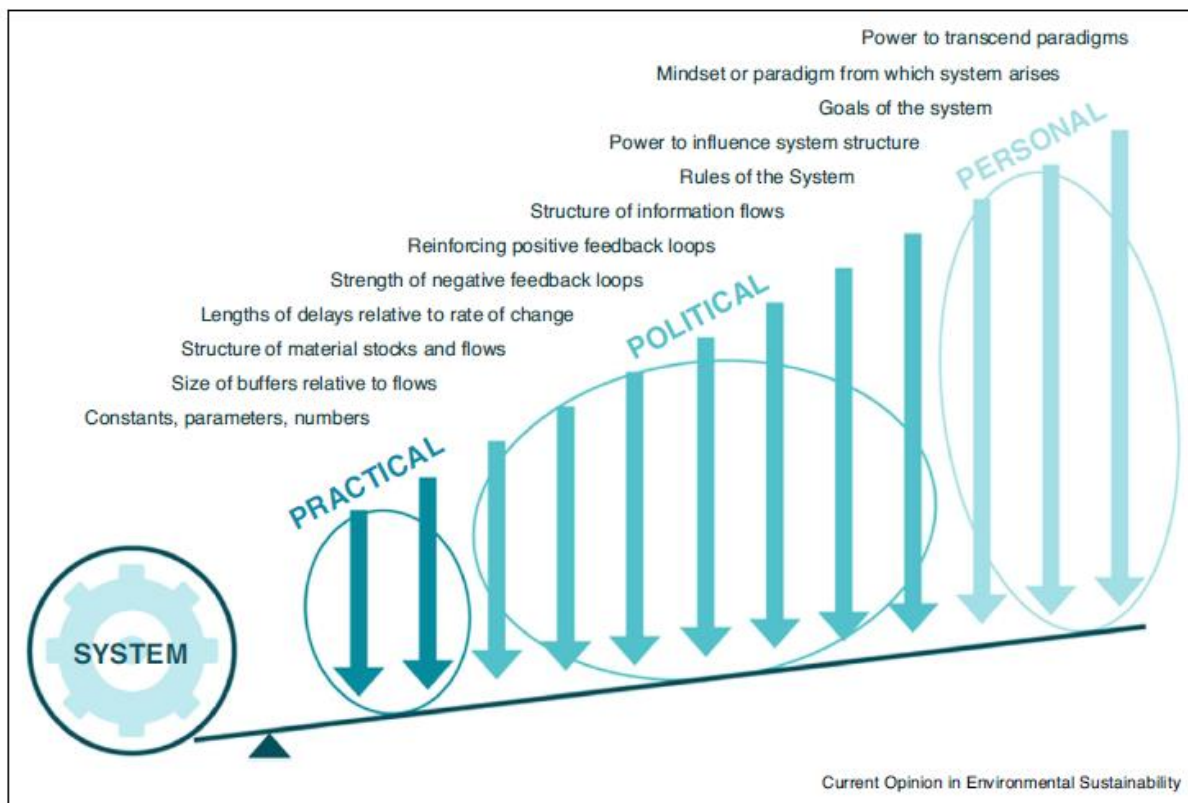


Figure 22. Leverage points for systems change based on Meadows (1999) and their relationship to the practical, political and personal spheres of transformation. Source: O’Brien (2018).

“The three spheres provide a simple and accessible way to think about social transformations that is generally consistent or compatible with many other theories and approaches, including the literature on the multi-level perspective, social-ecological transformations, social innovation, and social practice theory” (O’Brien, 2018, p. 157).

“A more effective starting point would be to engage individuals and groups with all three spheres of transformation, such that they shift from being seen as ‘objects to be changed’ and reduced to their carbon footprints, to viewing themselves as subjects or agents of change who are capable of contributing to systemic transformations” (O’Brien, 2018, p. 157).

Seen through the lens of the three spheres of transformation, the leverage points framework seems more “mechanistic” in its application as diagnostic tool for case studies. However, this impression may be due to the way we applied the LPF in case study dialogues and workshops. We asked case studies to consider whether leverage points were relevant as individual points of systems change, rather than encouraging thinking about simultaneity and interactions across a range or spectrum of shallower and deeper leverage points.

The three spheres of transformation framework was developed further into the “conscious full spectrum response” by Sharma (2017). The conscious full spectrum response emphasises that the capacities required to create societal transformation are needed across a full spectrum of responses. It contrasts partial interventions with full spectrum responses (Figure 23).

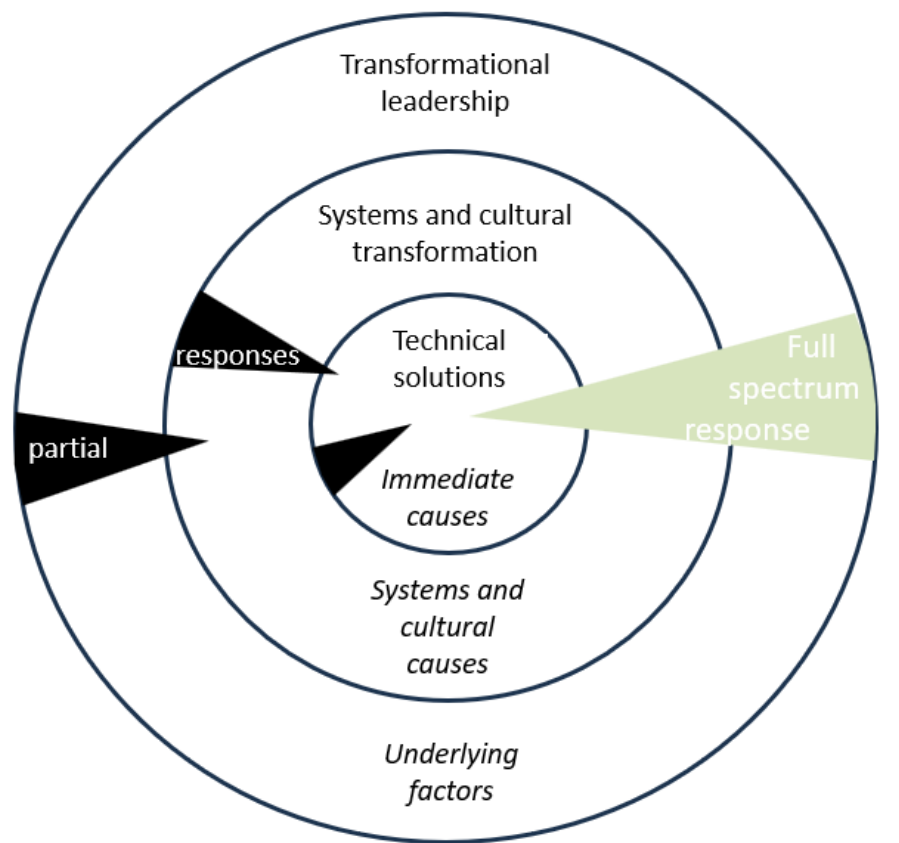


Figure 23. Conscious full spectrum response framework, showing full and partial response across the three spheres (after Sharma, 2017).

Following Sharma (2017) the following are some examples of *partial* – rather than *full spectrum* – responses in the three spheres in the context of forest biodiversity conservation could be:

- *Underlying factors* – e.g. development of personal capacities of individual forest managers, without connecting this to strategic actions or policy instruments.
- *Systems and cultural transformation* – e.g. introduction of policy interventions/instruments such as payments for ecosystem services for forest management, without the rules-in-use of the instrument specifying the actions and technical solutions that payments are conditional on.
- *Immediate causes* - tree planting techniques and soil conservation management measures with no policy incentives or land manager motivations to support them.

Both the three spheres of transformative change and the conscious full spectrum response frameworks help to think of transformation across leverage points, rather than treating leverage points, or their associated actions, individually. The conscious full spectrum response framework is operationalised in training practice as questions for introspection and dialogues with peers to help discover capacities, practice them and design for change in multiple spheres. It is a framework that also encompasses, nests and/or links to a number of different other tools that range from project design tools for securing funding (technical solutions sphere), through strategic operational planning (systems sphere) to conscious use of different leadership approaches (underlying factors sphere) (Sharma, 2017). Rather than discuss yet another suite of

methods, the intention in presenting the conscious full spectrum response framework is its emphasis on complex systems requiring multiple approaches/frameworks/concepts to be used together. Also, the emphasis is on designing strategically, i.e. using different frameworks for different purposes, adapted to the situation.

8. Conclusion: Towards a transdisciplinary diagnostic framework for biodiversity decision-support

David N. Barton

The social-ecological systems in each of the PLANET4B case studies need multiple frameworks and lenses to understand their complexity for the purpose of evaluating interventions and recommending policy and other actions for biodiversity prioritisation in decision-making. This heterodox conclusion is consistent with an “intersectional” approach in a broad sense – any single framework necessarily provides a limited perspective. What we strive for in PLANET4B is to combine multiple perspectives in a way that is discerning, rather than disciplinarily or professionally biased or discriminating. The aim of the *process* was to help us as researchers and practitioners in the project become more conscious of the theoretical approaches and languages that may condition the interventions we study and the policy and other recommendations we make to societal actors.

The process of understanding and applying the leverage points framework achieved some shared language and helped to compare assumptions about transformative change across the different case studies. As such, we think we achieved the *process objective* of using a common framework to diagnose PLANET4B case studies. However, case studies and experts on other integrating analytical approaches identified limitations of the LPF. Limitations include the LPF itself being a particular theoretical systems analysis lens which in some cases excluded practitioners through its unfamiliar concepts. Furthermore, the LPF was identified as being ‘structuralist’ or ‘mechanistic’ in the way we tested it in case studies, not addressing concepts such as agency, power and decision-making related to nature/biodiversity.

8.1 Draft transdisciplinary diagnostic framework for biodiversity decision-making

David N. Barton

Many different theoretical and methodological lenses exist in the transformational change literature. To achieve the objective of deriving a transdisciplinary framework for biodiversity decision-making, the above critiques inspired us to review additional frameworks. In chapter 7 we reviewed several frameworks developed by the IPBES to address decision-making in the context of plural values of nature, and transformational leadership frameworks to address agency. We concluded that PLANET4B needs a suite of tools and frameworks; *leverage points*, *intersectionality analysis*, *discourse analysis* and *reflexivity-contextualisation* each have complementary purposes.

Below we illustrate how the “conscious full spectrum response” (Sharma, 2017) can provide a conceptual framing *for a transdisciplinary diagnostic framework for*

biodiversity decision-making, without being exclusive of other frameworks. Complex systems require several analytical lenses and practices to lay the foundations for transformative change. A conscious full spectrum response is grounded in universal values of dignity, compassion and fairness (Sharma, 2017).

Figure 24 makes the point that multiple lenses can be applied consciously (explicitly) to design for change across the personal, political, and practical spheres of change. To make this point we have placed the approaches we tested in the workshops and dialogues with cases in PLANET4B, WP1, within the framing of the conscious full spectrum response framework (Sharma, 2017).

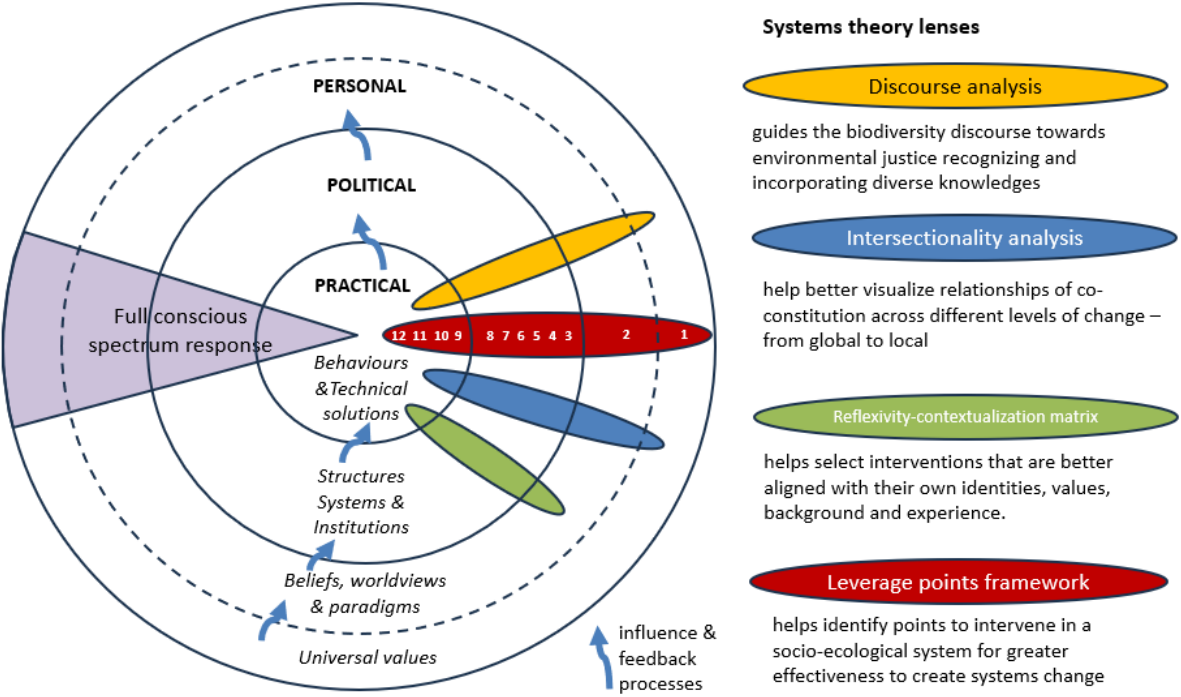


Figure 24. Draft transdisciplinary framework for diagnostic of decision support for biodiversity, after Sharma (2017).

Our reviews and discussions of intersectional analysis, discourse analysis, leverage points, and reflexivity contextualisation with practitioners and researchers in PLANET4B suggest that all frameworks have the capacity to address personal, political, and practical spheres of action. Each of them represents different systems theory lenses that may complement one another in understanding transformative change, in the same way that the different “life frame lenses” complement one another in understanding the plural values of nature (Pascual et al., 2023).

Figure 24 also draws on the nesting of the “layers of influence” on decision-making (Vatn et al., 2024), where universal values may influence beliefs, worldviews and paradigms, which in turn influence structures, systems and institutions, directly and indirectly influencing actions and decisions about behaviour and technical solutions for sustainability. In turn, those practical behaviours and solutions may feed back to and change political systems and personal beliefs over space and time.

We saw from chapters 5-6 that the scope of any particular framework may be limited to a few leverage points, or to one or two of the spheres, in any particular case study. When applied across the diversity of place-based and sectoral case studies in PLANET4B, the analytical frameworks we reviewed in chapter 4 are all potentially “full spectrum” approaches that can complement one another:

- **Discourse analysis** guides the biodiversity discourse towards environmental justice recognising and incorporating diverse knowledges.
- **Intersectionality analysis** helps visualise relationships of co-constitution across different levels of change – from global to local.
- **Reflexivity-contextualisation matrix** helps select interventions that are better aligned with their own identities, values, background, and experience along with relevant context and reflexivity considering the target of interventions at intrapersonal, interpersonal, and institutional scales.
- **Meadows’ leverage points framework** (1999) helps identify points to intervene in a socio-ecological system for greater effectiveness to create system change.

The conscious full spectrum response framework (Sharma, 2017) springs from transformative change research in both the climate change field and public health. A recent integrating field of research on One Health or Planetary Health (e.g. Pham et al., 2024) attempts to span the nexus between health and Sustainable Development Goals. It finds that linkages between planetary health, economic and social impacts are strongly established in the literature, as well as between climate change and the SDGs, but less so to environmental goals (including biodiversity). The study also found relative lack of quantitative metrics in this literature. Similarly, in the continuation of systems and policy analysis in WP3 and WP4 in PLANET4B it may be a fruitful avenue to explore case studies’ explicit linking of biodiversity metrics in their work to SDGs and planetary health concepts.

8.2 Linkages to further work in PLANET4B

David N. Barton

Here we refer to section 3.5 and the expectations of the transdisciplinary framework from other Work Packages.

As described in section 3.5, the development of a transdisciplinary diagnostic framework in Task 1.5 is complementary to Task 3.2. A transdisciplinary diagnostic framework for PLANET4B was expected to inform Task 3.2 by enabling a comprehensive exploration from diverse conceptual perspectives of systemic interventions in the case studies. Both tasks contain a leverage points framework as the key component. The draft transdisciplinary, diagnostic framework outlined above is a multi-sphere research concept. It has been developed in workshops and dialogues primarily with case study leads to explore its potential and gaps, and then a “meta-level” comparison with other frameworks to fill the conceptual gaps that were identified. The draft ‘framework’ above has not itself been tested by cases. It is fair to say that the proposal drafted above is more of a tentative mapping of PLANET4B methods onto a well-tested framework in radical transformational leadership (Sharma, 2017) than a framework proper. It raises useful questions about methodological plurality and complementarity that may be further explored in the next Work Packages.

As discussed in this report, Task 1.5 used the 12-leverage points framework (LPF) as a structured or technical approach to identifying systems features. Using a bottom-up approach, Task 3.2 aims to let Learning Communities, i.e. the stakeholders or representatives of case studies, explore places to leverage change. Task 3.2 will apply a more general 4-part LPF approach (parameters, feedback, design, intent) that leaves more space for learning communities to explore particular leverage points themselves, without having further predetermined categories.

This simplification of the LPF aligns well with our findings on the limitations and gaps, and the resulting draft framework above which simplifies to the 3 spheres (personal, political, practical) and a full spectrum response across all spheres. One of the main critiques of the LPF from some case studies was an alienating scientific language. The framework above may help to provide alternative terminologies for understanding what is meant by “parameters, feedback, design, intent” by locating them also using the terminologies of 3 spheres. Bridging from Task 1.5 to Task 3.2, the application of LPFs across different dialogue platforms – from focused discussions with case leaders using a 12 LPF approach to broader engagements within learning communities employing a 4 LPF approach – is expected to provide a richer material for comparing top-down and bottom-up systems analysis approaches.

Looking ahead, Task 3.3 aims at producing sector-specific leverage points and transformative change stories with a just transition focus. Based on a reflection and validation process, the diagnostic framework in Task 1.5 may be revisited to identify commonalities in variables, mechanisms, and leverage points across the findings at different scales of the intensive and extensive case studies. This task is expected to result in a compendium of transformative change stories from the project. The draft framework in Figure 24 is open for further modification. While broad and open for change, “full spectrum response” encourages the future transformative change stories from PLANET4B to provide narratives that span the personal, political, and practical spheres. Stories should be practical in describing what interventions are needed for different contexts. The stories should combine a broad awareness of simultaneously working with different shallow and deep leverage points. Stories should contain discourses that are sensitive to actors’ identities, building on an understanding of how these intersect in personal and political spheres and in practices on the ground.

Looking yet further ahead to Work Package 4 on scaling interventions to national and EU policy recommendations, the frameworks reviewed in chapter 7 may also pose some useful questions. We suggest that we need some shared typologies for describing decision-making, and specifically relating policy recommendations to different domains of biodiversity and plural values of nature. The work done by the IPBES on decision-making domains and types of nature values offers some guidance. We also need a “theory of scaling out and up” from what Task 3.2 will learn about place-based interventions and sector case policy and other recommendations and Task 4.2 (Validating transformative methods and pathways with policy makers and businesses) on wider policy recommendations.

PLANET4B was designed as a “full spectrum response” and the draft framework above may help to reinforce transformative design. The combined use of the different conceptual lenses in designing and telling transformative stories is admittedly a complex task. Radical transformative change of complex systems needs the combined

perspectives of diverse systems theory lenses. Nevertheless, a conscious full spectrum response is also built on simple principles of being grounded in universal values of dignity, compassion and fairness (Sharma (2017). In the biodiversity domain these universal values can bridge different worldviews, broad values and form the foundation for designing for shared action, respecting the plural values people hold in living from, in, with, and as nature (Pascual et al., 2023).



PLANET4B

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Statement on data availability

Data used to produce this report included notes taken by the authors during general discussion meetings, workshops, and interviews with case study partners shared with the authors via the internal data repository of the project (SharePoint). Data from the workshops have been reported on separately in PLANET4B deliverables D1.4-1.6 (Mendes et al., 2024, 2023; Mendes & Inoue, 2023). Notes from case study dialogues were used directly in chapters 5 and 6 and will be made available on Zenodo before the end of the PLANET4B project in October 2025. There is no additional raw data to be reported.

Statement on ethics

Interviews and discussions for this report were kept among project participants who were all informed about and agreed with their purpose. The authors have no conflicts of interest to declare.

Annexes

Appendix 1 – definitions and examples of leverage points

Vinicius Mendes

To support case study discussions of Meadows' (1999) leverage points framework (LPF; section 2.6) Meadows' definitions of leverage points was summarised and complemented by examples in less academic language as shown below. The examples were added after feedback in the workshops that the academic leverage point definitions were challenging for some researchers and practitioners.

12. Constants, parameters, numbers (such as subsidies, taxes, standards)

From the original: *“Parameters’ in systems jargon means the numbers that determine how much of a discrepancy turns which faucet how fast. Maybe the faucet turns hard, so it takes a while to get the water flowing or to turn it off. Maybe the drain is blocked and can allow only a small flow, no matter how open it is. Maybe the faucet can deliver with the force of a fire hose. These considerations are a matter of numbers, some of which are physically locked in and unchangeable, but most of which are popular intervention points. (...) The amount of land we set aside for conservation. The minimum wage. How much we spend on AIDS research or Stealth bombers. The service charge the bank extracts from your account. All these are parameters. (...) Parameters are dead last on my list of powerful interventions. (...) Not that parameters aren’t important — they can be, especially in the short term and to the individual who’s standing directly in the flow. People care deeply about parameters and fight fierce battles over them. But they RARELY CHANGE BEHAVIOR. If the system is chronically stagnant, parameter changes rarely kick-start it. If it’s wildly variable, they don’t usually stabilize it. If it’s growing out of control, they don’t brake it”* (Meadows, 1999, p. 5).

Parameters are *numbers* that usually affect certain activities or patterns within a system.

E.g. let us consider a river basin as our system. The river basin is becoming heavily polluted by an increasing number of recreational boats. To tackle the problem, the basin’s governance body establishes a new tax (considerably high compared to benchmarks) for sailing in the river. Only boat sailors paying such a tax will be allowed to navigate. This tax is a parameter that intends to improve the functioning of system by creating a disincentive for navigation, attempting to reduce pollution. Useful terms to identify this LP: subsidies, taxes, standards, rates, degrees, etc.

11. The sizes of buffers and other stabilising stocks, relative to their flows

From the original: *“Consider a huge bathtub with slow in and outflows. Now think about a small one with very fast flows. That’s the difference between a lake and a river. You hear about catastrophic river floods much more often than catastrophic lake floods, because stocks that are big, relative to their flows, are more stable than small ones. In chemistry and other fields, a big, stabilizing stock is known as a buffer”* (Meadows, 1999, p. 7).

Buffers, or stabilising stocks, represent the sources of resilience of a system. Buffers can protect the system from drastic changes that might affect its functioning or wellbeing.

For example, establishing green belts and wildlife corridors to connect fragmented habitats in European landscapes can promote biodiversity conservation by creating buffers against habitat loss and fragmentation.

10. The structure of material stocks and flows and nodes of intersection (such as transport networks, population age structures, flow of nitrogen through soil)

From the original: *“The plumbing structure, the stocks and flows and their physical arrangement, can have an enormous effect on how the system operates. When the Hungarian road system was laid out so all traffic from one side of the nation to the other has to pass through central Budapest, that determined a lot about air pollution and commuting delays that are not easily fixed by pollution control devices, traffic lights, or speed limits. (...) The only way to fix a system that is laid out wrong is to rebuild it, if you can”* (Meadows, 1999, p. 7).

This refers to the internal structure of a system (its flows, stocks, and nodes of intersection).

E.g. consider the following system: the international soy supply chain. In this system, one flow are the greenhouse gas emissions resulting from global production and distribution (soy agriculture, irrigation, machinery use, transportation, etc.). This generates stocks of CO₂ in the atmosphere. What can be done if one wants to reduce the emissions from this system globally, i.e. to change some structures of the system? In this case, emissions are flows and the total amount of greenhouse gases in the atmosphere due to soy supply chains are stocks.

Strategy: change the structure of material flows (activities that generate emissions).

How?

By changing fuel types, from fossil fuels to biofuels, in transportation and delivery activities.

By adopting low-carbon agriculture techniques instead of traditional practices in soy farming.

By eliminating the use of nitrogen fertilisers, which lead to the release of CO₂, N₂O and CH₄ in the atmosphere.

Etc.

9. The lengths of delays, relative to the rate of system change

From the original: *“Delays in feedback loops are critical determinants of system behaviour. They are common causes of oscillations. If you’re trying to adjust a system state to your goal, but you only receive delayed information about what the system state is, you will overshoot and undershoot. Same if your information is timely, but your response isn’t. (...) . A system just can’t respond to short-term changes when it has long-term delays”* (Meadows, 1999, p. 8).

The difference between the timing of the information necessary to kickstart a system change (fast) and the timing for the actual system change to occur (slow).

E.g. our system is a city: Extreme climate events in cities (e.g. floods) are fast and often unpredictable. Sometimes the nature/severity of such events can be anticipated only a few hours before. This means that the information only arrives when these catastrophes are about to materialise.

To act effectively to combat extreme climate events, adaptation solutions can be deployed. However, government action to promote changes in the system (e.g. create and deploy climate adaptation infrastructures) are usually much delayed relative to the rate of system change (fast jump from a non-flooded to a flooded city).

8. The strength of negative feedback loops, relative to the impacts they are trying to correct against

From the original: *“Negative feedback loops are ubiquitous in systems. Nature evolves them and humans invent them as controls to keep important system states within safe bounds. A thermostat loop is the classic example. Its purpose is to keep the system state called ‘room temperature’ fairly constant at a desired level. Any negative feedback loop needs a goal (the thermostat setting), a monitoring and signalling device to detect excursions from the goal (the thermostat), and a response mechanism (the furnace and/or air conditioner, fans, heat pipes, fuel, etc.). A complex system usually has numerous negative feedback loops it can bring into play, so it can self-correct under different conditions and impacts. Some of those loops may be inactive much of the time — like the emergency cooling system in a nuclear power plant, or your ability to sweat or shiver to maintain your body temperature — but their presence is critical to the long-term welfare of the system”* (Meadows, 1999, p. 9).

Negative feedback loops are components of a system that basically aim to regulate it, i.e. avoid that the system becomes dysfunctional. All negative feedback loops have a goal, a monitoring and signalling device, and a response mechanism.

E.g. keeping deforestation in the Amazon below 20% (a tipping point for irreversible “savannisation” of the forest) by applying the Forest Code (a Brazilian regulation). In this case, the system is the Amazon rainforest, and the Forest Code is a negative feedback loop in the system.

One of the goals of the Forest Code is to keep deforestation in the Amazon below 20%. The monitoring and signalling device is the Brazilian Amazon Forest Deforestation Monitoring Program by Satellite, a government system that monitors deforestation by clear cutting in the Legal Amazon and produces, since 1988, annual deforestation rates in the region. The response mechanism of the Forest Code is the application of sanctions and fines for those involved in illegal deforestation.

7. The gain around driving positive feedback loops

From the original: *“A negative feedback loop is self-correcting; a positive feedback loop is self-reinforcing. The more it works, the more it gains power to work some more. The more people catch the flu, the more they infect other people. The more babies are born, the more people grow up to have babies. The more money you have in the bank, the more interest you earn (...). Positive feedback loops are sources of growth, explosion, erosion, and collapse in systems. A system with an unchecked positive loop ultimately will destroy itself. (...) Reducing the gain around a positive loop — slowing the growth — is usually a more powerful leverage point in systems than strengthening*

negative loops, and much preferable to letting the positive loop run” (Meadows, 1999, p. 11).

A positive feedback loop is a self-reinforcing trend in a system. The more the positive feedback loop works/repeats itself, the more power it gains. A mathematical example is how compound interest works over time.

6. The structure of information flows (who does and does not have access to information)

From the original: *“There was this subdivision of identical houses, the story goes, except that for some reason the electric meter in some of the houses was installed in the basement and in others it was installed in the front hall, where the residents could see it constantly, going round faster or slower as they used more or less electricity. With no other change, with identical prices, electricity consumption was 30 percent lower in the houses where the meter was in the front hall. We systems-heads love that story because it’s an example of a high leverage point in the information structure of the system. It’s not a parameter adjustment, not a strengthening or weakening of an existing loop. It’s a NEW LOOP, delivering feedback to a place where it wasn’t going before” (Meadows, 1999, p. 13).*

Changing parts of the system, or modifying its architecture, to facilitate or hinder certain information flows.

E.g. nudging. Our system is an environmental NGO. The NGO collects donations through its website. But it prefers donations as cash transfers rather than credit card payments. Thus, in its website, the NGO decides to increase the salience of the desired option (cash) by making it the default option in the donation page. This way, donors are now “nudged” to select the option cash transfer by default. Compared to the previous situation (without the nudge), the NGO then identifies that donations in cash are considerably higher than before. This resulted from a small change in the structure of the information in the system.

5. The rules of the system (such as incentives, punishments, constraints)

From the original: *“The rules of the system define its scope, its boundaries, its degrees of freedom. Thou shalt not kill. Everyone has the right of free speech. Contracts are to be honoured. The president serves four-year terms and cannot serve more than two of them” (Meadows, 1999, p. 14).*

This leverage point is related to the rules that govern how a system must function (what is allowed, and what is not).

E.g. environmental policies, targeting certain desired behaviours (*only a max of 10% of the forest might be cleared for commercial purposes*), and/or punishing those who don’t follow the rules (*if someone cuts more than 10% of the forest, the exceeding cleared area must be re-forested, and a fee of X Euros will be applied*).

4. The power to add, change, evolve, or self-organise system structure

From the original: *“The most stunning thing living systems and some social systems can do is to change themselves utterly by creating whole new structures and*

behaviours. In biological systems that power is called evolution. In human economies it's called technical advance or social revolution. In systems lingo it's called self-organization. Self-organization means changing any aspect of a system lower on this list — adding completely new physical structures, such as brains or wings or computers — adding new negative or positive loops, or new rules. The ability to self-organize is the strongest form of system resilience. A system that can evolve can survive almost any change, by changing itself” (Meadows, 1999, p. 14).

E.g. an environmental NGO (the system) loses a highly specialised worker (part of the system); the only one capable of developing and operating an Artificial Intelligence program for checking the level of biodiversity in rural areas. The NGO managers try to hire a substitute for the worker, but don't find one. Then the managers decide to assess the relevance of that function for the overall goal of the organisation. They find that removing that particular function would not affect the operations of the NGO in a meaningful way. As a consequence, the NGO managers stop looking for a substitute worker, and opt to run the organisation without the biodiversity function. In sum: the system self-organised, adapting itself (removing part of its operation) in response to a sudden change, but in a way that still keeps the operations running smoothly. The managers were the agents of change.

3. The goals of the system

From the original: *“If the goal is to bring more and more of the world under the control of one particular central planning system (the empire of Genghis Khan, etc.), then everything further down the list, physical stocks and flows, feedback loops, information flows, even self-organizing behaviour, will be twisted to conform to that goal” (Meadows, 1999, p. 16).*

E.g. our system is a sustainable food programme in a country. The programme aims to increase public awareness and acceptance of sustainable food, by distributing locally sourced organic food to the poorest citizens. However, after a while, the governor decides to change the goal of the system. The new goal of the sustainable food programme is to implement food gardens in the country, by incentivising people to have their own food gardens (e.g. government will cut house taxes for households with food gardens). With this new goal, the structure of incentives, information flows, feedback loops, etc. will change accordingly.

2. The mindset or paradigm out of which the system — its goals, structure, rules, delays, parameters — arises

From the original: *“Paradigms are the sources of systems. From them, from shared social agreements about the nature of reality, come system goals and information flows, feedback, stocks, flows and everything else about systems. (...) So how do you change paradigms? Thomas Kuhn, who wrote the seminal book about the great paradigm shifts of science, has a lot to say about that. In a nutshell, you keep pointing at the anomalies and failures in the old paradigm, you keep coming yourself, and loudly and with assurance from the new one, you insert people with the new paradigm in places of public visibility and power. You don't waste time with reactionaries; rather you work with active change agents and with the vast middle ground of people who are open-minded” (Meadows, 1999, p. 17).*

E.g. our system is the tax system. The current paradigm is the shared social agreement of paying taxes to the government, because according to the social norm the State operates in the best interest of society. Let's say that we/society want/s to change this paradigm. We want to originate a new paradigm, in which every person will choose to whom they will pay their taxes (e.g. to an NGO that does advocacy in the best interest of the global environment; or to a public school that does an excellent job in inclusivity and equity; or to a firm that creates products that benefit global sustainability while also having excellent labour conditions, etc.). In this new paradigm, each registered "tax recipient" will be assigned a maximum amount to receive per year. This way, social institutions that are not able to convince taxpayers about their beneficial role to society and the environment will eventually get out of funds, stop operations, and disappear.

1. The power to transcend paradigms

What can we do to transform the values, opinions, and imagination of society about the benefits of this new paradigm, out of which a new tax system can arise?

From the original: *"There is yet one leverage point that is even higher than changing a paradigm. That is to keep oneself unattached in the arena of paradigms, to stay flexible, to realize that NO paradigm is 'true', that everyone, including the one that sweetly shapes your own worldview, is a tremendously limited understanding of an immense and amazing universe that is far beyond human comprehension"* (Meadows, 1999, p. 19).

E.g. given the previous example, how can we change from the previous to the new paradigm? Who has the power to promote that change (people, communities, governments, private sector, etc) – i.e. who are the change agents? What can trigger that change to occur? How might the change happen?

A note on the status of relevant KPIs achieved

Under Work Package 1 we have thus far delivered the following KPIs:

- 3 expert workshops (Mendes & Inoue, 2023; Mendes et al., 2023, 2024)
- 1 inventory of key theories (Aspøy et al., 2023)
- 1 transdisciplinary framework (this deliverable, report D1.7)