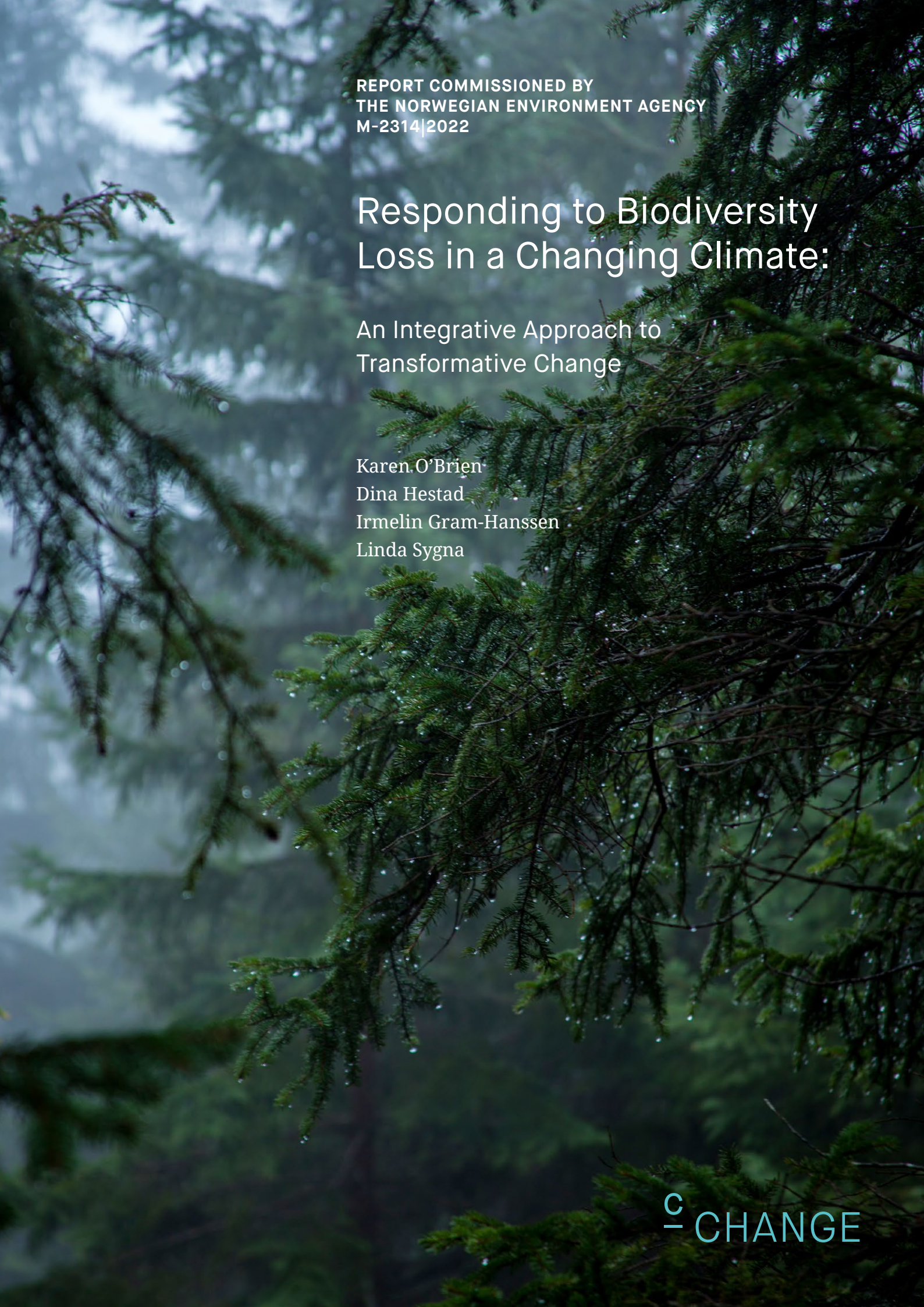




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Responding to Biodiversity Loss in a Changing Climate:

An Integrative Approach to
Transformative Change

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 CHANGE

Report commissioned by
the Norwegian Environment Agency
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Summary

A photograph of a forest path with tall trees and sunlight filtering through the canopy. The path is made of dirt and rocks, winding through a dense forest of tall, thin trees. Sunlight filters through the canopy, creating a dappled light effect on the path and the surrounding vegetation. The overall tone is serene and natural.

In this report, we take a closer look at transformative change in response to the interrelated issues of climate change and biodiversity loss. The report responds to the urgent need to understand how to bring about equitable and ethical transformations that support a sustainable and thriving world. Climate change and biodiversity loss are two of the most pressing challenges to a sustainable and thriving world. Despite increasing recognition that the two problems are in fact related, they are seldom viewed and approached as interlinked outcomes stemming from similar drivers of change. Furthermore, they are most often framed as environmental problems without sufficient consideration for the social and human dimensions that shape these drivers at all levels. This results in fragmented, partial, and sometimes counterproductive actions that do not address the root causes of the problems. The question then becomes, what can we do *right now* to address these interlinked crises? Addressing multiple problems together calls for integrative approaches to transformative change that are robust, actionable, aligned, and results-oriented.

This report draws on insights from the transformations literatures linked to climate change and sustainability, and discusses an integrative approach based on the “Three Spheres of Transformation,” a framework that highlights

interactions among practical, political, and personal spheres. Rather than prescribing specific policies, such an approach focuses on how to generate new patterns for responding in ways that are aligned with global goals, while simultaneously being sensitive to local contexts and scale dynamics. Generating new patterns involves frameworks for action based on new ways of perceiving agency, time and scale. The integrative approach presented in this report can complement current understandings of the determinants of transformative change and contribute to actions that generate results.

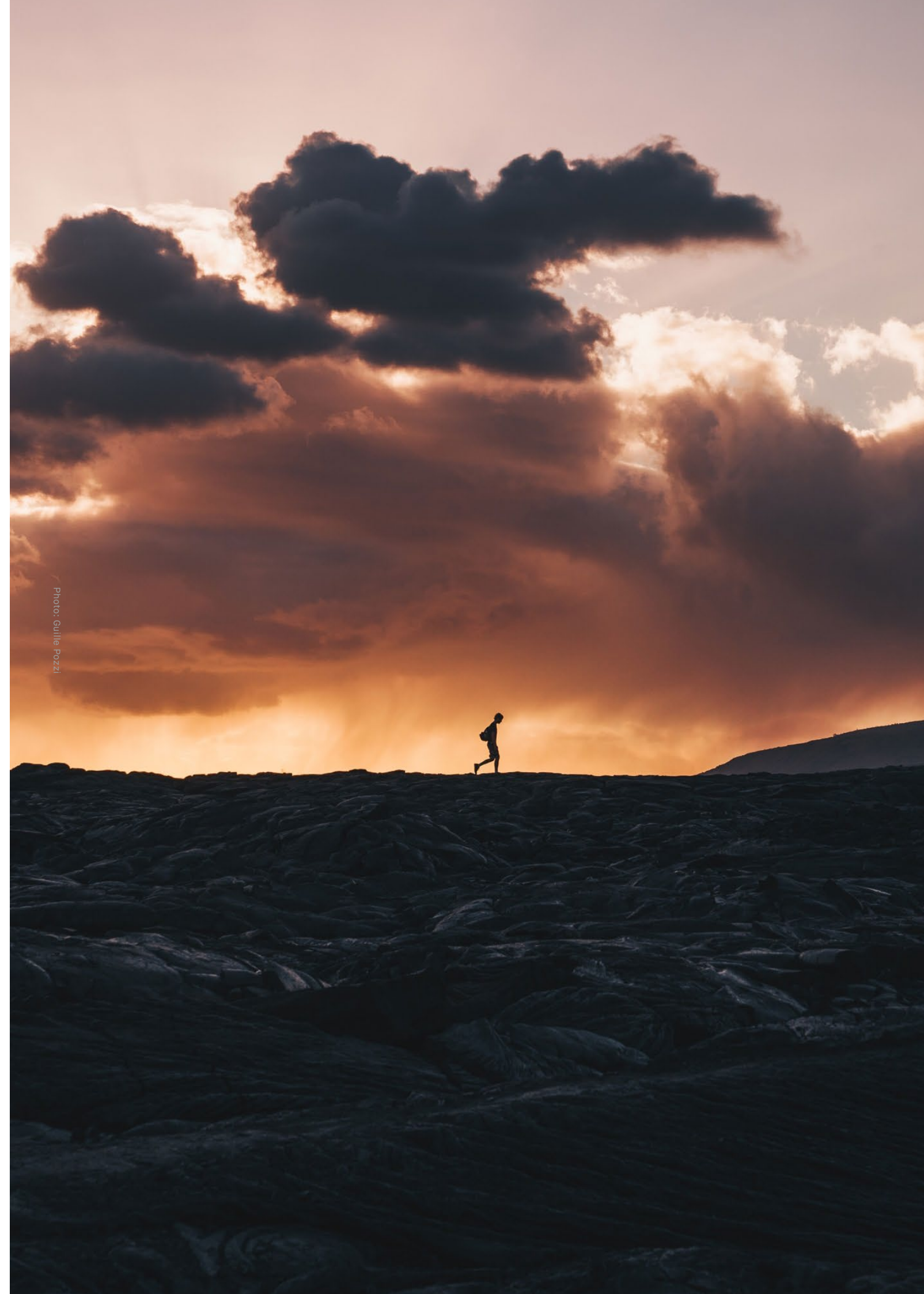


Photo: Guille Pozzi

A person with long brown hair, wearing a bright yellow hooded raincoat, black leggings, and black rubber boots, is walking away from the camera on a path through a forest. The path is covered with fallen leaves and grass. The trees are tall and thin, with green foliage in the background. The lighting is soft, suggesting an overcast day.

What can we do *right now* to successfully address these interlinked crises?

Photo: William Delgheault

1. Introduction

We are living at a decisive time in human history. This decade matters. The deterioration of nature, including ecosystem functions and services, is contributing to a rapid loss of biodiversity across the planet.¹ Scientists have repeatedly emphasized the urgency of the situation regarding biosphere degradation and species extinctions, with some arguing that it poses an existential threat to civilization.² Pointing to research-based predictions of a “ghastly future,” there is great concern that we are vastly underestimating the threats of biodiversity loss and are failing to sufficiently respond.³ Parallel to this, we are experiencing the dramatic consequences of climate change, which amplifies the biodiversity crisis through warming temperatures, changing rainfall patterns, sea level rise, ocean acidification, and the occurrence of extreme weather events.⁴ Responses to climate change, which are currently weak, are no guarantee that biodiversity loss will be addressed, and vice versa. Many people care deeply about the state of the planet, feel an acute sense of crisis, and are aware that we have limited time to respond. Yet it is unclear how we can rapidly address both climate change and biodiversity loss in a manner that is equitable, just, and sustainable. What can we do *right now* to successfully address these interlinked crises?

1.1 CALLS FOR TRANSFORMATIVE CHANGE

One common thread that connects the problems of climate change and biodiversity loss is a shared recognition of the need for transformative change, i.e., changes that result in significant and enduring societal shifts at all levels. For example, the IPBES Global Assessment showed that the Aichi Biodiversity Targets and the SDGs related to biodiversity cannot be met by continuing along trajectories rooted in current and past trends. Instead, “*goals for 2030 and beyond may only be achieved through transformative changes across economic, social, political and technological factors.*”⁵ The Intergovernmental Panel on Climate Change’s (IPCC) 1.5°C report communicates a similar message: “Limiting warming to 1.5°C above pre-industrial levels would *require transformative systemic change, integrated with sustainable development.*”⁶ Calls for transformative change have

also been made in dozens of international reports on issues related to sustainability and human development.⁷

Yet the language of transformation can be ambiguous, and like many popular concepts, it risks becoming nothing more than a buzzword.⁸ “Transformation” can be interpreted in many ways and applied in multiple and often conflicting policy arenas and discourses.⁹ Consequently, it is important to be clear about what distinguishes transformation from other types of change. For example, transformative change can be considered an approach to rapid and systemic change, and it is referred to both as a process (e.g., a nonlinear change) and an outcome (e.g., a significantly different result). Transformations are often conceived as the opposite of incremental changes, particularly in the context of adapting to climate change. However, the distinction is not straightforward because small changes *can* generate significant impacts. Incremental change typically describes relatively minor changes or tweaks to current ways of doing things in order to maintain existing socio-ecological systems.¹⁰

The terms transformative change and transformation are often used interchangeably, and sometimes equated with transitions. The concept of transitions can more generally be used to describe a shift from one state to another, such as from degraded to thriving ecosystems, or from reliance on fossil fuels to renewable energies. Transitions tend to focus on changes in societal sub-systems (e.g., energy transitions, mobility transitions, food transition, etc.), and they involve a combination of social, institutional, or technological change.¹¹ However, many transitions call for wider and deeper changes than those typically associated with technical and behavioral responses to discrete and sectoral problems. Such changes involve conscious and deliberate transformations that address the underlying or root causes of multiple and interconnected problems. For these transformations to occur, integrative approaches are essential.

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Photo: Nicolas De

1.2 INTEGRATIVE APPROACHES TO TRANSFORMATION

Integrative approaches recognize that transformative change requires an emphasis on both systems and relationships, including relationships between humans and nature. Recognizing this, Diaz et al. emphasize that “this transformation will need innovative governance approaches that are adaptive; inclusive; informed by existing and new evidence; and integrative across systems, jurisdictions, and tools.”¹² Building on this, in the report *Moving Towards Transformative Change for Biodiversity*, Bulkeley et al. argue that “Developing an integrated response to both the threat and opportunity of climate change for realizing biodiversity goals has the potential to make a significant contribution to an agenda for transformative change within the post-2020 biodiversity governance framework.”¹³ Such integrative approaches must consider how humans are both adapting to changes in biodiversity *and* taking actions to avoid further changes.¹⁴

However, labels such as “integrative” do not guarantee that processes and outcomes will be equitable and enduring. In practice, transformative change is not a neutral, value-free process. For some, transformations involve the much-needed socio-technical innovations perceived as essential to green growth, regardless of their distributional effects. For others, transformations involve challenging the economic and political drivers of climate change and biodiversity loss while prioritizing social justice and equity. Still others view transformations as a contraction of freedom that will result in economic disruptions, job losses, and chaos and thus something to be actively avoided. Global inequalities, differentiated responsibilities, and deep political unrest are embedded in diverse social and historical contexts that shape the current realities and both drive and challenge transformative change. Not surprisingly, transformation is viewed as politically undesirable by some communities, groups, sectors, and countries, resulting in resistance and opposition.¹⁵ Social activists and advocates of change may also be skeptical, seeing transformations as merely new packaging for “business as usual” activities that override the need for more radical and transgressive change.¹⁶

The types of transformations that we identify, prioritize, and implement are directly linked to the perspectives we take and the meanings we make about how different things relate, how change happens, and the role that we each play in transformative processes. Addressing transformative change in an integrative manner involves shifting perspectives from a focus on isolated challenges to seeing the patterns, connections, and relationships across multiple issues and through diverse worldviews. However, such integration involves more than linking issues; it draws attention to the core values, principles, and qualities that underpin and motivate transformative change, including to the interests, identities, and emotions that support the status quo. An integrative approach can both broaden and deepen the “solution space” and contribute to societal and cultural shifts that are vital for generating measurable results in response to multiple and interacting problems.

Regardless of where we enter the solution space, the way or manner of transformation is as important as the means through which we approach them. The manner of transformation refers to the ways in which it is put into practice, and describes the core values, principles, qualities, and relationships that not only motivate transformative change, but shape its processes.¹⁷ Whether we are working with protected areas, renewable energy, reduced consumption, social movements, green jobs, sustainability education, compact cities, or mental health and wellbeing, we need to address not only what we do, but also how we do it. For example, the extent to which the transformation of public spaces in urban areas engage local people and their values and goals is considered critical to sustainability outcomes.¹⁸

This inevitably raises questions about the values that we recognize and prioritize for ourselves and others, how we organize society, how we interact with nature, and how we relate to ourselves and each other. Moreover, it moves us beyond purely scientific understandings of the theories and determinants of transformative change, bringing in different ways of knowing and different types of knowledge and experience. Identifying the means of transformation is important, but to translate knowledge, know-how, and understanding into strategic, results-oriented

action calls for integrating both the means and the manner of transformation.

This report responds to the urgent need to understand how to bring about equitable and ethical transformations that respond to both biodiversity loss and climate change. We start with a discussion of the relationship between biodiversity loss and climate change, then focus on how problem framings influence the types of solutions that are identified and prioritized. This is followed by a short overview of key attributes of transformative change. We then present an integrative approach based on the “Three Spheres of Transformation,” which highlights interactions among the practical, political, and personal spheres.¹⁹ We next discuss three shifts in perspective that can be considered important when it comes to promoting biodiversity conservation and restoration within the context of a changing climate, while simultaneously supporting the SDGs. We conclude by considering how this integrative approach can both complement and deepen understandings and assist in practical implementation of transformative change.



Identifying the means of transformation is important, but to translate knowledge, know-how, and understanding into strategic, results-oriented action calls for integrating both the means and the manner of transformation.

Photo: Whosaynow



Photo: Roberto Nicksen

2. Biodiversity Loss and Climate Change

How we perceive and understand the relationship between climate change and biodiversity loss is significant, influencing not only how we approach problems, but also how we identify options and implement solutions. Within research, the two issues have long been recognized to be related. A conference on *The Consequences of the Greenhouse Effect for Biological Diversity* held in 1988 drew attention to how ecological systems would respond to different climate scenarios. One conclusion from the conference was that, “We now realize that climate fluctuations, whether they be warmer or colder, will change and stress natural ecosystems, providing a challenge to the flexibility of our conservation strategies.”²⁰ In policy realms, however, climate change and biodiversity loss have frequently been treated as two distinct environmental problems. The UN Framework Convention on Climate Change (UNFCCC) and the Convention on Biodiversity (CBD), both established at the Rio de Janeiro Earth Summit in 1992, were designed as complementary approaches to achieving global sustainability. Yet as Harvey Locke and Brendon Macy pointed out more than a decade ago, “Politicians, policy experts, technicians, financiers, entrepreneurs, scientists, nongovernmental organizations (NGOs), and the general public consider the two conventions as addressing unrelated problems.”²¹

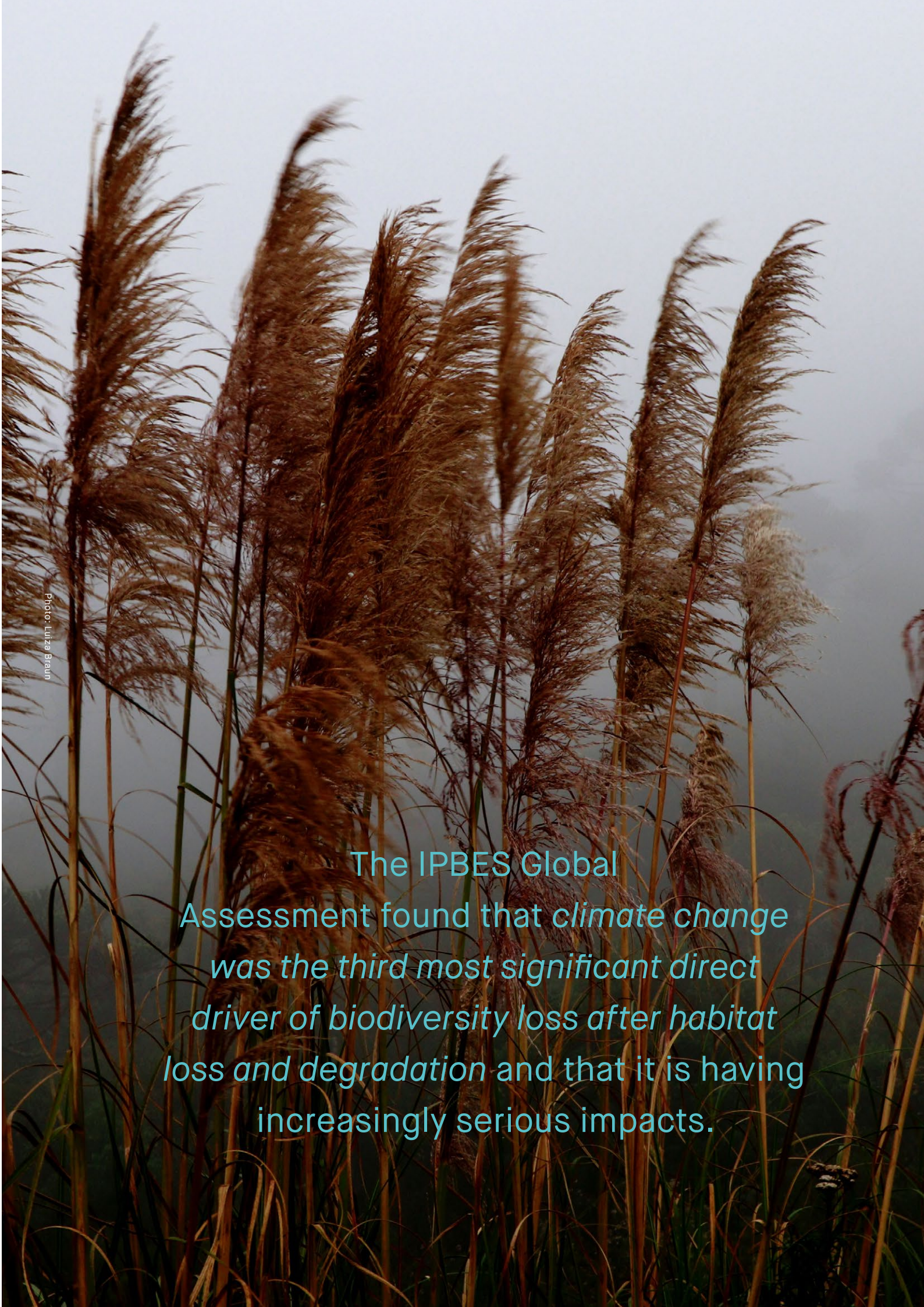
Research on the relationship between climate change and biodiversity loss has increased considerably over the past decades, and reports from both IPBES and IPCC acknowledge the interdependent nature of these challenges. For example, the IPBES Global Assessment recognizes that climatic changes, such as increases in temperature, changes in precipitation, sea level rise, and the occurrence of extreme weather events, has “contributed to widespread impacts in many aspects of biodiversity, including species distribution, phenology, population dynamics, community structure and ecosystem function.”²² Moreover, it warns that the accumulation and interaction of these factors can lead to further unexpected non-linear change, “with perhaps irreversible impacts on nature and nature’s contribution

to people and society – including economic growth and food and water security.”²³ Importantly, the IPBES Global Assessment found that *climate change was the third most significant direct driver of biodiversity loss after habitat loss and degradation* and that it is having increasingly serious impacts.

Biodiversity loss and biosphere degradation also have significant impacts on climate change given that ecosystems and biodiversity both on land and at sea both store and aid in the uptake of carbon dioxide and other greenhouse gases (GHGs).²⁴ A large amount of anthropogenic GHG emissions is sequestered by ecosystem processes, including in oceans. However, the ways that human activities are changing the capacities of natural systems to function as carbon sinks are not completely understood.²⁵ Intact and resilient natural systems also protect humans from the consequences of climate change. For instance, forests, wetlands, and bogs protect human settlements against flooding, but also supply water in dry periods.²⁶ Changes in climate conditions and ecosystem functions, including changes in the magnitude and frequency of extreme weather events and changes in the ocean food web, are likely to require transformational adaptations that will impact nature and society in profound ways.²⁷

More recently, the systemic nature of these global crises has become increasingly clear, and efforts have been made to strengthen the connections and collaborations on biodiversity loss, climate change, and sustainability. For example, a workshop on Biodiversity and Climate Change, cosponsored by IPCC and IPBES in 2021, highlighted the many interlinkages, synergies, and tradeoffs between the issues and recognized the need for transformative change: “Cross-cutting issues, intersectoral policies and regulatory frameworks are areas where strong synergies could contribute to the transformative societal change that is needed to achieve ambitious goals for biodiversity, climate mitigation and good quality of life.”²⁸ Policymakers increasingly acknowledge the importance of these relationships, as seen in the recent UNEP report on *Making Peace with Nature*.²⁹

Transformative change is necessary to address biodiversity loss and climate change, yet experience from research, policy,



The IPBES Global Assessment found that *climate change was the third most significant direct driver of biodiversity loss after habitat loss and degradation* and that it is having increasingly serious impacts.

A photograph of a person from behind, holding a bright yellow umbrella. They are standing in a rainy city street. In the background, there are historic buildings with arched windows and other people, some wearing rain gear. The scene is slightly blurred, emphasizing the person and the umbrella.

Climate change and biodiversity loss are more than environmental problems – they are social and human problems that are closely linked to politics, power, social and cultural norms, institutions, values, and meaning making.

and practice shows that trying to design and implement transformative solutions to either one of these problems in isolation can result in adverse effects on the other. This leads to trade-offs, whereby a success for one policy goal implies a loss for others. For example, monoculture plantations designed as a solution to climate change have negative implications for biodiversity, just as “last chance” nature tourism to raise awareness of the need to protect threatened species or ecosystems can result in significant GHG emissions.³⁰ Despite a recognition of these interlinkages, climate change and biodiversity loss are seldom addressed together in an integrative manner.

2.1 FRAMING PROBLEMS AND SOLUTIONS

Despite the increased understanding of the systemic nature of today’s global crises, there is a growing recognition among research, policy, and practitioner communities that traditional strategies and business-as-usual approaches are not contributing to the desired results, including realization of the SDGs. Nevertheless, there is a persistent tendency to continue addressing both climate change and biodiversity loss in a techno-managerial manner, often through increased financial resources, better management, more know-how, new innovations, greater investments, or more research. While such interventions are critically important, they often fail to meet short-term and long-term targets and goals.³¹ What is missing?

Climate change and biodiversity loss are more than environmental problems – they are social and human problems that are closely linked to politics, power, social and cultural norms, institutions, values, and meaning making. The social and human dimensions of global environmental issues have received significant attention within research.³² They have also been prioritized in transdisciplinary global change research programs such as *Future Earth*, which is the world’s largest community of sustainability scientists. Social dimensions are increasingly addressed in practice, for example through Kate Raworth’s “Doughnut Economics” model, which draws on planetary boundaries to set an environmental ceiling, and defines social foundations based on the SDGs.³³ Doughnut Economics recognizes that for both people and planet to thrive, responding

to the overstepping of planetary boundaries must be seen and addressed hand-in-hand with shortfalls in the social foundations.

Boundaries are important, but they can also be constraining, particularly if they limit perspectives and possibilities. In the context of climate change and biodiversity loss, the goals set through climate and conservation agreements and national action plans have implicit framings that draw on particular discourses, concepts, metaphors, and images. Framings can limit or expand what is considered relevant or irrelevant in discussions, debates, analyses, and assessments, and they influence how we view the roles of individuals and collectives in transformative change. For instance, in the context of climate change, the goal of the Paris Agreement is to limit global warming to well below 2°C compared to pre-industrial levels and reach a climate-neutral world by mid-century.³⁴ For biodiversity loss, many actors are working to develop a post-2020 framework goal of protecting at least 30% of the planet by 2030.³⁵ Such framings tend to see the issues solely as environmental problems that must be addressed through specific strategies and interventions, rather than also as social problems that require broader and deeper changes.³⁶ The framing of problems is not trivial, since it bounds issues and influences the types of approaches to solutions that seem logical and plausible, often with an emphasis on measurable outcomes. What if we were to explore alternative approaches?

2.2 DISTINGUISHING BETWEEN TECHNICAL AND ADAPTIVE APPROACHES TO BIODIVERSITY LOSS AND CLIMATE CHANGE

When it comes to change, a distinction can be made between two ways of understanding and approaching problems: technical and adaptive.³⁷ From a technical perspective, problems can be solved by applying or increasing existing knowledge, know-how, and expertise. This is the typical approach to addressing both climate change and biodiversity loss, which includes asking questions like “how can we halt illegal wildlife trafficking?” or “how can we support renewal energy projects?” Although it is very important to support and implement strategies and actions that address these questions, they often fail to get to the root causes and systemic nature of both problems – a point that is increasingly emphasized by researchers working on the social and human dimensions of environmental change.³⁸

Taking an adaptive approach to problems involves new ways of perceiving the systems and relationships that shape them, as well as new insights into the role of individuals and groups in transforming them. Adaptive approaches highlight the relational nature of problems, recognizing that individual and shared mindsets shape the ways that people, communities, corporations, states, and societies relate to themselves, each other, nature, ecosystems, and non-human life. Biodiversity loss and climate change are excellent examples of adaptive challenges, and both draw attention to the ways that we perceive and relate to change itself.³⁹ Framing them as adaptive problems, for example, includes attention to the social and human dimensions. This broadens the scope of solutions beyond technical and behavioral interventions to include systems and cultures, and it deepens the scope by exploring subjective experiences and transpersonal relationships, such as what we value and how we relate to nature. From an adaptive perspective, questions of problems and solutions are situated within a larger framing that recognizes not only how climate change and biodiversity loss are related, but also the deeper human dimensions driving them. This includes asking questions like “what are the paradigms and assumptions that drive climate change and biodiversity loss?” and “what values and perspectives are recognized in formulating responses?” Without addressing these broader and deeper dimensions of the problem, responses tend to be superficial and short-lived, rather than deep and enduring.

One telltale characteristic of an adaptive problem is a persistent gap between aspirations and reality. For instance, despite some progress, not one of the Aichi Biodiversity Targets was reached by 2020 and the decade between 2010 and 2020 was the hottest on record, with little progress on emission stabilization or reduction.⁴⁰ One underlying belief of the technical approach is that humans can innovate their way out of the climate and biodiversity crisis through managerial interventions, technological advances, and behavioral campaigns. Though widespread, this belief has been questioned by many researchers.⁴¹ Experience also shows that treating an adaptive problem as if it were only a technical one is a recipe for failure.⁴² From an adaptive perspective, transformative change invites us to view

APPROACHES TO CHANGE	TECHNICAL APPROACH	ADAPTIVE APPROACH
Problem dimensions	Recognizes and includes mainly environmental dimensions of the problem.	Recognizes and includes environmental, social, and human dimensions, including assumptions and worldviews driving both biodiversity loss and climate change.
Questions asked	Asks questions of technical nature in isolation – such as, how can we increase the number of protected areas? Or how can we promote plant-based diets?	Integrates technical questions into a broader frame of reference, such as what perspectives are we including and why? What are the values that underlie these responses?
Stakeholder processes	People are included in processes based on their knowledge, know-how and expertise, with the aim of exchanging and enhancing information.	People are included in processes based on a recognition of multiple perspectives and types of knowledges, with the aim of co-defining problems and co-creating solutions.
Types of solutions proposed	Innovations that improve on existing technologies and management plans, or promote behavioral changes.	Responses that are integrated and holistic, opening up spaces for alternatives.

Table 1

technical solutions more integrally and holistically, whether in terms of what they can achieve, at what cost, and who benefits and loses (see Table 1).

2.3 TRADE-OFFS: THE CASE OF NATURE-BASED SOLUTIONS

Technical responses to adaptive challenges often result in tradeoffs. One effort to address such tradeoffs is through nature-based solutions, defined as “actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits.”⁴³ Nature-based solutions include ecosystem-based adaptation and regenerative agricultural practices, and can involve ecosystem protection, management, or restoration. These have also been widely promoted in strategies for both climate change adaptation and mitigation.⁴⁴

Integrated solutions have become increasingly common in sustainability efforts. For example, conservation funders have been considering the need to integrate climate change adaptation into plans that address biodiversity loss, recognizing that this is essential to ensure that strategies, initiatives, and investments are sustainable.⁴⁵ The IPCC special report on *Climate Change and Land* states that: “Ecosystem-based adaptation can, in some contexts, promote nature conservation while alleviating poverty and can even provide co-benefits by removing greenhouse gasses and protecting livelihoods (e.g., mangroves).”⁴⁶ Others have argued that nature-based solutions can contribute to transformative change, not the least due to them being centered on people as well as on nature.⁴⁷

Nature-based solutions are considered promising in helping to cool the planet,⁴⁸ but such approaches can be potentially problematic if they are not carefully designed and implemented. For example, planting non-native trees or vegetation that is not adapted to the local climate can have negative effects in cities, threatening local species and water supplies.⁴⁹ Similarly, coastal interventions such as ‘natural’ seawalls and sand reclamation can affect the diversity of species in the area.⁵⁰ Furthermore, research shows that nature-based solutions are unlikely to result

in just socio-ecological futures and transformative change if they are embedded within current socio-economic systems and neoliberal policies.⁵¹ Currently, many nature-based solutions are financed through carbon markets, with the expectation that they will provide a financial return on investment.⁵² When designed and implemented within current socio-economic paradigms, the transformative potential of nature-based solutions may be limited.

One key question that is seldom addressed in discussions of nature-based solutions relates to the role of human agency, particularly in terms of which people and paradigms have power in deciding on the types, qualities, locations, and implementation of nature-based solutions. The way that these solutions to biodiversity and climate change are communicated and the role of human and non-human agency in their design and implementation is also important.⁵³ This again draws attention to the need for integrative approaches to transformations.

A photograph of a hand holding a green fern frond against a blurred forest background. The hand is in the lower foreground, holding the stem of the fern. The fern has several bright green, feathery fronds. The background is a soft-focus forest with tall trees and a grassy clearing.

When designed and implemented within current socio-economic paradigms, the transformative potential of nature-based solutions may be limited.

Photo: Andreas Dress



3. Transformations: An Integrative Approach

Transformations to a low-carbon, well-adapted, and socially just global society where ecosystems, biodiversity, and people can thrive present both opportunities and risks. This raises some important questions:

- What do we actually mean by transformation?
- Can we transform in a manner that is equitable and sustainable?
- Can we develop strategies and actions that contribute to sustainability, while also recognizing different contexts, capacities, and commitments?

There is a large amount of theoretical and practical knowledge on what transformations involve in relation to biodiversity loss, climate change, social-ecological resilience, and sustainability (see annotated bibliography). The IPBES Transformative Change Assessment (in progress) will contribute to a better understanding of the underlying causes of biodiversity loss and the determinants of transformative change and options for achieving the 2050 Vision for Biodiversity.⁵⁴ Likewise, the IPBES Nexus Assessment (in progress) will take a holistic approach to exploring the interlinkages among biodiversity, climate change, adaptation and mitigation, including aspects of the energy system, water, food, and health.⁵⁵ Translating knowledge into action in a timely manner calls for greater attention to how different theories and frameworks contribute to integrative understandings of transformative change.

3.1 THEORIES, FRAMEWORKS, AND APPROACHES

There are numerous theories, frameworks, and approaches for understanding transformations to sustainability, including research on socio-technical transitions, resilience thinking, adaptive management, ecosystem stewardship and community-based conservation, and vulnerability and adaptation approaches. The diverse ways of defining and approaching transformations have contributed to a large knowledge base

regarding *what* needs to transform, but a partial, fragmented, and sometimes contradictory understandings of *how* these types of changes come about.

Summarizing a wide body of work from diverse academic communities, the European Environment Agency's report on *Perspectives on Transitions to Sustainability* highlights different approaches to transformations including socio-ecological transformations, socio-technical transitions, socio-economic transformations, action oriented perspectives on transitions and system innovation, and integrated assessment modelling approaches to analyzing systemic change.⁵⁶ This report points out that “while it seems unlikely that these different perspectives can be integrated into a single framework, they do appear to share certain characteristics and complement each other in useful ways.”⁵⁷ There is, for example, convergence around the need for *fundamental* changes to the various types of societal systems that drive environmental pressures. Overall, research points to the need for transformation at multiple levels, facilitated by critical reflection, deliberation, adaptive management, innovation, learning, and leadership.⁵⁸

The notion of a fundamental or profound shift is recognized in many definitions of transformation. For example, the IPCC Fifth Assessment Report defines transformation as “a change in the fundamental attributes of natural and human systems.”⁵⁹ The notion of fundamental change can also be seen in the IBPES Global Assessment's definition of transformative change as “a fundamental, system-wide reorganization across technological, economic and social factors, including paradigms, goals and values.”⁶⁰ The word *fundamental* describes something of central importance, i.e., something that is at the base or core of change. What exactly this “something” refers to, however, is not always clear, and there may be conflicting views about *who* and *what* needs to change, as well as *when* and *how*, and *who* decides.

Calls for transformations are seen as problematic if they are used to advance specific agendas based on questionable methods and approaches.⁶¹ For example, several strategies and responses have been promoted as urgent solutions to climate

The diverse ways of defining and approaching transformations have contributed to a large knowledge base regarding what needs to transform, but a partial, fragmented, and sometimes contradictory understandings of how these types of changes come about.

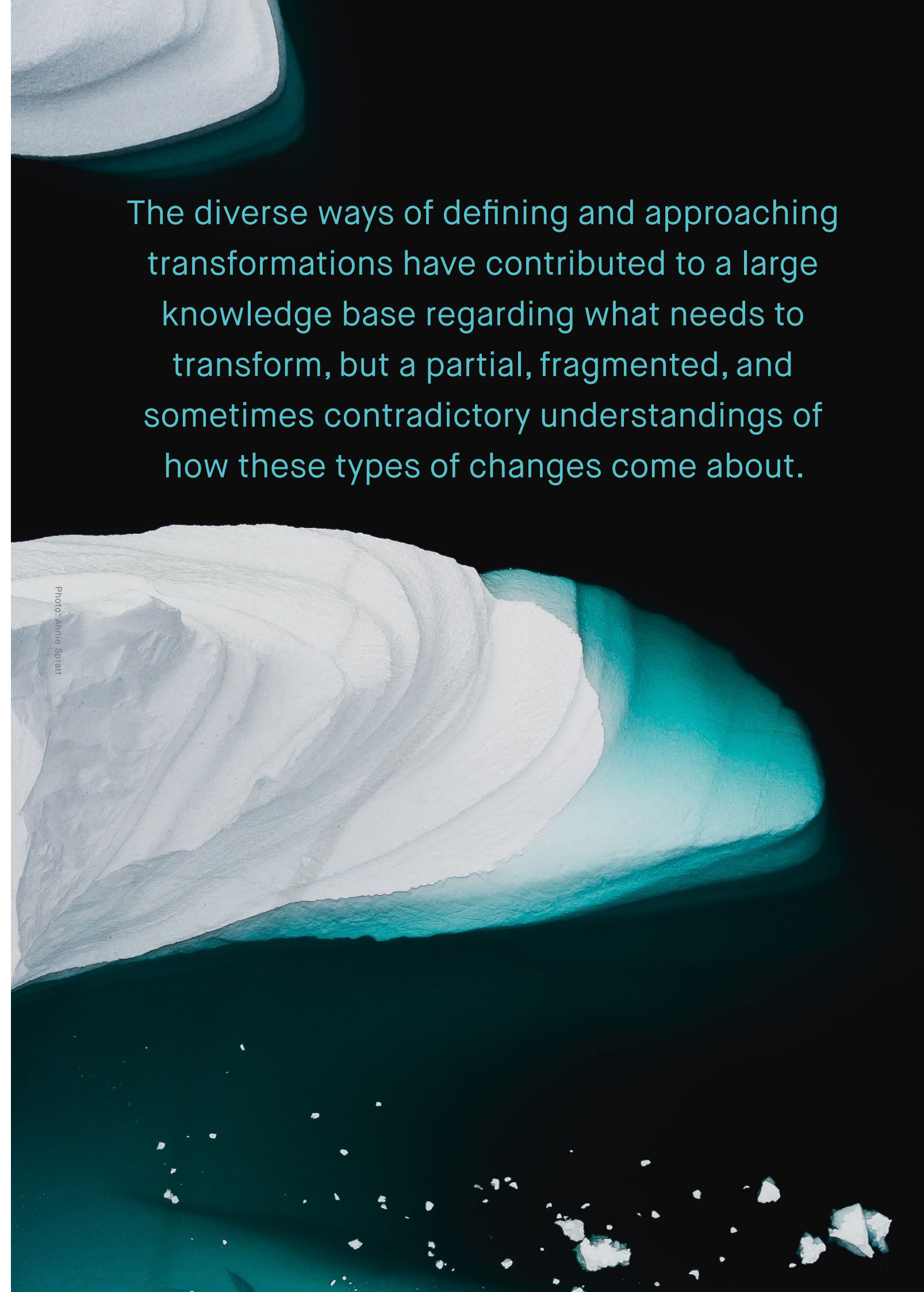


Photo: Annie Spratt

change, without adequate deliberation about the wider, social implications and long-term, systemic consequences (e.g., biofuels, nuclear power, geoengineering). Similarly, many strategies for addressing biodiversity loss, such as the “half Earth approach,” which works to conserve half of the land and sea to reverse the species extinction crisis, do not address the underlying drivers of exploitation, extraction, colonization, and consumption, nor the social, economic, political, and cultural consequences of the proposed interventions.⁶² While a number of societal changes may indeed be considered transformational, in the sense of fundamentally shifting systems or relations, they do not always support the goal of creating a world where both people and the planet can thrive. For example, there are numerous examples of societal transformations experienced during the Covid-19 pandemic where equity and sustainability were not considered important.⁶³

Many social scientists have pointed out that the predominant approach to addressing anthropogenic climate change is one that maintains rather than challenges the status quo, in other words, current economic, political, social, and cultural systems.⁶⁴ The unquestioned continuity of these systems is often a result of depoliticized approaches that tend to take capitalism and the market economy as the “basic organizational structure of the social and economic order, for which there is no alternative.”⁶⁵ This leads to market-based solutions and public-private partnerships that are frequently challenged by civil society, and points to the highly political nature of transformative change. This has implications for organizations, civil society movements, and businesses that challenge business as usual or the status quo. Challenges often take the form of alternative approaches, initiatives, and experiments aiming to create new, inclusive, and more sustainable systems, such as ecological democracy and regenerative agriculture.⁶⁶

Alternative approaches are often highly relational, integrating an understanding that humans and nature are not separate. Many Indigenous cultures, philosophers, scientists, and artists have challenged the very idea that nature is separate from society. Indeed, biodiversity and conservation research has

highlighted the intricate and reciprocal relationships between humans and nature.⁶⁷ For example, research with Indigenous and traditional rural communities recognizes an intimate knowledge of and connection to local environments, emphasizing that this relationship is fundamental to cultural identity.⁶⁸ As such, Indigenous knowledge is not just something to be protected, studied, or learned from, nor can it naively be assumed as a panacea for all environmental problems. Rather, Indigenous scholars have emphasized that people in the West need to remember their own place-based knowledge, regain the ability to see complex patterns, and understand that human action is always situated within dynamic relationships with each other and the land – and then behave accordingly.⁶⁹ The ways that we view nature and our relationship to social-ecological systems are critical to understanding how to create transformations that are both equitable and sustainable.

A relational approach involves seeing the patterns underlying both climate change and biodiversity loss from a deeper perspective. This means looking more closely at the beliefs, values, worldviews, and paradigms that dominate current understandings of human-environment relationships, which are embedded in institutions and practices.⁷⁰ Such understandings are reinforced through cultural narratives and stories, which in turn influence how “natural resources” are perceived and managed. In other words, they are reflected in the ways that economies and societies are organized, including the goals that are prioritized and what is measured and valued. The extent, nature, and importance of nature-society relationships highlight the significance of transdisciplinary and integrative approaches to research, policy, and practice.⁷¹

3.2 CONSCIOUS AND DELIBERATE TRANSFORMATIONS

There have been many appeals for new modes of thinking about multiple interacting processes, and both science and policy discourses have increasingly emphasized the need for *conscious and deliberate transformations*.⁷² A focus on deliberate or intentional transformations acknowledges that humans are *already* transforming the global environment, including ecosystems and the climate system.⁷³ A key challenge is to engage

with transformative change by deliberately prioritizing and pursuing climate-resilient development pathways that support biodiversity in a manner that is both equitable and enduring.⁷⁴

Deliberate transformations are particularly important when it comes to reducing risk and vulnerability among and within households, communities, groups, and regions that are experiencing multiple stressors, whether related to climate change, land degradation, ocean pollution, globalization, economic crises, political oppression, or pandemics.⁷⁵ Sustainability and conservation science has traditionally emphasized the external world of systems, including ecosystems, economic markets, social structures, and governance dynamics. Less attention has been paid to the “inner dimensions,” such as collective intentions, meanings, and values that are related to and inform institutional and behavioral change.⁷⁶ Partial responses to interconnected global challenges are unlikely to generate results if the underlying drivers lie not only in dominant social, economic, political, and cultural systems, but also in the persistence of paradigms, mindsets, and thought patterns that influence how such systems are viewed and organized. Partial and fragmented approaches fail to promote deep and enduring responses that realize society’s full potential to generate measurable results. To protect biodiversity and the integrity of ecosystems while mitigating and adapting to a changing climate calls for conscious actions that transcend separate or “siloed” approaches.

Photo: Mathilda Khoo

To protect biodiversity and the integrity of ecosystems while mitigating and adapting to a changing climate calls for conscious actions that transcend separate or “siloed” approaches.

4. The Three Spheres of Transformation

In the remainder of the report, we describe an integrative approach that can contribute to meeting goals and targets to address multiple global challenges, including biodiversity loss and climate change. The Three Spheres of Transformation is a heuristic that can be considered as an integrative and actionable framework to both understand and take actions for transformative change (see Figure 1).⁷⁷ Recognizing the need for fundamental changes in form, structure, and meaning-making, this heuristic recognizes relationships between the practical, political, and personal spheres of transformation.⁷⁸ This approach has been adapted from Monica Sharma’s “conscious full spectrum response” model for transformations, based on development work carried out by the United Nations and implemented in over 60 countries.⁷⁹

As a general heuristic for transformative change, the Three Spheres framework acknowledges diverse theories of change and approaches to transformations that delve into different aspects of social-ecological transformations, such as social practice theories, the Multi-Level Perspective, political ecology, and Integral Theory.⁸⁰ The Three Spheres framework has been used by researchers to highlight the importance of integrative approaches, both for understanding and guiding actions on sustainability issues.⁸¹ In educational settings, it has been used to structure and guide teaching in a manner that draws attention to the links between individual and collective agency and societal and systems change.⁸² The “conscious full spectrum response” and Three Spheres framework have also been used by development and social change practitioners, NGOs, municipalities, universities, to design and implement actions and interventions that deliver results across scales.⁸³ Interventions designed to integrate all three spheres have the greatest potential for generating non-linear transformations that are not only environmentally sustainable, but also equitable and just.

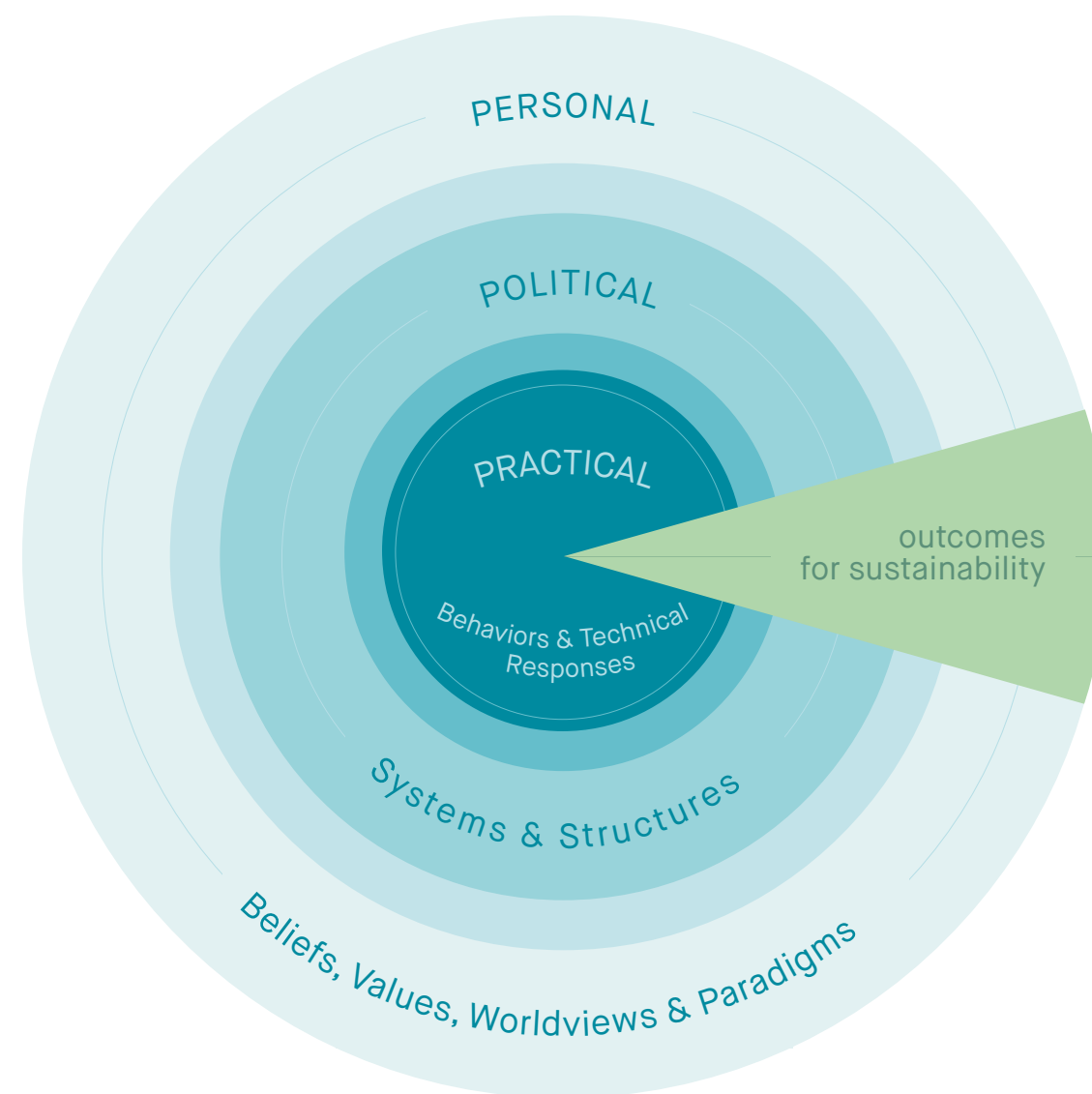
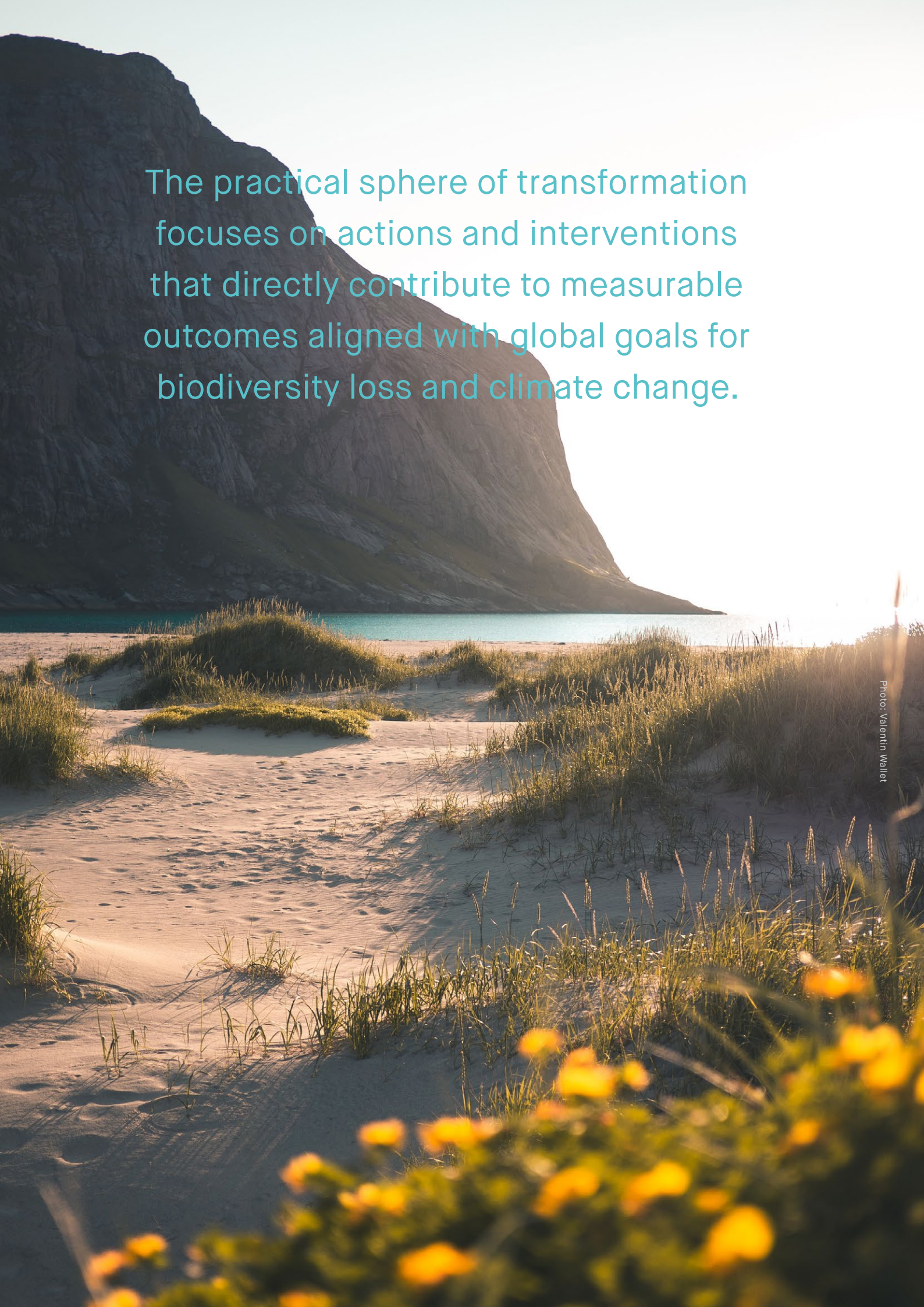


Figure 1: The Three Spheres of Transformation
(O’Brien and Sygna, 2013; based on Sharma 2007).



The practical sphere of transformation focuses on actions and interventions that directly contribute to measurable outcomes aligned with global goals for biodiversity loss and climate change.

Photo: Valentin Waller

4.1. THE PRACTICAL SPHERE

The practical sphere of transformation focuses on actions and interventions that directly contribute to measurable outcomes aligned with global goals for biodiversity loss and climate change. Transformations in the practical sphere often emphasize technical approaches to change, e.g., the importance of developing new technologies, new management plans, or different behaviors. Investments have been made to reach these targets and goals by enhancing knowledge, know-how, and expertise; promoting socio-technical innovations; improving management; and nudging or changing behaviors.⁸⁴ Many hope that a proliferation of such innovations and programs will lead to “win-win-win” situations that address climate change, biodiversity loss, and the SDGs.

In the case of biodiversity conservation, such actions may include measures to expand protected areas, increase wildlife conservation and anti-poaching initiatives, establish breeding programs for endangered species, translocate species to new habitats, restore degraded ecosystems, support agroecology, and so on. Other technical approaches to reducing biodiversity include the use of reforestation drones and artificial intelligence (AI) to track and protect threatened species from poachers, the development cultured or lab-made meat, or the development of vertical farming, and the cultivation of microalgae as a palm oil alternative.⁸⁵ In the case of climate change, responses in the practical sphere include interventions aimed at shifting to renewable and energy-efficient technologies, soil management practices, reduced energy and material consumption, electrification of transport, plant-based diets, forest protection and regeneration, and environmental education programs.

Although optimism remains high for reaching multiple international goals, measurable results within this practical sphere have nonetheless been disappointing. In the case of renewable energy, many so called “climate solutions” have had significant negative impacts on biodiversity. Hydropower has long been controversial due to its impacts on rivers, communities, species, and ecosystems, not to mention its impacts on Indigenous territories and cultural heritage.⁸⁶ Solar farms can also harm



There remains a significant gap
between aspirations and reality when it
comes to addressing biodiversity loss
and climate change.

Photo: Eberhard Grossgasteiger

wildlife and lead to habitat degradation due to the amount of space they occupy and their location.⁸⁷ Nuclear energy has been highly contested due to the impacts it can have on people and nature should accidents occur, as well as problems of nuclear waste disposal. Additionally, research that looks at the entire life-cycle assessment of renewable energy projects notes that they require extensive amounts of land, posing questions of whether technologies like wind farms built on peatland lead to net reductions of greenhouse gas emissions.⁸⁸

When solutions are focused primarily on the practical sphere of transformation, the social, cultural, and political dimensions of change are often overlooked or ignored. The dynamics of economic, political, and socio-ecological systems and the diversity of cultures and worldviews are often not considered in a critical and reflexive manner. Technical solutions, regardless of how brilliant and promising, often fail to contribute to meeting global targets and goals.⁸⁹ As a result, few of these efforts have been successful in generating transformative changes at the rate and scale that is called for by international agreements. There remains a significant gap between aspirations and reality when it comes to addressing biodiversity loss and climate change.

4.2 THE POLITICAL SPHERE

The failure of technical and behavioral solutions to protect biodiversity, restore ecosystems, and mitigate and reduce the risks associated with climate change is in many cases related to actions, decisions, strategies, and interests in the political sphere. The political sphere refers to the structures and systems that influence or govern how society is organized, including which values are prioritized, whose goals are pursued, and how solutions are discussed, negotiated, decided upon, and implemented. It recognizes that social and cultural norms, institutions, rules, regulations, and incentives can facilitate *or* hinder practical changes, and acknowledges that power and interests influence decision-making processes.⁹⁰ The significance of the political sphere is reflected in both progress and challenges in meeting global sustainability goals.

Differences, contradictions, and antagonisms are often surfaced in the political sphere, raising questions about who decides what will be implemented, when, and how.

Most policy- and decision-makers work at the interface between the political and practical spheres. For example, political interventions by the Norwegian government and the city of Oslo led to a number of changes in rules, regulations and incentives which in turn facilitated a dramatic increase in the number of electric cars in Oslo.⁹¹ Frequently, however, those in powerful positions in industry, government, or political organizations have vested interests and commitments to uphold and protect existing structures and systems, resulting in inertia, lock-in, or prolonged conflicts. Multinational companies and countries whose key sources of income depend on an unsustainable exploitation of nature and carbon-based energy often oppose national and international agreements, lobbying against regulations or actions.⁹²

The lack of action in the political sphere, evident in many communities, cities, and countries, is commonly attributed to power, politics, interests, ideologies, corruption, and greed. It has been pointed out that the narrative of sustainability can be used to make actions appear to be aligned with global goals, often through “greenwashing.” For example, critics argue that Norway and Equinor were guilty of greenwashing when they rebranded their oil as “the cleanest in the world” and their gas as a “transition fuel.”⁹³ Solutions to biodiversity loss and climate change are often presented as if they are self-evident and unquestionable, when in fact they are a product of the interests and worldviews of dominant groups. Without changes in these relationships and dynamics, it is likely that elites and experts will continue to control how the transformations are defined and addressed.

The diversity of views regarding both problems and solutions is not necessarily linked to knowledge and information, but is instead influenced by power, politics, and interests, as evident in many polarized debates about sustainability issues. However, structures and systems are not fixed or “given,” and throughout history they have been transformed by individuals, groups, and social movements that recognize and engage with alternatives. This is often exemplified with reference to the women’s suffrage movement in the early 20th century, the South African anti-

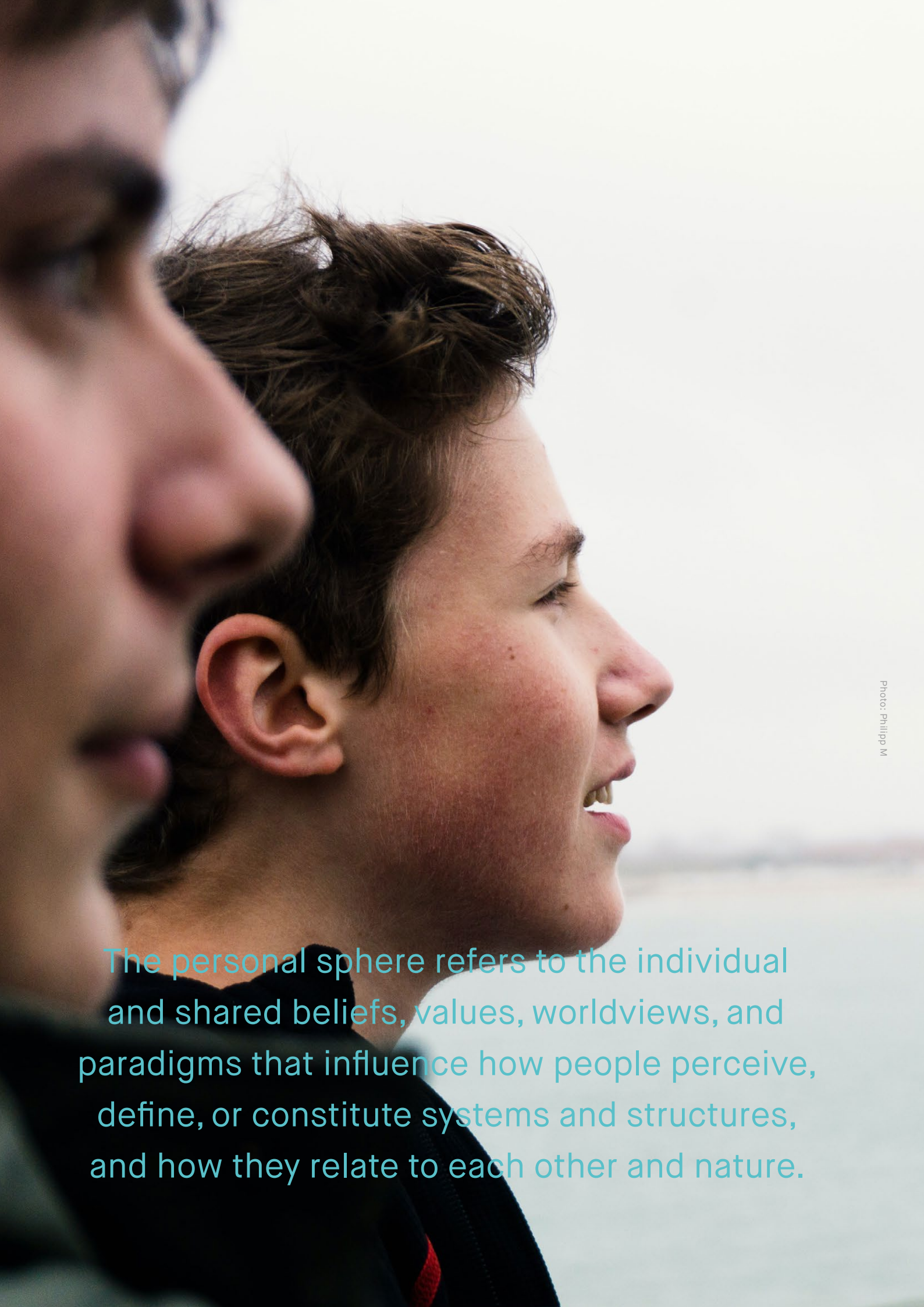


Photo: Philipp M

The personal sphere refers to the individual and shared beliefs, values, worldviews, and paradigms that influence how people perceive, define, or constitute systems and structures, and how they relate to each other and nature.

apartheid movement of the late 20th century, and the marriage equality movement of the early 21st century. In current times, climate movements such as Fridays for Future, the Sunrise Movement, and Extinction Rebellion are working to transform politics, with young people and those with strong moral identities leading the way.⁹⁴

Differences, contradictions, and antagonisms are often surfaced in the political sphere, raising questions about who decides what will be implemented, when, and how. Alternative visions often face resistance or suppression through various expressions of force, including oppression and violence. For example, in Brazil, the government, private militias, and cartels have suppressed both scientists and environmentalists who are working to stop deforestation.⁹⁵ Is there a way to skillfully navigate among different worldviews and interests to transform the very systems and cultures that perpetuate inequitable and unsustainable outcomes? To do so calls for attention to the personal sphere of transformation.

4.3 THE PERSONAL SPHERE

The personal sphere refers to the individual and shared beliefs, values, worldviews, and paradigms that influence how people perceive, define, or constitute systems and structures, and how they relate to each other and nature. These subjective dimensions shape what is prioritized, where lines are drawn between “us” and “others,” and how issues of agency and causality are perceived and addressed.⁹⁶ Transformations in the personal sphere can influence the solutions deemed possible, desirable, and achievable in the practical sphere, as well as those which are prioritized in the political sphere.

It is vital that the personal sphere is integrated into transformative change strategies. Worldviews, which can be defined as a model of reality made up of a combination of beliefs, assumptions, attitudes, values, and ideas, create a lens or a filter that influences how people understand and interact with the world.⁹⁷ Values represent what individuals or groups intrinsically consider important and can be seen as part of the relations that configure social-ecological systems.⁹⁸ Beliefs refer to what is taken to be true, often without evidence.⁹⁹ Together, these

subjective factors influence how transformations are perceived and ultimately realized. A growing number of researchers have emphasized the importance of personal transformations and the role of meaning-making, stressing that these have often been neglected.¹⁰⁰

Conservation and climate change research increasingly recognizes other cosmologies and ways of knowing, including many Indigenous and local knowledge systems that are based on deeply relational worldviews. For instance, Indigenous cultures such as the Yup'ik of southwestern Alaska and the Guna of Panama do not consider individuals as isolated and separate; instead, the individual and the collective are understood to be inherently connected with each other and with nature.¹⁰¹ Such relational paradigms bring attention to individual and collective responsibility, as well as possibilities for both adaptation and transformation in more holistic ways.¹⁰² Although the importance of Indigenous and local knowledge is central to the IPBES conceptual framework, their local and global contributions have not yet been fully recognized in conservation and development policies.¹⁰³

Paradigms - and the personal sphere in general - represent a powerful entry point for transformative change, as subjective views influence the problems are seen and engaged with, as well as the solutions that are prioritized. Paradigms refer to the concepts, metaphors, and thought patterns that form the basis of theories and methods of science, how we understand the world, and how we organize society. In global policy fora, Western actors are usually the ones deciding which paradigms are deemed rational and valid, and which are considered “alternative.” Although the classical Western scientific paradigm has been credited with many of the discoveries and developments central to modern-day society, especially in the form of technology and medicine, systems theory, complexity science, and understandings of social-ecological systems increasingly point to the importance of process-oriented and relational paradigms.¹⁰⁴

A growing number of researchers point out that the assumptions and practices that enabled the human species to become a global force are the same ones underpinning current unsustainable

systems, structures, and relations.¹⁰⁵ Nonetheless, there are very few critical conversations about how the individual and shared beliefs, worldviews, and paradigms of scientists and policymakers shape and inform conservation and climate change strategies.¹⁰⁶ The inability of science and technology to successfully address the interlinked crises of climate change and biodiversity loss points to the potential limits of a paradigm that emphasizes dualistic, deterministic, and reductionist perspectives.¹⁰⁷ Transformative change involves a continual awareness and inquiry into the role of paradigms in designing, advocating, and implementing strategies for transformative changes that address both biodiversity loss and climate change.

4.4 INTEGRATING THE THREE SPHERES

Rapid, equitable, and sustainable transformations call for conscious and strategic interventions that engage with the practical, political, *and* personal spheres of transformation simultaneously. The Three Spheres framework emphasizes that these spheres are not separate but seamlessly interrelated and always interacting. It thus recognizes multiple entry points for engaging with transformative change. Viewing transformative change from different perspectives involves identifying what is currently ignored, missing, or partial within policies, practices, and responses.

Many of the existing frameworks and approaches to transformative change highlight interactions within one or two spheres only, resulting in partial rather than integrative responses.¹⁰⁸ Even when the personal sphere is acknowledged, the role of reflexivity and self-development is often considered distinct from collective change and systems change. For example, calls for increased mindfulness and shifts in consciousness sometimes downplay the role of politics, power, and interests in either maintaining the status quo or manifesting alternative future. Likewise, a focus on systems change typically pays little attention to the different beliefs, values, and worldviews of individuals and groups who are calling for or countering collective action. The importance of integrative approaches to transformative change can be illustrated by considering the role of forests (see Box 1) and wind farms (see Box 2).

BOX 1: AN INTEGRATED APPROACH TO FOREST MANAGEMENT

When it comes to transformative change, it is not just the presence of forests that matters. The quality of forest ecosystems and their capacity to both support biodiversity and stabilize the climate also matters, as does recognizing the needs of local communities who depend on forests, and on human-forest relationships. Forests influence the climate system “through physical, chemical, and biological processes that affect planetary energetics, the hydrologic cycle, and atmospheric composition” and these interactions can drive or mitigate anthropogenic climate change.¹⁰⁹ Deforestation and land degradation reduce biodiversity and contribute to climate change; the protection of forests, reforestation, and afforestation can enhance biodiversity, as well as mitigate climate risks and contribute to adaptation.

When it comes to the practical sphere, the goal of reducing deforestation while simultaneously increasing reforestation and afforestation typically relies on measuring the percentage of deforestation, number of trees planted, and hectares of forested land. While important, such metrics say little about the quality of the forests, nor the processes that drive and influence this. Actions in the practical sphere are closely linked to the political sphere, in that decisions about forests and land cover are often linked to economic interests and short-term gains rather than values as ecosystem integrity, equity, and sustainability.

Political interests can shape how key policymakers and institutions think about the definition and management of forests. Seddon et al. point out that “existing international frameworks provide a definition of forests created for the purpose of assessing forest carbon stocks alone and as a result pledges tend to focus more on the extent (i.e. monocultures in larger areas) rather than the quality of forest to be protected, afforested or reforested (i.e. species diversity and age diversity).”¹¹⁰ This can result in a practical focus on monoculture plantations over “practices that enhance the ecological attributes that underpin functional resilience,” which are more likely to result from a diversity of species and traits.¹¹¹ A study of payments for afforestation in Chile found that government incentives for afforestation resulted in an increase in plantations and a decrease in native forest.¹¹²

Heilmayr et al. concluded that “Chile’s forest subsidies probably decreased biodiversity without increasing total carbon stored in aboveground biomass.”¹¹³ In this way, forest monocultures provide a simple and economically lucrative solution that seemingly “ticks the boxes” with regard to climate change without achieving anything worthwhile in practice.

The personal sphere is seldom included in forestry management policies. In fact, the cultural, symbolic, and spiritual roles of forests are given little attention in sustainable development, including “the role of forests in our consciousness of being human.”¹¹⁴ However, recognizing the deep and profound relationships between humans and forests can contribute to more sustainable economic, ecological, and social functions.¹¹⁵ Although integrative responses can be more time-consuming and require greater care and consideration in both design and implementation, such approaches are likely to bring about better and lasting results, which may be more cost-effective from a long-term perspective.



Photo: David Baker

BOX 2: AN INTEGRATIVE APPROACH TO WIND FARMS

The number of wind farms in Norway has increased dramatically in recent years, as part of an effort to reduce greenhouse gas (GHG) emissions both within and outside the country in response to international climate policy agreements. Between 2019 and 2020, wind production in Norway increased by 79%.¹¹⁶ However, this increase has not been without controversy. Many individuals and communities oppose further development of land-based wind farms, often due to the impact these farms have on nature and on local eco-cultural landscapes.¹¹⁷ This is especially the case for many Sami reindeer herders in northern Norway, who argue that windmills and the culturally significant practice of reindeer management are not compatible due to the negative impacts of windfarms on grazing areas.¹¹⁸

Within the practical sphere, research shows that land-based wind farms can have adverse negative effects on birds and potentially other animals, both on land and in the sea and may not adequately conserve important ecosystems.¹¹⁹ Questions have also been raised as to whether wind farms reduce GHG emissions when the production of the windmills and the development of infrastructure is compared to the accompanying habitat loss and degradation. The extent to which swamp terrain or peat bogs are destroyed to build wind parks and their associated infrastructure is also unclear.¹²⁰ Swamps and bogs are natural carbon sinks, with peatlands storing 20% of all carbon held in the soil worldwide, despite only covering 3% of the earth's surface.¹²¹ Research on the Roan windfarm, one of the biggest in Norway, has shown that if all of the affected bogs were to release their carbon, it would amount to emissions between 50,000 and 300,000 tons of CO₂, which would significantly impact the carbon budget of the wind farm.¹²²

The impact of wind farms on local landscapes and nature are important to acknowledge in the political sphere. The overall low acceptance by the public is linked to attitudes and perceptions, and to the exclusion of local people and diverse interest groups in landscape planning and decision making. The political context of wind farms does not make them unacceptable as climate solutions, but instead highlights the importance

of addressing climate change and biodiversity loss together through inclusive political processes that recognize diverse values and the importance of environmental justice. A review of 20 case studies by Avila shows that opposition to wind farms challenges the socially unequal and geographically uneven development patterns associated with ecological modernization, and suggests that this can open up new visions and approaches to transformative change.¹²³

For example, some of the resistance to wind farms may be resolved through greater deliberation and local control of energy infrastructure. In contrast to top-down approaches that take away people's agency, energy projects can instead be organized around the visions and capacities of local actors, in collaboration with national and regional strategies and goals. This draws attention to the importance of the personal sphere of transformation, including the values that are prioritized by communities. In some cases and contexts, wind farms may not be considered to be in the interest of communities; in other cases, new or alternative visions for renewable energy may emerge through dialogue and deliberation. Such deliberations take time and require a long-term commitment that extends beyond political terms or reporting cycles. Yet if the collective ambition is to take global goals on climate change, biodiversity loss, and sustainable development seriously, such a commitment is not only beneficial, but essential.



Photo: Anna Jimenez



Photo: Pantian Purnuang

5.0 Generating Transformative Change: What's Missing?

Addressing biodiversity loss, climate change, and other pressing global issues together calls for *integrative approaches* that recognize diverse types of knowledge and perspectives on transformative change. Response strategies that are equitable, sustainable, and enduring call for translating these diverse understandings into specific actions that are *robust, aligned, and results oriented*.

A distinction can be made between frameworks for *understanding* and frameworks for *action*. Frameworks for understanding rely on the application of theories and approaches to analyze past or ongoing transformations, often drawing attention to key processes, important explanatory variables, and policy implications. Most academic frameworks for understanding transformations are developed to bring clarity to how things work and why organizations, sectors, governments, or societies do or do not change. Such frameworks usually make their case from an ideological perspective, either intentionally or unintentionally, by emphasizing some theories over others. Ideological differences frequently lead to disagreements, debates, and even conflicts, typically regarding which approach or theory is right or wrong, which deserves attention and resources, and so on. Such disagreements play an important role in academia, and a critical perspective on policies and actions is necessary. However, the urgency of implementing policies and actions that address complex global problems such as biodiversity loss and climate change has led to calls for more integrative and pluralistic approaches to knowledge that go beyond dualistic “right-wrong” views and recognize the importance of multiple perspectives.¹²⁴

Frameworks for action draw on insights about transformations and “theories of change” to generate real-world change.¹²⁵ For example, a theory of change might include attention to values, wisdom, and experience as guiding principles for strategies, decisions, and actions that shift the status quo at personal to planetary scales.¹²⁶ Frameworks for action rely on a defined goal or outcome that can be measured and monitored, and an



A Three Spheres approach to transformative change recognizes that every person can be a leader and shift systems and cultures, regardless of whether they hold a position of authority or are in a leadership role.

understanding of what structures, systems, and cultures need to shift. They often include a set of transformative tools and practices that can guide learning and action to generate results *here and now*. However, to do this effectively, the tools and practices included in most frameworks for action need to be continually *practiced* throughout the lifespan of an initiative.¹²⁷

Actionable frameworks start with the actors and agents who are interested in generating outcomes that address both biodiversity loss and climate change. The deep drivers of change often originate in the personal sphere, motivated by what is important to us and others, from individual, collective, *and* planetary perspectives.¹²⁸ Values are pivotal to transformative change and can play a powerful role in generating impact at scale. However, change requires more than talking about values; it involves embodying values.¹²⁹

There are numerous definitions and uses of the term “values” in ecology and sustainability science, including economic values, intrinsic values, and relational values.¹³⁰ In the context of transformational change, Monica Sharma’s view of values is that they need to be universal, and apply to everyone; as such, they “are not culturally determined, and they transcend religious tenets, norms, and other social diktats.”¹³¹ In describing universal values that “anchor” equitable and sustainable transformations, Sharma identifies three that cut across culture, religion, political ideology, and economic theories: “dignity, equity, and compassion—all emanating from our inherent oneness.”¹³² From the perspective of ecology, values based on oneness can be extended to all species and beings on the planet, a point that has long been emphasized by many Indigenous knowledge systems and wisdom traditions.¹³³

Universal values represent a latent space for sourcing deep change, even if such values are not consciously acknowledged or recognized. Actions that are grounded in universal values are relational, and they represent a powerful point of departure for designing strategies to transform inequitable and unsustainable systems and cultures. Applying to humans and non-humans alike, they have the potential to bridge divides and bring people

together with nature. There are numerous tools, templates, and practices that can be used to design responses to address cultural and systemic change in a holistic way. Such a holistic and integrative approach does not necessarily involve doing new things, but rather doing things differently.

As a framework for action, the Three Spheres can be considered a “learning-in-action” process that begins when individuals and groups articulate the results they want to generate, engage in strategic design, learn new tools and praxis, design and implement “breakthrough initiatives,” and transform the way that everyday work and projects are carried out.¹³⁴ Importantly, this approach involves some shifts in perspective on transformative change. Below, we identify three shifts that can enhance transformative change in practice. These shifts relate to perspectives on agency, time, and scale.

5.1. SHIFT 1: AGENCY

Transformative change involves a shift from viewing people as “needing to be changed” to recognizing everyone as an agent of change with the capacity to transform relationships based on universal values. Transformative change is not about changing others, but about engaging, enrolling, and aligning people with actions that matter for themselves and others, in a manner that supports both people and the planet. A Three Spheres approach to transformative change recognizes that every person can be a leader and shift systems and cultures, regardless of whether they hold a position of authority or are in a leadership role. This is a critical point when it comes to sustainability transformations, which often focuses on the need to change people’s beliefs and behaviors. This need can lead to interventions aimed at manipulating peoples’ beliefs, values, or attitudes, or by nudging behaviors.¹³⁵ Such approaches are common in the advertising industry, and similar strategies have been pursued via social media algorithms or using “big data.” Although environmental campaigns have also adopted such approaches, they are rarely successful in creating long-term change, especially if they moralize.¹³⁶ Moreover, they miss an important opportunity to target the values that people hold and aspire to live up to in their everyday lives.¹³⁷



Photo: Federico Garcia



Photo: Mauro Lima

Aside from the ethical aspects of forcing change on others, such an approach frequently tends to backfire, since people generally do not like being told what to do, and seldom remain committed to externally-imposed changes. Palm et al. found that when people received specific recommendations for how to change behavior, regardless of the source, it “decreased individuals’ willingness to take personal actions to reduce greenhouse gases, decreased willingness to support pro climate candidates, reduced belief in the accelerated speed of climate change, and decreased trust in climate scientists.”¹³⁸ Treating people as “objects to be changed” often generates pushback and resistance, and it has historically been associated with oppression, indoctrination, and colonization.¹³⁹

Successful approaches to transformation recognize that transformation is a profoundly human process that is experienced as the unleashing of human potential to commit, care, and effect change for a better life.¹⁴⁰ Involving and engaging people in specific projects and initiatives means shifting from superficial representation to a deeper involvement. This process of change includes the development of social consciousness, or what Schlitz et al. describe as “conscious awareness of being part of an interrelated community of others.”¹⁴¹ This interrelated community of “others” is recognized by many cultural worldviews to include more than humans, as well as future generations.¹⁴²

Transformative capacities can be developed through practice.¹⁴³ This has been demonstrated in studies of sustainability entrepreneurs in Barcelona.¹⁴⁴ Research on adult learning has shown that worldviews can, and often do, change over the course of a lifetime, and over generations, often when the complexity of a situation exceeds the capacity of current worldviews and beliefs to manage them.¹⁴⁵ However, the process of human development is complex, and perspectives can either expand or contract, depending on contexts and capacities for self-reflection and dialogue.¹⁴⁶ When people are pushed too far outside of their comfort zone or feel that their worldview is being challenged, they often experience a sense of disequilibrium, or what Giddens refers to as ontological insecurity.¹⁴⁷ A natural reaction is to

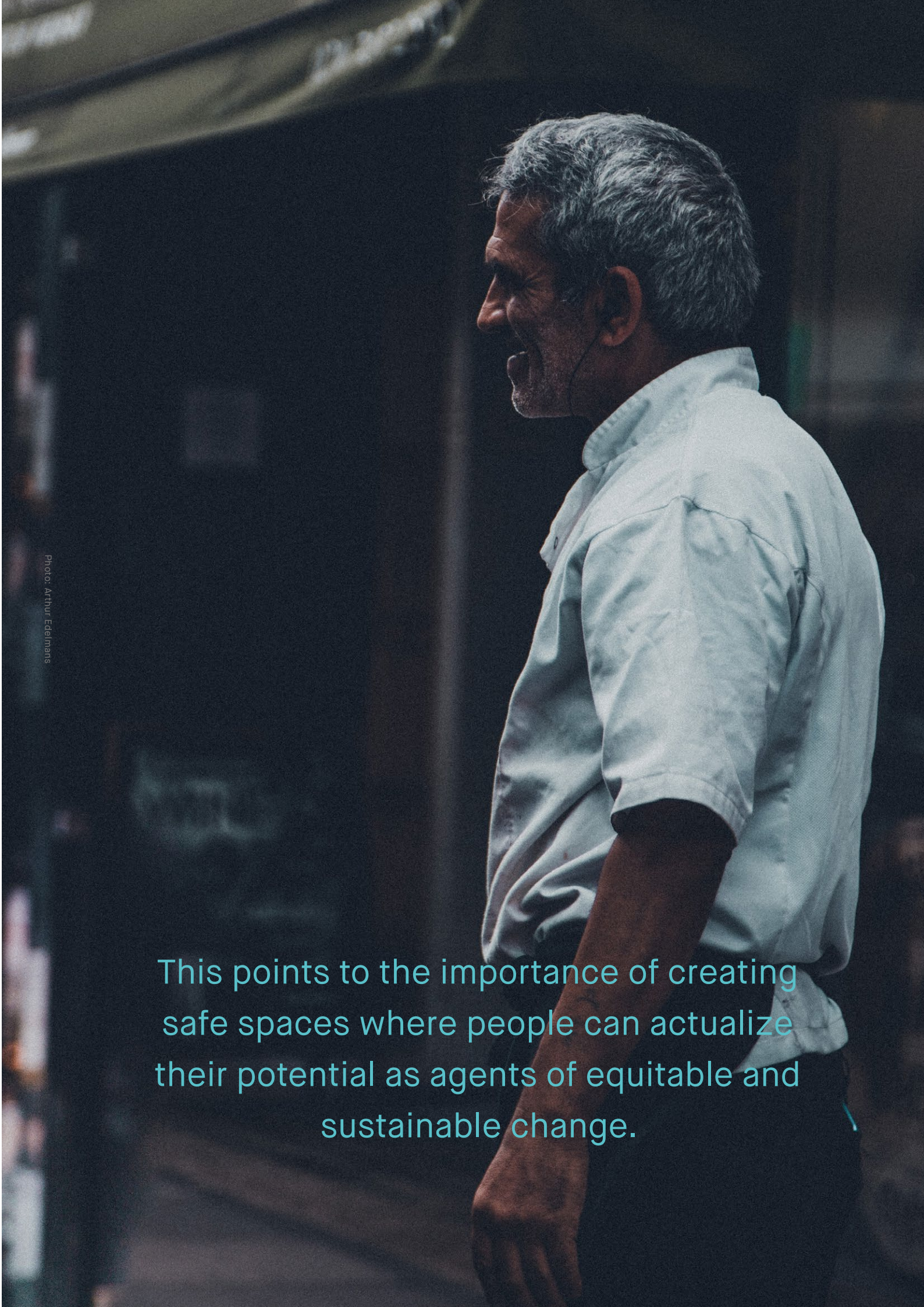
dismiss other perspectives in order to maintain a sense of equilibrium and security.

When it comes to addressing biodiversity loss and climate change, rather than communicating more or better information, transformative change can be supported by creating situations where individuals and groups can share deep reflections and experience insights, identify patterns, and recognize interconnections. This points to the importance of creating safe spaces where people can actualize their potential as agents of equitable and sustainable change.

5.2. SHIFT 2: TIME

Every day, new reports, assessments, and news stories remind us that time is running out when it comes to climate change and biodiversity loss. Scientists warn us that we have a window of opportunity and only a few years left to reduce greenhouse gas emissions and protect biodiversity.¹⁴⁸ Although the need to act now is clear, the goals, outcomes, and impacts that we collectively strive for tend to be oriented towards the future. One response to the failure to reach targets and goals is to reconvene and set new and more aspirational ones. In *The Sustainability Mirage* philosopher John Foster describes this approach as the “politics of never getting there.”¹⁴⁹ A second shift thus involves our relationship to time. Instead of approaching equity and sustainability as a desirable future state, this shift focuses on manifesting transformations here and now.

Physicist Carlo Rovelli encourages us to think differently about time: “In order to understand time, it is not enough to think of it from the outside: it is necessary to understand that we, in every moment of our experience, are situated within time.”¹⁵⁰ Opportunities for change exist in every moment, through every conversation, meeting, interaction, engagement, and act of speech or writing. Every strategy, policy, and intervention, when designed and implemented in an integrative manner and grounded in values that are inherent to all, can shift patterns and generate results across all three spheres of transformation.

A photograph of a man with grey hair, wearing a white short-sleeved button-down shirt, looking out of a window. The background is dark and out of focus, showing some architectural details. The text is overlaid on the right side of the image.

This points to the importance of creating safe spaces where people can actualize their potential as agents of equitable and sustainable change.

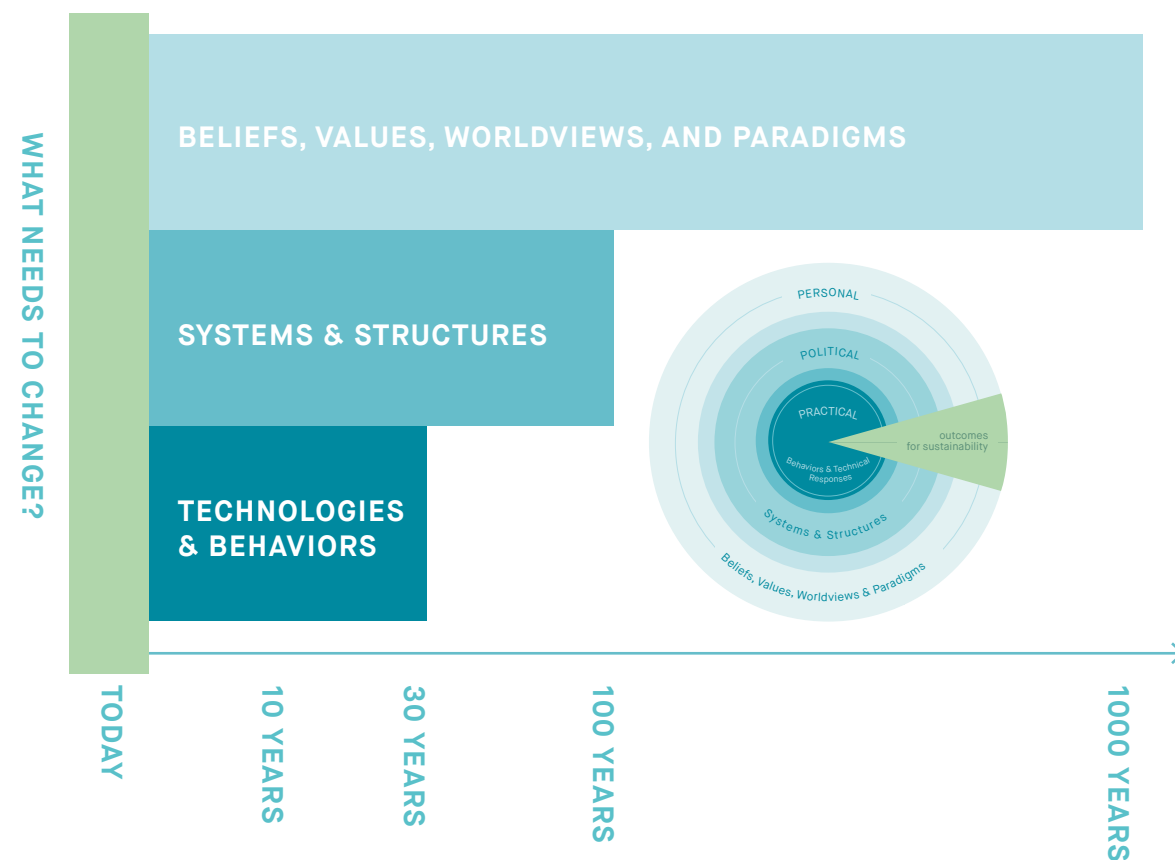


Figure 2: Transformation in time
(Based on Sharma 2017).

Figure 2 illustrates how time scales for transformative change are typically viewed, and it depicts how a Three Spheres approach transcends a linear approach and focus on actions taken here and now. Commonly, technical and behavioral transformations in the practical sphere are viewed as relatively efficient, generally occurring over a few decades. This is one reason why interventions and initiatives in the practical sphere receive so much attention and are prioritized. Changes in the political sphere are seen to take considerably longer, as they involve transforming institutions and processes that generate considerable opposition, pushback, and resistance. While social movements play an important role in the political sphere, they are often viewed as long-term struggles.¹⁵¹ In the personal sphere transformations are widely believed to occur over a generational time span, if at all. However, situating ourselves in the here and now, or “within time,” it is possible to take actions today that simultaneously transform the practical, political, and personal spheres.

5.3 SHIFT 3: SCALE

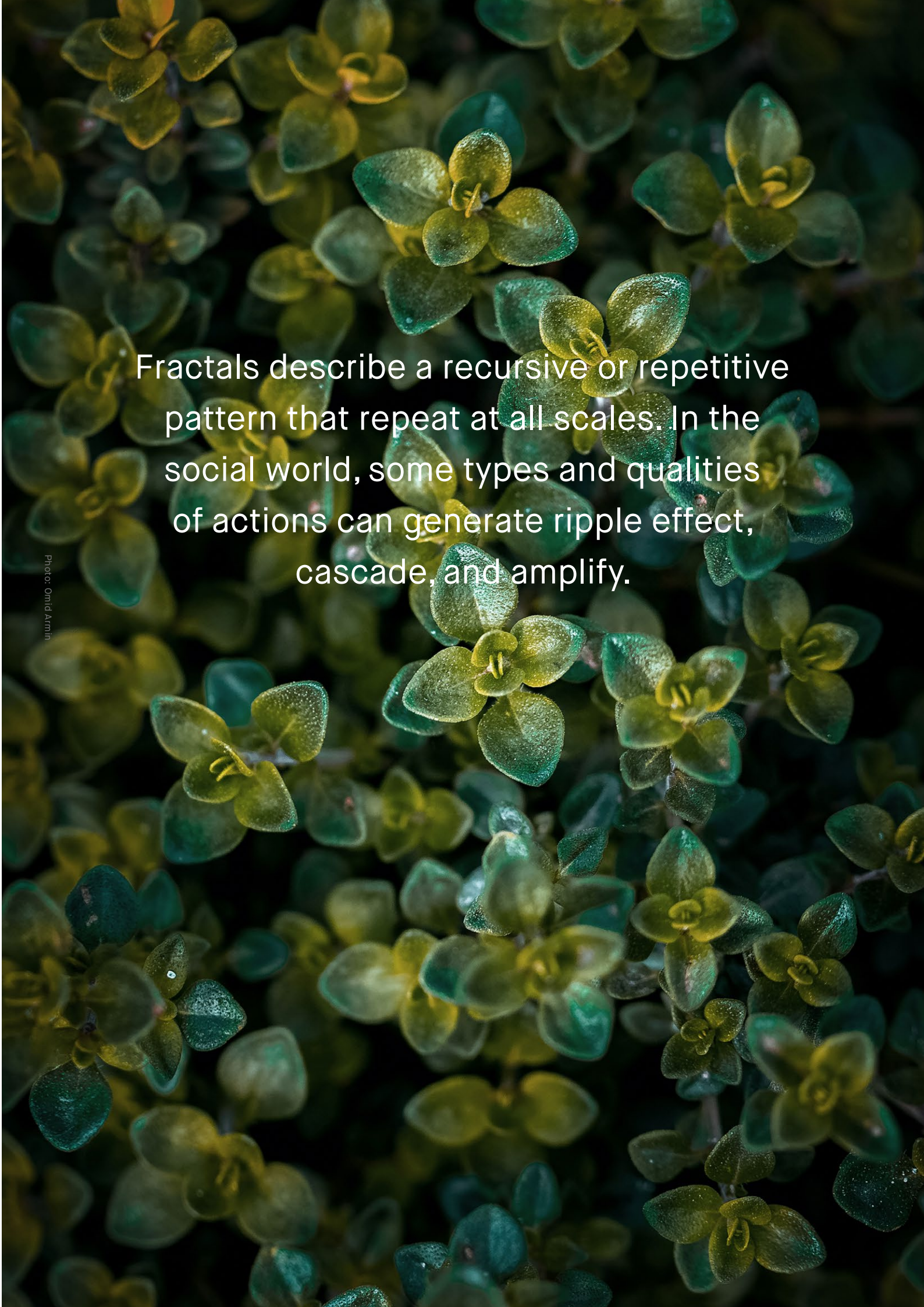
The third shift relates to the ways we perceive of scale when it comes to transformative change. Each action taken in an integrative manner can generate patterns that transcend traditional notions of scale. Often when we think about scaling sustainability solutions, we focus on top-down versus bottom up, local versus global, individual versus collective, and so on.¹⁵² However, transformative change involves a perspectival shift in the way we look at scale, moving from a focus on hierarchical or network-based approaches to recognizing that actions grounded in universal, relational values produce “fractal” patterns that replicate at multiple scales.

Fractals describe a recursive or repetitive pattern that repeat at all scales. In the social world, some types and qualities of actions can generate ripple effects that cascade and amplify. These can be considered fractals, in that they are self-similar patterns that are generated by each idea, initiative, or endeavor that is designed with the same characteristics desirable for the whole.¹⁵³ Social fractals have been used to describe unique, context-specific patterns that represent multiple versions of the whole, or “a

whole in microcosm.”¹⁵⁴ Downton uses the concept of urban and cultural fractals as a means of changing the direction of development through the creation of projects that contain the essence of the macro in micro.¹⁵⁵ In relation to sustainability, Perey considers fractals as not only tools of observation and measurement: “they are also tools of intervention into the dynamics of social systems.”¹⁵⁶

In contrast to traditional approaches to scaling, integrative and relational approaches are based on the idea that individuals generate entangled fractal patterns through thoughts, ideas, words, metaphors, decisions, conversations, actions, and agency.¹⁵⁷ From a Three Spheres perspective, every activity and intervention can contribute to transforming the whole in a manner that addresses *both* biodiversity loss and climate change. This includes scientific assessments, projects, funding schemes, initiatives, communication campaigns, meetings, or consultations and conversations. For example, as discussed earlier, nature-based solutions can be designed and implemented to address both issues if they are designed to shift the systems and cultures that keep societies locked into current patterns and relationships. This includes patterns and relationships based on emotions of fear, scarcity, and loneliness that can perpetuate conscious and unconscious biases and “othering,” which leads to power hierarchies, oppression, exploitation, polarization, and fragmentation. Shifting patterns based on universal values transforms systems and cultures both within and across scales, as depicted in Figure 3.

When new patterns are generated, synergies can be created across different projects and actions to produce results at scale. Although transformative change will have unique expressions depending on particular contexts, alignment is key to scaling. Importantly, from a fractal perspective, scaling transformations does not rely on reaching ever more people with a particular innovation or intervention. Instead, it calls attention to the manner of transformation, the quality of agency, and to importance of caring for relationships in and between places, including relationships with nature. Recognizing that expressions of transformation will take on a variety of forms, the



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Photo: Omid Armin

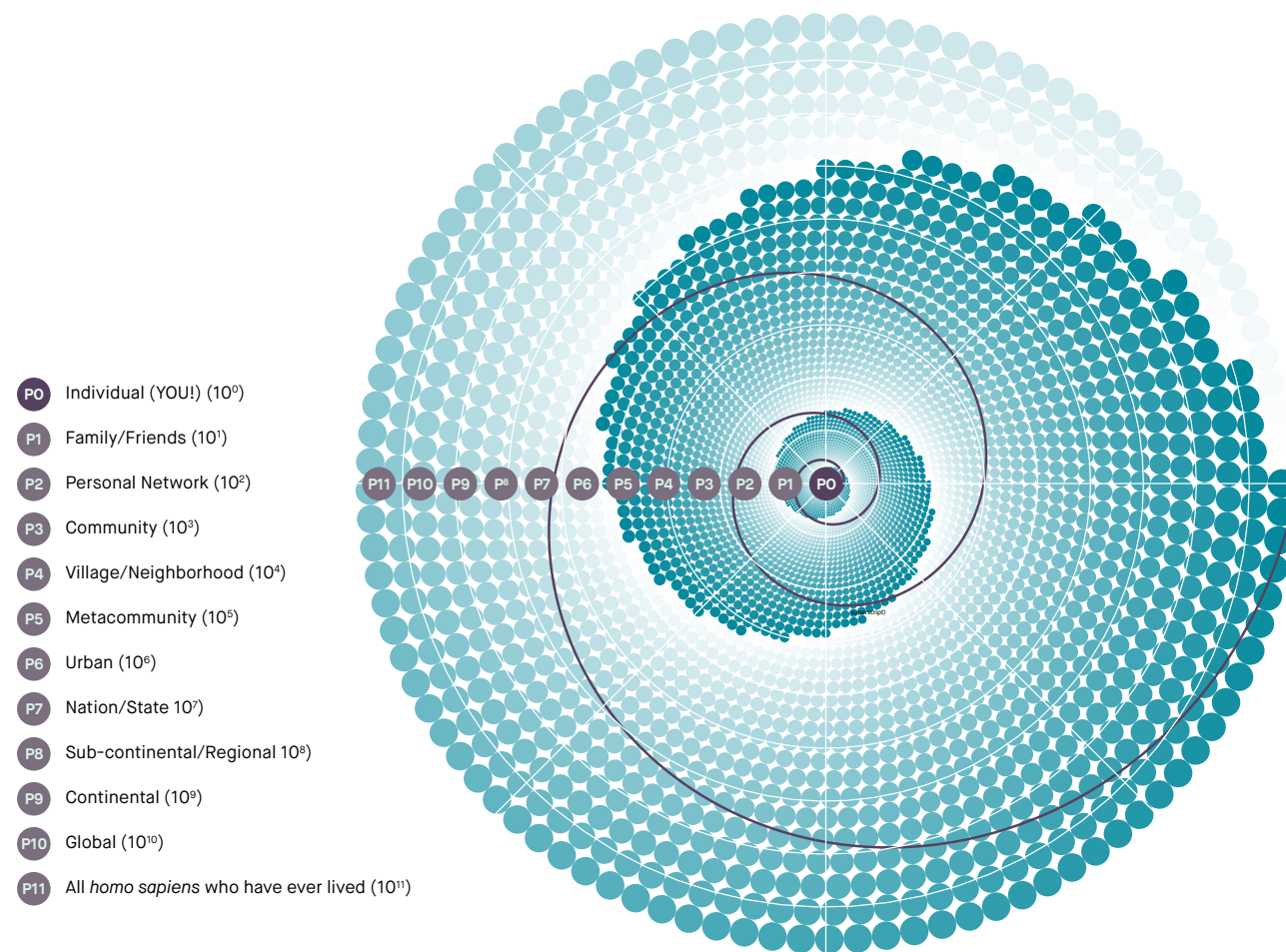


Figure 3: A fractal approach to scaling transformative change.

recursive reiteration of universal and relational values aligned with wholeness, oneness, and equity can build synergies and alignment that prioritize a world where all can thrive.¹⁵⁸ An example of this is New Zealand’s 2019 launch of a “Wellbeing Budget,” which considers social and environmental dimensions along with economic and fiscal ones, and calls for collaborative and integrated budgeting and prioritization.¹⁵⁹ When relational values and principles are applied recursively to what some Indigenous peoples refer to as “all our relations,” fractal patterns scale.¹⁶⁰ By radically questioning the very notion of separability that underlies individualism, relational and integrative approaches to scaling can embrace uncertainty and complexity and favor careful contextual considerations when making policy decisions.¹⁶¹



6. Conclusion: Transformative Change is Possible

Biodiversity loss and climate change are interrelated global challenges that draw attention to an urgent and widely recognized need for transformative change. The stakes with biodiversity loss and climate change are too high to simply continue with business as usual. The IPBES/IPCC workshop report concluded that “Achieving the scale and scope of transformative change needed to meet the goals of the UNFCCC and CBD and the Sustainable Development Goals relies on rapid and far-reaching actions of a type never before attempted.”¹⁶² Doing things differently can be considered an imperative for realizing an equitable, thriving planet.

Yet doing things differently is seldom easy, and there is often tremendous inertia and resistance towards transformative change. Despite countless practitioners, researchers, policy makers, activists, organizations, and extraordinary people working tirelessly to address these issues, measurable results are not yet visible, and despite considerable frustration, there is a growing recognition that linking understandings of transformative change to actions and practices is vital to generating desired outcomes. In times of crisis, it is important to recognize that transformative change will always be met with resistance, push-back, and opposition, and to be aware that social change involves a continuous process of doing things differently in every moment. Results-oriented approaches to transformative change take both commitment and courage; strategically designing transformative change involves creating enabling spaces, developing capacities, collaborating across divides, supporting risk takers, and using data to support decision making.

This brings us back to the question posed at the beginning of the report: what can we do right now to successfully address these interlinked crises? To realize transformative change at the rate, scale, speed, and depth that is called for at this time involves shifting our perspective on agency, time, and scale. It involves bridging the gap between frameworks for understanding and

frameworks for action in practice and through practice, in order to respond in a manner that generates tangible and enduring results. Transforming ourselves and our societies in response to global challenges in an equitable and sustainable manner calls for frameworks that can both respond to the problems (e.g., biodiversity loss and climate change) and realize the full potential of every individual, group, community, organization, and state to have a positive impact on nature and society (e.g., thriving communities and a higher quality of life for all).¹⁶³

Transformative change is both a process and a practice; outcomes for sustainability that address both biodiversity loss and climate change involve the integration of different ways of being, seeing, doing, and relating. An integrative approach to transformative change recognizes that everyone has the capacity to generate and scale transformative change right here and now, and that this requires doing things differently, not just doing different things. Integrating the practical, political, and personal spheres of transformation involves aligning our actions with a quality of agency based on values that apply to the whole. As a process and practice, transformative change is profoundly challenging yet remarkably simple: it involves seeing, being, and doing things in a different way to the dominant approach, one thought, decision, and action at a time. Our collective future depends on this.

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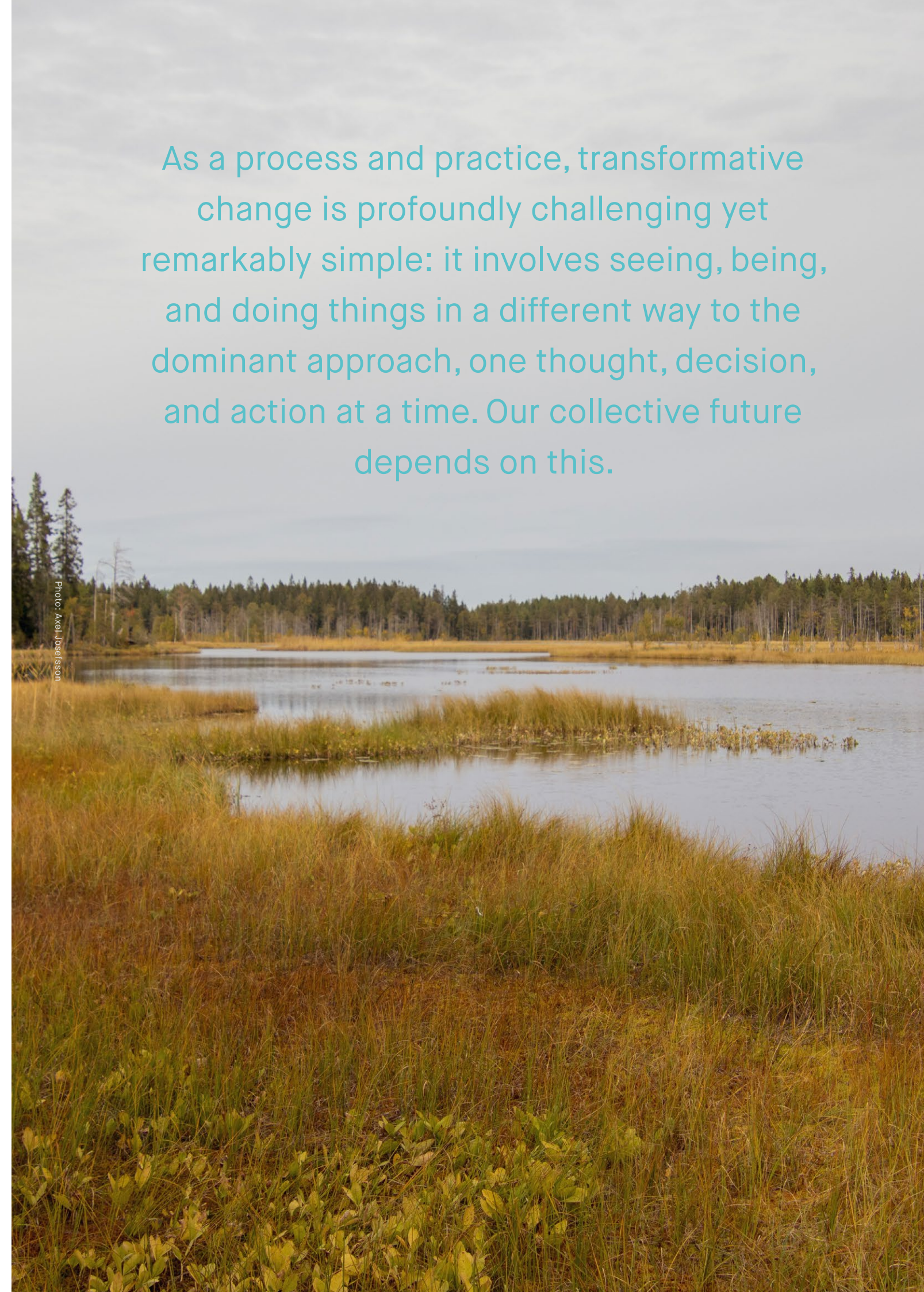


Photo: Axel Josefsson

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About cCHANGE

cCHANGE is a research and values driven organization working on the human and social dimensions of transformations to sustainability. cCHANGE bridges disciplines and themes, offering an integrated perspective on sustainability research and action.

cCHANGE offers knowledge, services, and powerful experiential tools and programs to help people understand, experience the potential for and lead transformation as a deliberate response to complex challenges. Our goal is to empower individuals and groups with the knowledge and skills to generate ethical and sustainable transformations.

In collaboration with Dr Monica Sharma cCHANGE runs the Transformational Leadership for Sustainability learning-in- action program which equips people to design integrated strategies, projects, and actions with greater impact and contribute to enduring, sustainable, and equitable transformations.

In cCHANGE we have the courage to do things differently, we act with integrity, and we do it for everyone.

Biographies

Karen O’Brien

Karen O’Brien is a Professor in the Department of Sociology and Human Geography at the University of Oslo, Norway and a co-founder of cCHANGE. Karen’s research emphasizes the social and human dimensions of climate change, including the relationship between climate change adaptation and transformations to sustainability, and she is particularly interested in the role of beliefs, values, worldviews, and paradigms in generating conscious social change. Her most recent is *You Matter More Than You Think: Quantum Social Change for a Thriving World*. Karen has been named by Web of Science in 2019, 2020, and 2021 as one of the world’s most influential researchers of the past decade, and in 2021 she was a co-recipient of the prestigious BBVA Foundations Frontiers of Knowledge Award for Climate Change. Karen has participated in four reports for the Intergovernmental Panel on Climate Change (IPCC) and is the co- chair of the Transformative Change Assessment of the Intergovernmental Science-Policy Panel on Biodiversity and Ecosystem Services (IPBES).

Dina Hestad

Dina has over 10 years of experience researching and working with NGOs, businesses, and governments from around the world in promoting climate change adaptation and transformations. In her role as Research Advisor at cCHANGE, she helps organisations and individuals catalyze and scale up transformative change. She is also a writer of the *Earth Negotiations Bulletin* for the International Institute of Sustainable Development. Dina has worked on climate change adaptation and finance for the Government of the Marshall Islands and for the UNDP Programme of Assistance to the Palestinian People. She holds a DPhil from the Environmental Change Institute at Oxford University exploring how Sustainability-Oriented Hybrid Organisations can help promote sustainability transformations in cities.

Irmelin Gram-Hanssen

Irmelin Gram-Hanssen is a social science researcher and research advisor, specialized in identifying and enhancing drivers of deliberate transformations toward sustainability. Her research focuses on the role of relations for enabling transformative change that is equitable and just, exploring how different ways of being in relation are linked to different sustainability outcomes. As a research advisor for cCHANGE, Irmelin collaborates with business and organization partners to translate cutting-edge research on transformations into practice. She also works to feed the insights from practice back to the research community, thus bridging research and practice to enable transformational results. She completed her doctoral degree in human geography at the University of Oslo in June 2022 on “How Relations Come to Matter: A Study of the Role of Relations for Deliberate Transformations in an Alaska Native Community”.

Linda Sygna

Linda Sygna has been working within the climate change field for more than 20 years, with special focus on the social and human dimensions of climate change. Equitable and sustainable transformations is at the core of the collaborations she is part of, and she is passionate about what role individuals and groups play in creating and leading change. She has extensive experience with transdisciplinary projects and events and science-policy-public dialogue on social science perspectives on climate change. As a co-founder in cCHANGE she is working on bringing out the largest potential in the connection between research and practice, building synergistic partnerships, and fostering broad networks in Norway and internationally.

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Annotated bibliography

Adloff, F. and S. Neckel. 2019. Futures of Sustainability as Modernization, Transformation, and Control: A Conceptual Framework. *Sustainability Science* 14(4): 1015–25.

The authors of this paper outline a new conceptual framework to study visions and approaches to generating a sustainable future. They separate between three imaginaries which have different trajectories of social change, namely: modernization which sees economic growth as a requirement for sustainable development and wants a sustainable future with moderate adjustments of current systems; transformation which sees economic growth as an obstacle to sustainable development and instead calls for societal transformation; and control which emphasizes political measures to control people and enforce change – often at the expense of the vulnerable. The framework aims to understand the consequences of including sustainability criteria in different settings and how conflict, inequalities, hierarchies, and justification patterns can result from them.

Beck, S. and T. Forsyth. 2020. Who gets to imagine transformative change? Participation and representation in biodiversity assessments. *Environmental Conservation* 47(4): 220-223. doi:10.1017/S0376892920000272

The authors argue that in the creation of assessments on transformative change which includes normative visions of the future, IPBES needs to consider “whose values and visions count,” as different values and visions impact whose views are considered relevant enough to be included. The authors argue that IPBES needs to rethink participation and co-production processes away from consulting groups as ‘users’ of the assessments to “seeing how visions of a sustainable world are represented through the selection of evidence and actors.” This means a heightened focus on how actors bring perspectives with

them instead of only on who is included and excluded. They argue for the adoption of a more reflexive and inclusive approach which decreases the chances of such assessments closing down instead of expanding pathways diversity, as well as the actors and visions that are a part of their development.

Blythe, J., Silver, J., Evans, L., Armitage, D., Bennett, N.J., Moore, M-L., Morrison, T.H., and K. Brown. 2018. The Dark Side of Transformation: Latent Risks in Contemporary Sustainability Discourse. *Antipode* 50(5): 1206-1223.

This article questions how the concept of transformation is being translated into policy and practice and how this translation process shapes change. The authors identify five latent risks associated with shifting from descriptive to prescriptive engagement with transformations and the framing of the concept as apolitical, inevitable or universally beneficial. They argue against engaging with transformations in a way that does not include analysis of the social, cultural, spiritual, and political dimension of environmental change responses; as approaches that do not consider these are likely to address symptoms rather than root causes. Instead, they call for the continued exploration, engagement, and debate of different transformative options above and beyond just the material and/or technical.

Bhowmik, A.K., McCaffrey, M.S., Ruskey, A.M., Frischmann, C. and O. Gaffney. 2020. Powers of 10: seeking ‘sweet spots’ for rapid climate and sustainability actions between individual and global scales. *Environ. Res. Lett.* 15(9), 094011. <https://doi.org/10.1088/1748-9326/ab9ed0>

This article presents a new framework (the Powers of 10’ (P10) logarithmic framework), introduced as a practical tool for decision makers and change agents to inform, target, and prioritize climate and sustainability interventions

at multiple scales. The framework shows the points at which the global, local, and individual scales converge and aims to show how agency can best be catalyzed (i.e. the capacity of change agents to make decisions, influence and take actions, and also implement and benefit from the actions firsthand). The authors quantify a ‘sweet spot’– the community scale (around 10,000 persons) - where the majority of global CO₂ reductions can be most effectively incubated and scaled. They go on to conclude that transformations may be most effectively placed at the community to urban scale (10,000 – 1,000,000 persons). At these scales, actions can be localized and customized for the culture, location, and circumstances rather than relying on individual or household efforts to accrue up or top-down global or national mandates to trickle down.

Caniglia, G., Luederitz, C., von Wirth, T. et al. (2020). A pluralistic and integrated approach to action-oriented knowledge for sustainability. *Nat Sustain* 4: 93–100. <https://doi.org/10.1038/s41893-020-00616-z>

The authors argue that to generate transformative change towards sustainability there is a need for action-oriented knowledge generated when plural ways of knowing are treated in an integrated approach. This means that in order to generate sustainability action, actors need to develop an appreciation and understanding for many kinds of knowledge and work in ways that integrate different ways of knowing, not necessarily through reaching agreement or consensus between different groups but to facilitate collaborative enquiry into potential conflicts and contestations. Such integrative pluralism means that “easy fixes or technocratic solutions to complex challenges” are unlikely to be helpful unless individual and collective learning processes are involved. The authors argue for the need for research to “create the conditions for change to unfold” through pluralistic and integrative knowledge generating processes instead of trying to direct change.

Grenni, S., Soini, K., Horlings, L.G. 2020. The inner dimension of sustainability transformation: how sense of place and values can support sustainable place-shaping. *Sustainability Science* 15: 411–422. <https://doi.org/10.1007/s11625-019-00743-3>

The authors of this review article emphasize the importance of understanding the different meanings and values that actors hold in order to generate sustainable place-based transformations. They argue that ‘inner dimensions’ such as collective intentions, meanings, and values are connected to and inform ‘outer’ dimensions like institutional change and behaviour and that these links need to be focused on in relation to place-shaping. They introduce an analytical tool and argue that this can facilitate knowledge on “what is valued and by whom, and in regard to what” which is crucial when fostering transformations that are socially and culturally just.

Ives, C. D., Abson, D. J., von Wehrden, H., Dorninger, C., Klaniecki, K. and J. Fischer. 2018. Reconnecting with nature for sustainability. *Sustainability science* 13: 1389-1397. [doi:10.1007/s11625-018-0542-9](https://doi.org/10.1007/s11625-018-0542-9)

This article focuses on human reconnection to nature and aims to generate more coherence around what this means, why it should come about, and how to do it. This is done through a conceptual framework and identification of five types of connections to nature: material, experiential, cognitive, emotional, and philosophical. Using the concept of leverage points they argue that addressing inner connections such as philosophical and cognitive ones are deep leverage points with outer connections (experiential and material) being shallower and playing supporting roles that are unlikely to generate transformative change by themselves. Yet, these operate in concert and cannot be seen independently of each other.

Ives, C.D., Freeth, R. and J. Fischer. 2020. Inside-out sustainability: The neglect of inner worlds. *Ambio* 49: 208–217. <https://doi.org/10.1007/s13280-019-01187-w>

This article contends that sustainability science has primarily focused on the external world of ecosystems, economic markets, social structures, and governance dynamics, and in doing so, a critical second dimension of reality has been neglected: the inner lives of individuals. The authors argue that our inner worlds, such as our emotions, thoughts, identities, and beliefs, lie at the root of sustainability challenges. Drawing on Donella Meadows' Leverage Points for Systems Change, they reason that the interior lives of individuals might be understood as deep leverage points because goals, values, worldviews, and emotions are the places from which the motivations and methods for pursuing sustainability originate and can be maintained. Increased focus on inner dimensions would include exploring how cultivating awareness and contemplation and building empathy can contribute to peoples' ability and willingness to transcend paradigms, Meadows' highest leverage point for systems change. To operationalise this, the article calls for (i) an expansion of the language used in framing sustainability, (ii) greater consideration of the inner life in sustainability research, and (iii) enhanced awareness and cultivation of the inner life in practice.

Lam, D.P., Martín-López, B., Wiek, A., Bennett, E.M., Frantzeskaki, N., Horcea-Milcu, A.I. and D.J. Lang. 2020. Scaling the impact of sustainability initiatives: a typology of amplification processes. *Urban Transformations* 2: 1–24.

What processes amplify the impact of sustainability initiatives to foster transformations? This is the question posed by the authors of this article. They answer this by identifying eight processes which are then aggregated into three categories: amplifying within, amplifying out, and amplifying beyond. They question the assumption

that 'more initiatives' will result in transformations and contends that a combination of different amplification processes are likely required, with different processes at different times in the development of an initiative.

Lam, D.P.M., Hinz, E., Lang, D.J., Tengö, M., von Wehrden, H. and B. Martín-López. 2020. Indigenous and local knowledge in sustainability transformations research: A literature review. *Ecology and Society* 25(1): 3. <https://doi.org/10.5751/ES-11305-250103>

The authors investigate how transformations research that apply indigenous and traditional knowledge (ILK) represent this knowledge in scientific papers. Transformations research is dominated by Western scientific knowledge and they found that ILK is used to complement or confirm scientific knowledge. The research does not focus on the understandings of transformations that indigenous peoples and local communities hold, but rather what changes they see and describe. The authors argue that this is a missed opportunity for a more plural understanding of transformative change which could improve knowledge, is ethical, could increase agency, and support research on transformations.

Massarella, K., Nygren, A., Fletcher, R., Büscher, B., Kiwango, W.A., Komi, S., Krauss, J.E., Mabele, M.B., McInturff, A., Sandroni, L.T., Alagona, P.S., Brockington, D., Coates, R., Duffy, R., Ferraz, K.M.P.M.B., Koot, S., Marchini, S. and A.R. Percequillo. 2021. Transformation beyond conservation: how critical social science can contribute to a radical new agenda in biodiversity conservation. *Current Opinion in Environmental Sustainability* 49: 79–87. <https://doi.org/10.1016/j.cosust.2021.03.005>.

The authors of this article are one of the first to critically review how transformative change narratives is being incorporated into discussions on the conservation of biodiversity. They identify three main goals of

transformative conservation: (1) wild nature flourishes independently of humans and needs to be strictly and increasingly protected (i.e., 50% of the planet to be protected) (2) we exist in a post-wild world, so humans and nature need to co-exist and humans are both beneficiaries and managers of nature (i.e., through restoration or rewilding) (3) just transformation where we work for a world that is more equitable for humans as well as non-humans (i.e., through Indigenous Peoples and community conserved areas). They look at how critical social science can be used to politicize and pluralize these and other conservation debates and help identify alternatives that could be transformative such as convivial conservation.

Montana, J., Elliott, L., Ryan, M. and C. Wyborn. 2020. The need for improved reflexivity in conservation science. *Environmental Conservation* 47(4): 217-219. doi:10.1017/S0376892920000326

In this commentary the authors argue that conservation science needs to move away from a focus on “finding ever more precise facts about nature” towards cultivating research which aids communities and thereby increases utility and contributions to addressing biodiversity challenges. They suggest that this should happen through increasing reflexivity, meaning the ability to critically assess own assumptions. For researchers they practically suggest experimenting with enabling conditions and actions such as: being willing to ask questions that are difficult of themselves and others; noticing how people differ; understanding the context before collecting data on predefined problems; citizen science; and writing a journal to build self-awareness.

O’Brien, K. 2018. Is the 1.5°C target possible? Exploring the three spheres of transformation. *Current Opinion in Environmental Sustainability* 31: 153-160. <https://doi.org/10.1016/j.cosust.2018.04.010>.

In this article, O’Brien explores the question of how deliberate social transformations happen and uses insights from social science to answer it, insights that are often overlooked in research related to transformations. In particular, this relates to the fact that transformations are rife with social complexity, but this is often overlooked, and instead technical solutions and behavioral approaches are most often prioritized; despite the fact that such approaches are incomplete. To showcase this, she presents the Three Spheres of Transformations framework which consists of three interacting and overlapping spheres: practical, political, and personal, and uses this to identify leverage points for transformation.

Otto, I M., Donges, J.F., Cremades, R., Bhowmik, A., Hewitt, R.J., Lucht, W., Rockström, J., et al. 2020. “Social Tipping Dynamics for Stabilizing Earth’s Climate by 2050.” *Proceedings of the National Academy of Sciences* 117(5): 2354–65. <https://doi.org/10.1073/pnas.1900577117>.

This paper considers the concept of social tipping interventions and their potential to activate processes that can lead to a rapid spread of social and technological change. Based on online expert elicitation, an expert workshop, and a literature review they propose a set of interventions that can lead to large scale and rapid transformations towards sustainability. The paper considers that social tipping dynamics can occur through contagious processes in social networks which consist of behaviors, opinions, knowledge, technologies, and social norms. When they are triggered, they can be difficult to stop and irreversible, as such small changes or interventions in subsystems can lead to large macroscopic change. These changes could come about deliberately through human agency or as a result of nonhuman or unintentional forces. They argue that systems can be ‘imperfectly navigated’ in an intentional way to achieve certain outcomes.

Palomo, I., Locatelli, B., Otero, I., Colloff, M., Crouzat, E., Cuni-Sanchez, A., Gómez-Baggethun, E., González-García, A., Grêt-Regamey, A., Jiménez-Aceituno, A., Martín-López, B., Pascual, U., Zafra-Calvo, N., Bruley, E., Fischborn, M., Metz, R. and S. Lavorel. 2021. Assessing nature-based solutions for transformative change. *One Earth* 4(5): 730–741. <https://doi.org/10.1016/j.oneear.2021.04.013>

Using the three spheres of transformations framework this article assesses nature-based solutions capacity to create transformative change. They do so through analyzing 93 nature-based solutions in mountainous areas and find that they are both people and nature based and cut across the three spheres by combining personal elements (values, knowledge, and worldviews), political aspects (rules and instruments) and practical dimensions (technology, ecosystem management, and behaviors). They argue that their results confirm the transformative potential of nature-based solutions and their framework can help assess the effectiveness of nature-based solutions.

Pereira, L., Frantzeskaki, N., Hebinck, A., Charli-Joseph, L., Drimie, S., Dyer, M., Eakin, H., Galafassi, D., Karpouzoglou, T., Marshall, F., Moore, M.-L., Olsson, P., Siqueiros-García, J.M., van Zwanenberg, P. and J.M. Vervoort. 2020. Transformative spaces in the making: key lessons from nine cases in the Global South. *Sustain Sci* 15: 161–178. <https://doi.org/10.1007/s11625-019-00749-x>

The authors of this paper argue that collaborative environments are required for transformations, especially spaces where experimentation with new socio-ecological systems configurations can occur. They focus on how such spaces can be designed and enabled and analyze nine cases in the Global South. They identify five design phases and argue that transformative spaces can enable the inclusion of the agency and knowledge of agents that often are kept out of Western-based knowledge systems.

Robinson, J. and R.J. Cole. 2015. Theoretical underpinnings of regenerative sustainability. *Building Research & Information* 43(2): 133-143.

The focus of this paper is questioning the dominant sustainability discourse, namely one that has focussed on environmental constraint and limits, which the authors argue is not engaging, does not go far enough, primarily focusses on environmental considerations, and adopts and uncritical approach to the role and meaning of scientific understanding. Instead they are proponents of a new narrative, one of regenerative sustainability. This is a net-positive approach focussed on maximising benefits of human action. They argue this is more engaging, focuses more on both social and environmental issues, and does not have a narrow realist view of science. Rather it is based on a procedural view of sustainability – which acknowledges the normative and political nature of the concept. The authors highlight that the origin of the approach was to create a paradigm where people engage with the living world in a co-creative partnership with nature.

Sharma, M. 2017. *Radical Transformational Leadership: Strategic Action for Change Agents*. North Atlantic Books.

In this book, Sharma outlines a unique response model for how to generate equitable and enduring positive change - the conscious full-spectrum response model. The focus is on manifesting transformative results through sourcing inner capacities and universal values. Based on over 30 years of experience, Sharma outlines a practical approach with a range of tools for leading and generating change that is subject agnostic. The book emphasizes that both practical, political, and personal dimensions need to be addressed in order to achieve long-term and equitable change for a more sustainable world.

Tàbara, J. D., Frantzeskaki, N., Hölscher, K., Pedde, S., Kok, K., Lamperti, F., Christensen, J.H., Jäger, J. and P. Berry. 2018. Positive tipping points in a rapidly warming world. *Current Opinion in Environmental Sustainability* 31: 120-129. <https://doi.org/10.1016/j.cosust.2018.01.012>

This paper reviews the concept of positive tipping points – and sees them as emergent properties of systems that can enable the implementation rapid transformative solutions to tackle climate change. A synthesis is provided to identify and coordinate the capacities required by agents to implement such solutions. The authors argue that thousands of solutions or pathways of solutions are required to achieve such tipping points, and the chances of this is greatly increased if they share a vision for the future.

United Nations Environment Programme. 2021. Making Peace with Nature: A scientific blueprint to tackle the climate, biodiversity and pollution emergencies. Nairobi. <https://www.unep.org/resources/making-peace-nature>

This report synthesizes evidence from global environmental assessments into a blueprint for how to tackle climate change, biodiversity loss, pollution, through the framework of the SDGs. The report emphasizes the need to address environmental problems and human well-being together and to transform economic, financial, and productive systems to lead and power the shift towards sustainability. The authors highlight that individuals have a role in transforming human-nature relationships through redeploying human knowledge, ingenuity, technology and cooperation. Polycentric governance is crucial for empowering people to do so.

Urmetzer, S., Lask, J., Vargas-Carpintero, R. and A. Pyka. 2020. Learning to change: Transformative knowledge for building a sustainable bioeconomy. *Ecological Economics* 167. <https://doi.org/10.1016/j.ecolecon.2019.106435>

This article explores the types of skills and knowledge required to successfully transform towards a bioeconomy. Transforming to a bioeconomy is considered a powerful approach to combating current trends of unsustainability. Across Europe policies and strategies to foster the bioeconomy are being given priority at a number of political levels. The authors of this article observe that so far, the concept has been predominantly perceived as a scientific and technical endeavor and they argue that different knowledge will be required to ensure a successful and enduring transformation to a bioeconomy. Transforming to a bioeconomy is classified as a “wicked problem”, and the authors contend that wicked problems require more than conventional approaches to problem solving. They require approaches that emphasize proactive consideration of the interconnectedness, interrelatedness, and interdependence of elements responsible for the problem. Therefore, they conclude it is crucial to understand the characteristics and levers for the creation and diffusion of such knowledge and skills so that we can induce system changes towards desirable ends. Three types of knowledge are identified as necessary to induce transformative change in the face of wicked problems: systems knowledge, normative knowledge (including the ability to establish visions of alternative scenarios), and transformative knowledge. This article focuses on transformative knowledge, which further involves skills for successful communication and education, the ability to plan and conduct participatory processes, policy and decision-making competences, as well as the capacity to reconsider inherited values and assumptions.

Waddock, S. and P. Kuenkel. 2019. What Gives Life to Large System Change? *Organization & Environment* 33(3). <https://doi.org/10.1177/1086026619842482>.

Answering the question of ‘what gives life to large systems change’ Waddock and Kuenkel consider why some places or groups feel ‘dead’ whilst others seem literally full of

life. They identify six principles around what ‘gives live’ to different systems and how these relate to humans’ ability to reflect: intentional generativity, permeable containment, emerging novelty, contextual interconnectedness and requisite diversity, mutually enhancing wholeness, and proprioceptive consciousness. They argue that considering these can help ensure or recreate vitality in socio-ecological systems, something which is key when attempting to generate flourishing socio-ecological systems and enhancing transformative efforts aimed at dealing with problems such as climate change, inequality, or unsustainability.

Wyborn, C., Davila, F., Pereira, L., Lim, M., Alvarez, I., Henderson, G., Luers, A., Harms, M.J.M., Maze, K., Montana, J., Ryan, M., Sandbrook, C., Shaw, R. and E. Woods. 2020. Imagining transformative biodiversity futures. *Nature Sustainability* 33(3): 670-672. <https://doi.org/10.1038/s41893-020-0587-5>

The authors of this commentary article claim that research on biodiversity, which is dominated by characterizations of declining trajectories and doom, have not motivated or mobilized transformative change. To address this and the opportunity that have come with the multiple disruptions experienced in 2020 they argue that the biodiversity community needs to be creative and imagine new futures that “enable people and nature to thrive on this planet”. They highlight three possible futures for the year 2050 which characterize the current debates: basic needs; wildlife rules; and climate first. They argue that technocratic approaches dominate ways of thinking about the future and that this needs to change as they are built on “outdated assumptions that often do not reflect diverse knowledges and perspectives about biodiversity values”. This is important as how we view the future shapes how problems are viewed and acted upon – making it political. They argue that “imagination can build the anticipatory capacity to get ahead of the curve, rather than react to a crisis” and that anticipatory leadership is required which

acknowledges the need for change and considers the costs and benefits to action now vs in the future.

