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An agenda for research and action towards diverse and just futures for life on Earth

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Abstract

Decades of research and policy interventions on biodiversity have insufficiently addressed the dual issues of biodiversity degradation and social justice. New approaches are therefore needed. This essay outlines a research and action agenda that calls for a collective task of 'revisiting biodiversity' towards the goal of sustaining diverse and just futures for life on Earth. The agenda was developed through a two-year dialogue process that involved close to 300 experts from diverse disciplines and geographies. This process was informed by social science insights that have shown that biodiversity research and action is underpinned by choices about how problems are conceptualized. Recognizing knowledge, action, and ethics as inseparable, we synthesize a set of principles that help navigate the task of 'revisiting biodiversity'. The agenda articulates four thematic areas for future research. First, the need to *revisit biodiversity narratives* by challenging conceptualizations that exclude diversity and entrench the separation of humans, cultures, economies, and societies from nature. Second, embracing a focus on the relationships between the *anthropocene, biodiversity, and culture* by considering humanity and biodiversity as tied together in specific contexts. Third, focusing on *nature and economy* by better accounting for the interacting structures of economic and financial systems as core drivers of biodiversity loss. Finally, *enabling transformative biodiversity research and action* by re-configuring relationships between human and non-human communities in and through science, policy, and practice. Revisiting biodiversity necessitates a renewed focus on dialogue among biodiversity communities and beyond that critically reflects on the past to channel research and action towards fostering just and diverse futures for human and non-human life on Earth.

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Introduction

The multiple challenges undermining relations between people and nature pose a conundrum for research and action. Despite decades of research and policy interventions, the dual issues of biodiversity degradation and social injustices continue apace (Díaz et al. 2019; IPBES 2019, Leach et al. 2018, Ripple et al. 2017). This essay sets out an agenda for research and action centred on a collective task of 'revisiting biodiversity' towards the goal of sustaining diverse and just futures for life on Earth.

Developed as part of a two-year dialogue under the Biodiversity Revisited Initiative, this agenda is intended for a broad community of researchers and practitioners from within academia, government, NGOs, research-funding organizations, and other institutions and communities. Here, we propose a principle-based approach to guide how research and action are shaped, conducted, and funded and identify four thematic directions for the future. The task of revisiting biodiversity requires ongoing dialogue across disciplines, sectors, knowledge systems, and geographies to ensure participation of an array of voices. This agenda is intended as an initial provocation to stimulate such transdisciplinary dialogue and thereby strengthen the diversity of disciplinary perspectives and collaborations in biodiversity research and action (after Teel et al. 2018).

Revisiting Biodiversity

This agenda calls for a collective task of 'revisiting biodiversity' towards the goal of sustaining diverse and just futures for life on Earth. This follows a longstanding legacy of political activism, debate and social research that has sought to rethink the place of people with respect to biodiversity, such as work on community-based conservation (i.e. Berkes 2004), integrated conservation and development (i.e. Adams et al. 2004), environmental justice (i.e. Agyeman et al. 2016), political ecology (Escobar 1998), and anthropology (Sawyer & Agrawal 2000), as well as recent normative calls for more integrated, inclusive, and transformative approaches to biodiversity research and action (Colloff et al. 2017; Díaz et al. 2019; IPBES 2019; Editorial 2020).

There are many reasons to revisit biodiversity research and action. Despite decades of scholarship, global conservation targets (e.g. CBD 2010; UN 2015) and localized conservation successes (e.g. Conservation Optimism 2020), biodiversity is declining at unprecedented rates (IPBES 2019; CBD 2020) and the systemic drivers of species extinction, habitat destruction, and unsustainable resource exploitation persist (Johnson et al. 2018). Meanwhile, conservation is plagued by its colonial legacy (Sawyer & Agrawal 2000) and the mixed impacts it has on local communities (Naughton-Treves et al. 2015) demand greater attention to issues of justice (Armstrong 2019), race (Editorial 2020), and inequality in biodiversity research and action (Leach et al. 2018). These concerns, and others, are compounded by misaligned incentive structures, short-term funding cycles, overly simplistic or prescriptive interventions (i.e. Rosenschöld 2019) and the choices that are made in how to look at the problem of biodiversity for research and action (i.e. Rose 2018, Wyborn et al. 2019). The task of revisiting biodiversity therefore requires a collective reflection on the what and how of research, education and action, drawing together diverse perspectives in innovative and inclusive ways.

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The agenda seeks to be transformative with respect to the driving goal of sustaining diverse and just futures for life on Earth. In doing so, it broadens the normative goal of biodiversity research and action in line with scholarship in parallel fields such as sustainability science (Kates et al. 2001), while retaining life on Earth as its unified object of inquiry. Recognizing the interconnections between biological and cultural diversity, and the central place that people play in shaping biodiversity futures (Rozzi et al. 2018), we extend the long-held norm of diversity as desirable in biodiversity research (i.e. Soulé 1985) to include humans and their cultures.

The agenda places justice as equal to, and inseparable from aspirations to sustain biodiversity. We adopt a multidimensional view of justice that encompasses the distribution of rights and responsibilities, costs, and benefits of biodiversity interventions (distributive justice), the role and ability of different stakeholders to contribute to decision-making (procedural justice), recognition of different histories and identities, and encompassing human and non-human communities (multi-species justice) (Schlosberg 2007; Heise 2016), and the connected agendas of environment, race, class, gender and social justice (environmental justice) (Agyeman et al. 2016). Justice invokes the moral and legal obligations owed to individuals by societies and their institutions, and therefore more so than e.g. 'equity', implies both rights and responsibilities (Armstrong 2019). Attention to justice has a longstanding history within sustainable development, environmental justice, and political ecology, however it deserves greater emphasis across all forms of biodiversity research. Adopting a normative goal that places justice on an equal footing to biodiversity would both be transformative, and require transformative change to reconfigure the underlying processes, structures, and outcomes (after Diaz et al. 2019; Scoones et al. 2020) that shape biodiversity research, education, and action.

This agenda builds upon other biodiversity-related research agendas (c.f. Sandbrook et al. 2013; Bennett et al. 2017; Mori et al. 2017; Burch et al. 2019; Sutherland et al. 2020), as well as agendas from sustainability science (Kates et al. 2001) and environmental governance (Leach et al. 2018; Cumming et al. 2020). Such current approaches to research and action have their strengths and weaknesses (see Wyborn et al. 2019); in developing this agenda, we looked across, rather than within, these existing traditions as a means to facilitate a transdisciplinary dialogue. The emergent result is a collective task of 'revisiting biodiversity' with the aim to critically reflect upon and renew the objects at the centre of a dialogue about research and action. The agenda's niche emerges from a commitment to the 'boundary object' of revisiting biodiversity. Boundary objects are concepts that embody different meanings across cultures, while providing enough commonality to allow different groups to communicate and collaborate (Star & Griesmer, 1989). 'Revisiting biodiversity' is proposed as a boundary object and convening device to create arenas where ideas and actions can co-evolve.

An approach to revisiting biodiversity

Revisiting biodiversity starts by recognizing that biodiversity research and action are always in the making, and subject to constant evolution. It entails reflecting on past experience, existing concepts, and established practices in an iterative process of recombination and renewal (Fig. 1). Building on the "multiple evidence based approach" (Tengö et al. 2014), recombination weaves together different knowledges to foster "regenerative relationships" (van Kerkhoff 2014) through iterative

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and interconnected collaborations (i.e. Montana 2019). The process is adaptive and flexible in response to change, and is relevant to diverse knowledge systems, including the biophysical sciences, social science, humanities, indigenous, local, and experiential knowledge. This approach acknowledges that working with diverse perspectives towards the goal of this agenda may not require uniformity, convergence, or integration.

INSERT Figure 1. An approach to revisiting biodiversity involving an iterative process of recombination and renewal

This iterative approach was piloted and refined through the Biodiversity Revisited Initiative. The process involved six multi-day reflective meetings both virtual and in person supplanted by written inputs (Fig. 2). Written inputs provided a starting point for the flagship event, the Biodiversity Revisited Symposium, where a dialogue process was used iteratively and qualitatively to refine the themes for this agenda (see Table 1 and Supplementary Material). The process was guided by an explicit intention *not* to reach consensus. Assuming that diversity is key to furthering biodiversity research (Tallis & Lubchenco 2014; Burgman et al. 2015; Mammides et al. 2016), it welcomed a plurality of perspectives and intentionally allowed for debate and tension (Hulme et al. 2020). In accordance with the ethos of this agenda, the Biodiversity Revisited Initiative was just a small step towards the more ambitious transformative potential of revisiting biodiversity. Ongoing efforts necessitate greater effort to overcome limitations of geographic and epistemic diversity, citation biases, and the exclusion of marginalized voices that lack access to the privileged spaces of such an initiative. Future iterations must start by embracing the project of decolonising research and adopting an ethic of incommensurability (Tuck & Yang 2012) to address the structural and systemic challenges that perpetuate a Northern bias in biodiversity research and action (Burgman et al. 2015, Nagendra 2018).

INSERT Table 1. Iterative development of themes

INSERT Figure 2. Timeline of the Biodiversity Revisited Initiative from February 2019 to June 2020

The Biodiversity Revisited Initiative was guided by nine principles that were iteratively refined throughout the process (Table 2). Principle-based approaches that emphasize ethical dimensions are increasingly recognized as important for socio-ecological research and action (i.e. CBD 2004, van Kerkhoff 2014). Here, knowledges, actions, and ethics are inherently interconnected and mutually sustaining components that structure human relations with the biosphere (e.g. Jasanoff 2004). Knowledge does not just tell us about the world, it actively shapes how we act within it (Turnhout et al. 2016). While the principles are not concrete steps for action, we found that recognising and reflecting on the connections between knowledges, actions, and ethics through these principles provided a means for guiding decision making throughout the Initiative. Similar forms of reflexivity will be needed for those who adopt this agenda (Montana et al. 2020). We invite readers to take forward these principles and approach to revisiting biodiversity as a framework for querying their own decisions and actions when funding or contributing to the ongoing agenda.

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INSERT Table 2. Principles underpinning efforts to revisit biodiversity research and action

Thematic focal areas

This dialogue process identified four thematic areas and priorities for research and action over the next five years that contribute to the agenda's goal and catalyse broad engagement in the ongoing task of revisiting biodiversity. This is not an exhaustive list. These themes, and others, can be further developed following the iterative process of recombination and renewal. Each offers indicative questions that could inform transdisciplinary research on both the social-ecological dynamics and implications of change.

Revisiting biodiversity narratives

Narratives analysis can identify the values, histories, knowledge systems, and worldviews that shape how human-nature relationships are perceived, and offer insight into how biodiversity research and action could become more diverse, effective, and just. Narratives can be powerful, emotive stories that incentivize collective action (Rose 2018). Narratives are not neutral descriptions of reality: they frame issues, determine which actors are included or excluded, define cause and effect, assign culpability, and prescribe action (Stone 1989). Once entrenched, dominant narratives can be hard to supplant, even in the face of contradictory evidence (Roe & Eeten 2004). In revisiting biodiversity narratives, we identified three areas towards which research could productively focus.

1. **Bringing diverse perspectives and approaches to narratives together to enrich biodiversity research**: Focusing on narratives can enable "unprecedented listening" by questioning which knowledge sources hold authority, and what other knowledges and options these close down (Veland et al. 2018). Narrative analysis can facilitate productive dialogue among knowledge systems, including Indigenous and local knowledge systems, and disciplines across the arts, humanities, psychology, and cognitive science. The very individuals, communities, and people that are needed to diversify narratives too often have little opportunity to engage in privileged research processes. Widening participation can acknowledge histories of colonization that have erased biodiverse knowledges in order to address limited practices of consultation and exchange. Researchers could examine: *How can biodiversity research more effectively listen to and learn from narratives which have been traditionally outside of biodiversity research?*
2. **Empirical examinations of the narratives that underpin destructive systems:** Analysis of narratives can provide insight into underlying factors shaping human-nature relationships (Veland et al. 2018). There is an evident need to address structural racism and geographic biases within biodiversity research and practice more broadly (Editorial 2020; Burgman et al. 2015). Such analysis can unpack the narratives that perpetuate unjust and unsustainable outcomes, focusing on the distribution of costs and benefits of actions, and make explicit the power relations which may be naturalized in narrative. Future research could examine what makes dominant narratives authoritative and stable (Roe & Eeten 2004): *Why some narratives become authoritative and unquestioned while others are silenced or deliberately ignored, and what are the results?*

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3. **Exploring the role of narratives in imagining alternative futures and enabling transformative change:** Research on climate narratives shows how local narratives may catalyze more meaningful action than those adopting ideas of causality and solutions based on physical science representations (Krauß 2020). Narratives therefore provide an important foundation for creative and emotive ways of imagining the future. Researchers increasingly call for participatory processes to envision radically different and positive futures to overcome the limitations of technocratic approaches in motivating action (Veland et al. 2018; Pereira et al. 2020) and could examine: *How can narratives and narrative approaches be used to foster productive engagement with contested and uncertain futures?*

Anthropocene, biodiversity, and culture

This theme builds on research noting the potential of the Anthropocene concept (Arias-Maldonado 2020), to suggest that revisiting biodiversity necessitates greater attention to contextually appropriate and community-led innovations that accommodate diverse cultures and knowledge systems. Earth system science largely focuses on the novelty of pace, scale and complexity of human impacts on the planet in the Anthropocene and has informed research in the biodiversity and the sustainability science communities (i.e. Steffen et al. 2015). However, the transformative potential of the Anthropocene concept is limited when it simplifies complex change processes into a uniform narrative of a destructive humanity that does not consider diversity, equity, responsibility, and the economic drivers of social-ecological degradation (Dalby 2016). For example, growing evidence globally emphasizes the contribution of Indigenous peoples, knowledge systems, and practices in maintaining biodiverse ecosystems (Roe & Eeten 2004) through longstanding cultural and spiritual connections to their land and seascapes (Garnett et al. 2018). Yet, the value of culture in biodiversity conservation is underexplored. In revisiting biodiversity through this theme, we identified four core areas.

1. **Cultivating deeper understanding of interconnected social-ecological systems**: The majority of today's landscapes, cultures, and biodiversity co-evolved through place-based interactions between humans and non-human species (Rozzi et al. 2018). This diversity is intimately linked (linguistically, culturally, biologically) and mutually sustaining (Gorenflo et al. 2012). We call for continued research which examines the world's social-ecological systems (their origins, composition, functions, and dynamics) addressing the question: *What physical, psychological, and philosophical connections and conditions are important to shaping knowledges, actions and ethics about nature in different places?*

2. **Re-considering human agency, accountability, and responsibility in shaping the Anthropocene**: The importance of culture and history in conservation is underappreciated. Participation, resource distribution, and cultural recognition matter to biodiversity research and action, and raise important questions about justice (Martin et al. 2016). Research is therefore needed to explore the role of human agency in navigating the challenges of the Anthropocene, and alternative mechanisms of governance that can enable accountability and responsibility for problems where cause and effect are distributed across time and space (Burch et al. 2019). This research needs to account for variation in historical, present, and future accountability and

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responsibility by examining: *What are the governance actors and processes that can most appropriately tackle the fundamental challenges of the Anthropocene?*

3. **Developing solutions that embrace context-based knowledge and multiple values:** Research contributions should account for the loss of biological and cultural diversity as land use, diets, and biotic communities become homogenized (Khoury et al. 2014, Nyström et al. 2019). At its core, this research could recognize uncertainty due to a lack of analogous historic states as central to the Anthropocene. Research should examine the appropriateness of conservation interventions when things are no longer considered "stable, pristine and certain" (Head 2018) and human values more explicitly underpin justifications for action. Research is needed to identify solutions that embrace appropriate context-based knowledge and multiple values by considering: *What are the mechanisms of change (across scales and contexts) that can lead us towards more just, prosperous, and ecologically diverse futures, and who decides?*
4. **Balancing the needs for context-driven responses to widespread global challenges**: Local biodiversity and culture are impacted by globally interconnected social, economic, and ecological drivers (i.e. telecoupling, Liu et al. 2016). The Anthropocene presents a paradox: the challenges are global, but effective solutions require smaller scale, context-specific interventions. Recognizing this tension, we invite research that examines: *What modes of social and political organization might balance contextualized concerns that promote and support difference and desires for cooperation and coordinated responses that span sites and scales?*

Nature and Economy

Revisiting biodiversity in this theme, involves challenging existing economic models, exploring new financial responses to the biodiversity crisis, and catalyzing innovative ways of understanding and transforming global social-ecological systems. Economic paradigms that separate nature and biodiversity from social and economic systems have fostered a dominant way of valuing and relating to nature as a resource or capital for human production, consumption or exchange. The resulting patterns of production, trade, finance, and consumption drive biodiversity loss, economic degradation, and commonly prioritize particular interests over collective wellbeing, perpetuating social inequalities (IPBES 2019). Addressing the degradation of biodiversity includes transforming global economic systems alongside underlying narratives about how humans, economies, and biodiversity relate and depend on each other. We do not conceptualize nature, capital and economy as existing in an absolute sense, but instead use these terms to anchor discourse to promote particular relations between nature and society (Escobar 1998). For example, common definitions of biodiversity and nature denote discrete scientific phenomena separate from humans and the economy, which are seen as supported through stocks of accumulated capital. While widely used, these definitions promote extractive and competitive relations and logics that can inhibit transformation. We acknowledge the performativity of definitions and openly explore alternatives that define "nature" and "the economy" as fundamentally interdependent (Moore et al. 2014) through three core areas of focus.

1. **Challenging 'business-as-usual'**: Existing economic paradigms and models largely frame nature and economy as separate, supporting efficient resource use and economic growth rather than absolute reductions in consumption and ecological impacts (Otero et al. 2020). Despite growing

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evidence of negative social-ecological effects of dominant economic practices (IPBES 2019), political and practical change has proven difficult, particularly with respect to decoupling economic growth from biodiversity loss and inequality (Otero et al. 2020). To better understand the processes and powers that reinforce this separation in policy and practice, research is needed to investigate: *What factors underlie current economic paradigms and practices, how do they reinforce a separation of nature-economy relations, and how can these factors be reshaped?*

2. **Exploring incremental change**: Despite growth in initiatives seeking to account for biodiversity in market logics (e.g. Natural Capital, Payments for Ecosystem Services), these approaches often fail to achieve desired conservation or social outcomes at scale as they are not embedded in an enabling regulatory and economic environment and do not challenge the status quo (Hein et al. 2020; McAfee 1999). Research is needed to examine the impact of incremental approaches (discrete measures aimed at adjusting a given course of action) by improving methods to monitor and understand their efficacy from a long-term and integrated perspective, including investigating distribution of costs and benefits, leakages, substitutions, impacts across scales: *How incremental efforts can support (rather than inhibit) transformative efforts towards just, equitable, and sustainable nature-economy relations?*
3. **Catalyzing fundamental change**: The entrenched logic of the predominant global economic paradigm makes it difficult for research alone to destabilize the mental models, ideologies, assumptions and practices underpinning the economic drivers affecting biodiversity. Radical initiatives are emerging to reshape the global economic system to value nature using alternative and pluralistic narratives (e.g. post-consumerism, economies of sufficiency, degrowth, Universal Basic Services, Nature's Contributions to People (IPBES 2019; Portes et al. 2017; Raworth 2017). Such innovation has potential to create economic systems that are more resilient and conducive to environmental integrity and social justice. Research should examine: *How can diverse approaches to transforming economies be harnessed to counter dominant economic logics and nature-economy relations? And, how can research engage diverse actors in joint efforts to understand and reshape nature-economy relations, and what are the risks and ethical implications of such engagements?*

Enabling transformative biodiversity research and action

This theme focuses on the ways that individuals and institutions can enable transformative change in the ways we understand, value, and relate to human and non-human forms of life through embracing plural knowledges, values, and cultures. Transformative change is likely to involve major shifts in the underlying paradigms and values that shape technologies, governance, economies, and nature (IPBES 2019). Transformation is never apolitical: it requires careful scrutiny about who transformations are for, what is to be transformed, and how these things are to be decided (Blythe et al. 2018; Scoones et al. 2020; Pereira et al. 2020). The burgeoning literature on transformative change provides critical insights for transformations-oriented work for biodiversity (e.g O'Brien 2012; Westley et al. 2011). Some headway has been made in discussing how to transform conservation science for the Anthropocene (Colloff et al. 2017). Directing this work towards revisiting biodiversity, we identify four priority areas:

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1. **Learning from past transformations**: The agency and transformability of individuals and institutions are key to implementing structural, systemic, and enabling approaches to transformation (Scoones et al. 2020). We call for research that critically evaluates these broad approaches to transformations to identify common elements of previous transformations, so as to understand and unpack the current and future transformations by examining: *How have previous transformative changes to biodiversity occurred, and how can understanding these past transformations help us plan for the future?*
2. **Institutional and individual roles in transformative change**: The ability of individuals and institutions to enact transformative change are co-dependent and guided by their underlying ethics, paradigms, and discourses. Transformative change entails rethinking training for researchers and policy professionals, and the ideas that are privileged in pursuit of conservation agendas. This includes addressing structural racism and geographic biases within biodiversity research and publishing (Editorial 2020; Burgman et al. 2015), as well as the methodologies (Chilisa 2017) and Western academic structures (Nyamnjoh 2019) that de-value stories about nature relationships from diverse parts of the world (Nagendra 2018). Decoloniality is a long-term project that requires commitment to generations of scholars, practitioners and knowledge-holders to acknowledge past injustices and open up spaces for more active contributions from a fully diverse group (Tuck & Yang 2012). A more robust understanding of the interplay between individual and institutional change can enhance the transformative potential of biodiversity research (Moore et al. 2014). This leads us to pose a reflexive question: *How is our work contributing to understanding, or enabling, transformative change towards diverse, sustainable and just futures?*

3. **Inclusive and plural transformations**: Doing transformative research requires changes to how institutions fund, conduct, and value research and action. Despite increased calls for interdisciplinarity and incorporation of non-Western knowledge systems, traditional funding mechanisms tend to focus on research that is tightly bound to a singular disciplinary focus with clearly defined objectives and outcomes (Hakkarainen et al. 2020). More work is needed to examine what approaches to research and action can catalyze or block transformation, how to foster pluralism and diversity, and in particular how to make marginalized voices and scholarship integral to transformative biodiversity research (Tengö et al. 2014; Latulippe & Klenk 2020). As a starting point, this work could start with identifying practical means through which to rectify the structural inequalities and the extractive traditions of knowledge production that underpin (biodiversity) research (Editorial 2020). This requires knowing: *What tools, narratives, and approaches are needed to embrace a plurality in perspectives on what transformations should occur, and provide pathways for multiple futures that can coexist?*
4. **Research and action in light of uncertainty**: Transformative change processes are inherently uncertain as it is very difficult to know whether an event is transformative, and how a system will respond (Blythe et al. 2018; Pereira et al. 2020). New capacities for transformative thinking and learning are required to anticipate change and conceptualize alternative futures, so as to enable informed decisions in the present, while acknowledging inherent uncertainties of the future (Vervoort & Gupta 2018). We should examine: *How can we build capacities to anticipate transformations and still take action despite uncertainties regarding how social-ecological systems respond to change?*

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Towards sustaining diverse and just futures for life on Earth

The ongoing task of revisiting biodiversity will take many forms. This agenda is intended as an initial resource that offers a renewed vision of the *what* and the *how* of future transdisciplinary research and action for biodiversity and social justice. Of course, social-ecological issues have messy realities, can be conceptualised and researched in many ways and might lead to an array of desirable futures. As such, this agenda seeks to inspire, rather than prescribe, collaborative engagement between different sectors of society and academia. Privileging particular actions or strategies has consequences for who is empowered or marginalized, which forms of knowledge are legitimized, and what comes into view. The proliferation of 'silver bullets' in biodiversity research and action has created perverse social and ecological outcomes and perpetuated social inequalities. Moving away from the universalist and global tendencies that plague biodiversity research and action (Turnhout et al. 2016), this agenda is put forward with humility to be renegotiated and revised within localized contexts and concerns where tangible actions are critical to affect change. We encourage projects, institutions, and research endeavors to identify appropriate actions by engaging with, and critically reflecting on diverse perspectives, visions, and stakes to consider the costs, benefits, and implications of future biodiversity research and action. Ultimately, new directions of many kinds are needed to foster more integrated, inclusive, and transformative approaches to biodiversity research and action that will enable more diverse and just futures for life on Earth.

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Table 1. Iterative development of themes

Initial project themes	**Themes discussed at Biodiversity Revisited Symposium**	**Themes in this agenda**
1. Concepts 2. Narratives 3. Science 4. Governance 5. Systems 6. Futures	1. Justice, accountability, rights and equal representation 2. Biodiversity and intergovernmental processes 3. Transformative change 4. Climate and biodiversity 5. Economy, capital, nature 6. Anthropocene and	1. 1.Revisiting biodiversity narratives 2. Anthropocene, biodiversity, and culture 3. Nature and economy 4. Enabling transformative biodiversity research and change

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	biodiversity 7. Knowledge(s), identities and biodiversity 8. A new conservation ethic and practice 9. Individual change? Institutional change? Systems change? 10. Funding, structures and mechanisms of doing research 11. Scaling: out, up, deep? 12. Coexistence and/or competition 13. Poverty, inequality and colonialism 14. Politics, democracy and pluralism	

Table 2. Principles underpinning Biodiversity Revisited research and action

Principle	Definition
1. Pluralist	Recognizes that there are multiple ways of knowing, doing, and valuing life on Earth. Pluralism emphasizes the benefit that comes from this diversity of thought rather than forcing consensus or privileging dominant approaches (e.g.Colloff et al. 2017, Díaz-Reviriego et al. 2019; IPBES 2019).
2. Reflexive	Emphasizes the value of being open-minded and aware of our own assumptions and biases, to engage in ongoing learning and improvement. Reflexivity enables flexibility, adaptation, and innovation, and if required transformation, in the face of change (e.g. Pereira et al. 2020).
3. Humble	Compels us to listen to others, as well as speak, and to consider the ethical implications of our actions. Humility is vital in urgent and uncertain times, and can cultivate an awareness of the limitations of our knowledge and actions in a globally connected and complex world (e.g. Pianalto 2013).
4. Adaptive	Acknowledges that change is constant, unexpected, and often contested. Adaptability harnesses the ability to respond to changing conditions, perspectives and knowledges as they are encountered (e.g. IUCN 2016; Colloff et al. 2017).

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5. Pragmatic	Recognizes the need to work for common benefits in the face of uncertainty. Pragmatism emphasizes the value of gaining knowledge through practical experience, while engaging in conscious reflection on existing knowledge, habits, and beliefs (e.g. Robinson 2011).
6. Inclusive	Fosters meaningful participation of new or previously unacknowledged and/or underrepresented voices. Inclusivity values diverse contributions to change, and shared leadership in sustained and equitable outcomes (e.g. Tallis & Lubchenco 2014, Díaz-Reviriego et al. 2019).
7. Fair	Fosters a trusted and transparent system of allocation. Fairness engenders solidarity with and response-ability towards the diversity of human and non-human life on Earth now and into the future. This requires us to actively work against sources of injustice in research and practice (Borrini-Feyerabend & Hill 2015, CBD 2004).
8. Innovative	Embraces creativity and experimentation, and removes unnecessary barriers to exchanging and developing new ideas. Innovation recognizes learning beyond academic institutions, to facilitate open source solutions and knowledge exchange (e.g. Borrini-Feyerabend & Hill 2015).
9. Accountable	Denotes explicit and open responsibility for the (un)intended implications throughout the process of research and practice. Accountability emphasizes the need for a shared liability and commitment (Borrini-Feyerabend & Hill 2015).

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Figure Legends

Figure 1. The Biodiversity Revisited Approach

The cyclical process of recombination and renewal (a) shows how the thematic areas of this research agenda feed into an ongoing process of research, action, and reflection that enhances movement towards diverse and just futures for life on Earth (b).

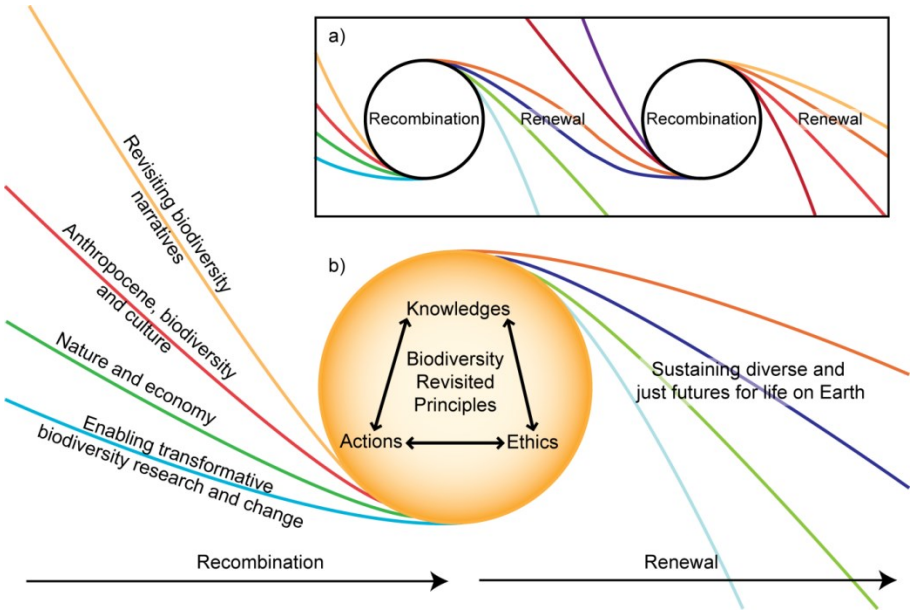
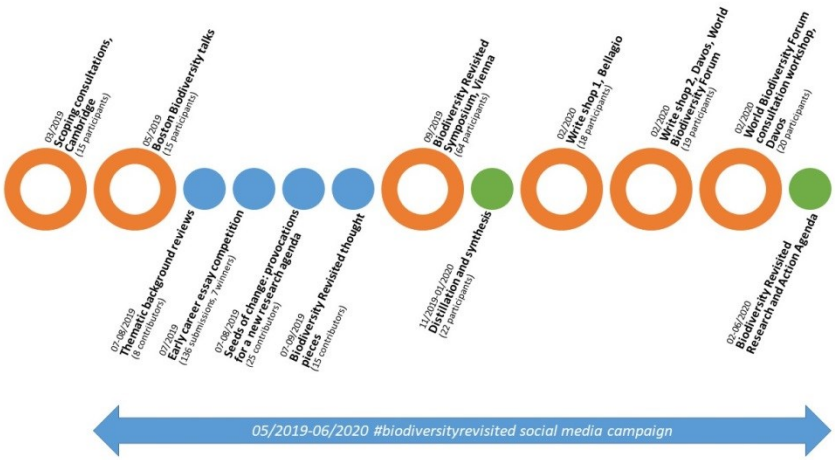


Figure 2. Timeline of the Biodiversity Revisited Initiative from February 2019 to June 2020

Orange hollow circles represent in person meetings, while blue circles represent written inputs to the process. The green circle represents a series of online meetings and discussions. The process involved close to 300 people in total, noting that the number of participants on the timeline is a total by event, there was a core group of around 5-10 who were present at events throughout.



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