

Seeds of change

Provocations for a new research agenda

Conference proceedings from the
Biodiversity Revisited Symposium

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The initiative is governed by a Secretariat, led by Melanie Ryan, and a Steering Committee chaired by Prof. Adil Najam (Pardee School of Global Studies, Boston University) and which includes Prof. Jon Hutton (Luc Hoffmann Institute), Dr Amy Luers (Future Earth), Prof. Jaboury Ghazoul (ETH Zurich), Prof. Bhaskar Vira (University of Cambridge), Prof. Georgina Mace (UCL), Dr Rebecca Shaw (WWF), Neville Ash (UNEP-WCMC), Dr Julia Jones (Bangor University) and Kristal Maze (SANParks).

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Introduction

The diversity of life that sustains humanity is being severely degraded by human action. This degradation is leading to a deterioration in land, air and water quality, loss of natural ecosystems and widespread declines in populations of wild species. These changes are well documented and of existential significance to human societies, yet significant knowledge about the problem has not catalysed effective broad-based action.

Biodiversity has not, generally speaking, proven to be a compelling object for sufficient action to halt the degradation of the diversity of life on earth. At the same time, the fragmentation of research and policy efforts into overlapping agendas – such as around biodiversity, climate, oceans, land degradation and sustainable development – has prevented the conservation community from developing a holistic approach to sustaining the diversity of life on Earth. Furthermore, the predominant focus of research on describing biophysical change does not provide the necessary insight into the social and policy dynamics that would facilitate effective action.

The [Biodiversity Revisited](#) initiative emerged in 2017 from a simple question: ‘what is wrong with biodiversity?’ leading us to ask if the decline in biodiversity is a problem, why have efforts to conserve it been ineffective? And is there a more inherent problem with the way in which ‘biodiversity’ is conceptualised and managed that undermines actions? These questions have spawned a collaborative endeavour, inviting leading thinkers and stakeholders within conservation and beyond.

Biodiversity Revisited is the first comprehensive review of the biodiversity construct since the term was popularised in the 1980s. The initiative aims to co-produce an integrated five-year research agenda that connects knowledge to how we enact a living future for Earth. The collaborative process seeks to raise new awareness and thinking about biodiversity, from concept through measurement to implementation, as well as looking critically at the narratives, science and systems that underpin it.

To help think through this challenge, 65 experts from 29 nations were brought together in Vienna in September 2019 for the ‘**Biodiversity Revisited Symposium**’, where participants began thinking creatively about the future of biodiversity. The collection of essays in these proceedings were provided to participants in the lead up to the event to stimulate debate and dialogue for the Symposium. This collection of essays is not a reflection of the outcomes of the Symposium; instead they were provided to participants in the lead up to the event to stimulate debate and dialogue. Authors were asked to think through six [themes](#) of concepts, narratives, science, governance, systems and futures related to biodiversity – or to address transcendent issues and respond to the following proposition statement:

Biodiversity has not, broadly speaking, proven to be a compelling object for sufficient action to halt the degradation of the diversity of life on Earth. At the same time, the fragmentation of research and policy efforts into overlapping agendas around biodiversity, climate, oceans, land degradation, sustainable development and so on has prevented the conservation community from developing a holistic approach to

sustaining the diversity of life on Earth. Furthermore, the predominant focus of research on describing biophysical change does not provide the necessary insight into the social and policy dynamics that would facilitate effective action.

The collection starts with abstracts from the essays and follows with two types of articles: **provocations** written by scholars and practitioners selected to present a range of views. The compilation also includes executive summaries of the **background reviews** commissioned on the six themes (concepts, narratives, science, governance, systems and futures), which helped to provide a common platform that builds on existing scholarship from a range of natural and social science disciplines. There are eight essays written by the winners of an [early-career competition](#) that the Biodiversity Revisited initiative ran in 2019, which attracted 136 entries from 46 countries. Winners of the competition were selected by a diverse panel of judges based on the quality, novelty and significance of their pieces. The winners were then invited to attend the Symposium to engage further in the debate.

The positions articulated in these proceedings are by no means exhaustive, nor are they meant to lead us to a new consensus or set of solutions. Rather, the intention of the collection was to catalyse a process to identify what questions could guide future research. They are meant as a springboard to build the foundations of thinking about how research, knowledge and action could play a more effective role in building a biodiverse 2030 and 2050. We hope that you'll enjoy reading and discussing them as much as we did.

Adil Najam

Chair of the Biodiversity Revisited Steering Committee; Dean, Frederick S. Pardee School of Global Studies, Boston University

Jon Hutton

Biodiversity Revisited Steering Committee member; Director, Luc Hoffmann Institute

Background review abstracts

Concepts: Elena Louder and Carina Wyborn

Concepts shape how a phenomenon is understood, discussed and managed within society so are a critical foundation for both research and action. Practically, concepts define both how we think about problems and how we formulate solutions. Much has been written about the concept of biodiversity, ranging from strong defence of the idea to criticisms that the concept has sparked a technocratic capture of myriad ways to understand nonhuman nature. In the context of unmet goals for biodiversity conservation, the concept of biodiversity has been problematised as an object of concern from various perspectives. This background review is an attempt to trace the origins, assumptions and problematic elements of the biodiversity concept and to reflect on the work that concepts do in general: the ways they shape our thinking, order our understanding of the world, and become the basis of institutions and governance. The review presents a brief history of the concept of biodiversity and its main critiques. It also reviews the ways that social scientists have analysed other related concepts, and then outlines possible future research directions.

Narratives: Elena Louder

Narratives shape human understanding and underscore policy, practice, and action. From individuals to multilateral institutions, we act based on the stories we tell ourselves and each other. As such, narratives have important implications for biodiversity conservation. There have been growing calls from the conservation field for a 'new narrative' to underpin efforts to address biodiversity decline, for example, calls for more optimism, or a more people centred narrative. This review presents some of the main contemporary narratives from within the biodiversity space to reflect on their underpinning categories, myths and causal assumptions. It establishes why narrative is important and offer perspectives from social science about the role of narrative in shaping human- nonhuman relations. Finally, I indicate productive tensions, unanswered questions and areas ripe for debate in a forward-looking research agenda.

Science: Megan Evans

What is the role of science in biodiversity conservation? Your answer to this question will probably be informed by your worldview, profession and cultural background. It may also be influenced by your disciplinary training and views of what is science and its place within society. Many would argue that science is utterly fundamental to the whole biodiversity conservation enterprise. How can we possibly know how to *do* conservation if we don't know where biodiversity is threatened, by what or how to most effectively mitigate these threats? In the spirit of the *Biodiversity Revisited* initiative, I will interrogate these fundamental concepts and questions, in addition to providing a brief overview of the key historical and emerging trends in conservation science. My hope is that by revisiting biodiversity science with a critical and curious lens, we can explore how science may be employed alongside other forms of knowledge to inform effective biodiversity conservation into the future.

Governance: Jasper Montana

The concept of governance can be understood as the various rights, rules, decision-making procedures, and programmatic activities that are developed to guide human actions in specific times and places. In the case of biodiversity, governance is often deployed to improve human relations with the natural world. In this background review, I offer an overview of the concept of governance and biodiversity for a general academic audience. To begin, I briefly outline the features of the world that are made visible through the concept of governance. From its focus on relations (such as between people and nature) to its explicit recognition of values in efforts to respond to environmental issues, the concept of governance emphasises things that other concepts such as 'policy' or 'management' may leave hidden. I explore how the concept of governance has been developed in research on biodiversity, including: governance as a source of solutions; governance as a source of problems; and the politics of governance. I provide additional background to understanding the architectures, modes and contextual conditions for governance. Finally, I explore what I consider to be some of the research frontiers that might be developed in future work.

Systems: Federico Davila, Roel Plant, Brent Jacobs

Systems thinking provides a comprehensive range of theories and methods which are useful for understanding and managing sustainability challenges. The utility of systems thinking stems from the rich history of theorising and testing methods that help identify connections, boundaries, emerging behaviours, and competing discourses that exist in social and environmental systems across a range of complex human and environmental challenges. Using Meadow's systems characteristics as an organising framework, we consider how systems thinking from different disciplines and philosophies have provided ways of understanding how system parameters, design and intent can be identified and analysed. We present a structured summary of the different systems literatures with selected case study examples of how systems thinking has developed and how it has been applied to a conservation context. Structuring the range of systems literature along parameters, intent, and design provides methodological guidance for using systems thinking across different domains of biodiversity conservation. We conclude with a set of lessons from the systems theories and methods that can inform conservation interventions that are supportive of diverse human understandings of biodiversity.

Futures: Carina Wyborn, Elena Louder, Mike Hartfoot, Samantha Hill

Global environmental change now, and into the future, will have a significant impact on biodiversity through the intersecting forces of climate change, urbanisation, human population growth, overexploitation and pollution. This means that biodiversity futures will be radically different from today. Integrating future concerns into current day decision-making is a challenge that transcends biodiversity. However, given that dominant approaches to manage or conserve biodiversity are largely reactive and backwards looking – seeking to conserve past or current assemblages of species or ecosystems in situ – planning for the future has motivated calls for conservation goals to be reconsidered. Moves towards more anticipatory, proactive approaches to decision-making for biodiversity must accommodate the many unknown and unknowable aspects of future social, political and environmental systems. Charting biodiversity futures is an inherently

normative agenda, these efforts have to confront political and philosophical questions about what level of loss is acceptable and how trade-offs can be made in ways that address the inherent injustices in the distribution of costs and benefits across and within human and nonhuman life forms. Futures thinking and anticipatory governance provide promising insights into ways to confront these challenges through explicit engagement with complexity, uncertainty and contestation.

Provocation abstracts

**** Denotes abstracts are from the early-career competition winners**

Bill Adams: It's not the terminology

It may be true that the word biodiversity is a problem, but this provocation explores a different hypothesis. What if the problem is that conservation, in its passion for charismatic species and spaces, does not really take the idea of biodiversity (the diversity of *all* life) seriously? A narrow view of biodiversity has several consequences. First, relatively few of the species and ecosystems most beloved by conservationists have an essential role in the functioning of the biosphere, so arguments that do are not very believable. Second, we lack a simple metric to show the implications of species extinctions for humans. Third, conservation's selective interpretation of biodiversity can seem marginal to everyday human lives (unlike climate change). Fourth, conservation struggles to focus on the fundamental causes of global biodiversity loss, the metabolism of the global economy and its engine, capitalism. We do not need new terminology, but to take the word biodiversity more seriously. We need to work out which elements of living diversity are critical to ecosystem function at every scale from puddle to biosphere, and refocus conservation attention on keeping them working.

Isis Alvarez: Balancing power – framing gender inclusive and effective environmental policy

Many years after the United Nations Human Environment Conference (UNHEC) in Stockholm (1972), when it was first recognised that human activities were having a severe impact on the environment, no resulting policy instrument or agreement has effectively addressed biodiversity loss, climate change and ecosystem degradation. Multiple factors including the big power imbalances and imposed 'conservation' programmes, invisibility of women's role in biodiversity conservation and sustainable use, and corporate capture of environmental policy, could be behind the lack of adequate solutions as they seldom recognise strategies outside market values. For instance, Indigenous Peoples and local communities' traditional knowledge and practices hold valuable contributions to address the current crises, however, limited support is given to them whilst 'business as usual' continues to attract significant funding without solving the problems it needs to address. Thus, a total transformation in the way environmental governance is structured, is urgently needed.

Madhurya Balan: Perceiving the living landscape we are within**

The essay invites the reader to consider a new definition for the landscape and living world that we are embedded in – the 'livingscape' – and to reimagine the language that we choose to feel and think about the relationships we have with our landscape.

Silke Beck and Tim Forsyth: Bridging science and culture

There is a growing attention to transformative change in biodiversity assessments. We argue that more consideration be given to both the normative values that define transformative change and to how

assessments themselves influence the understanding and implementation of transformative change via scientific knowledge generation. We argue for a need for more critical attention to the politics of participation within biodiversity assessments. Participation does not simply mean consultation of user groups but a much deeper engagement with how social values drive assessments and how they influence which acts of participation are considered sufficient. Since collective visions about the future are profoundly normative, they cannot be based only on scientific numbers and projected pathways, but instead need to reflect values relating to human wellbeing and acceptable risk in a self-critical and reflexive way. Assessments need to be less concerned about the inclusion or exclusion of actors within their processes and more about how included actors bring the perspectives of others into the assessment process and findings.

Sarah Clement: Culture, conservation, and the Anthropocene

In the Anthropocene epoch, pressures from climate change and land degradation are magnifying the already rapid rate of species loss, which are also causing the transformation of highly valued landscapes – socially, economically, and ecologically. Many of these landscapes are transforming into novel ecosystems where new species, interactions, and ecological functions are creating ecosystems unlike anything seen before. Whilst these landscapes can be managed to provide multiple values, doing so requires us stepping outside of conservative notions embedded in biodiversity policy and conservation practice, which anchor objectives to preserving ‘ideal’ historical states. There is palpable anxiety around ecosystem transformation, with many raising questions not only about the science, but also around who decides, how we should act, who is responsible, and even why we take action. At the opposite end of the spectrum are authors who feel this debate is mostly irrelevant, particularly in parts of the world where cultural landscapes are central to conservation policy and practice. This essay explores the connection between culture and conservation, arguing that shifting baselines are so prevalent that they will inevitably challenge the norms underpinning conservation, whether they are based on pre-human settlement ideals or connected to long-standing human activities. Although cultural resistance to change in society at large has received a great deal of attention, the cultural resistance of experts may indeed be keeping the conservative in conservation.

Sandra Diaz: Why care about nature? A pluralistic agenda for biodiversity

The meaning, framing and social implications of ‘biodiversity’ have transformed dramatically since the 1970s from a purely biological concept of academic interest to a boundary object at the heart of social negotiation dynamics. I summarise the milestones in this transformation within the context of broader narratives about people and nature. I argue that a shift in emphasis from a purely biophysical and numerical concept towards what nature means, and how it matters, for different people should help putting it in a higher position in policy agendas.

Kevin Elliot: The values embedded within scientific language

Philosophers of science have emphasised a number of ways in which science can be 'laden' with social and ethical values. One important way is through the concepts and terminology that scientists employ and the manner in which they frame their work. Within the context of environmental research, choices around scientific language can influence the future course of scientific research, alter public awareness or attention to environmental problems, affect the attitudes or behaviour of key decision-makers and change the burdens of proof or kinds of evidence required to act in response to environmental concerns. Scrutinising the concept of biodiversity from this perspective suggests that it may be value-laden in socially unhelpful ways. Most importantly, it may facilitate a problematic separation between concerns around nature and those around human wellbeing. Exploring conceptual schemes and frames that more successfully emphasise connectivity between human wellbeing and the ecosystems that they are a part will help generate more effective action to alleviate environmental problems.

Ursula Heise: Toward a new narrative

Biodiversity is not only or mainly a scientific, but also a widely debated cultural issue. Narratives about biodiversity loss across different cultures generally obey a shared proxy logic: certain charismatic species are taken to be proxies for all species, species are understood to stand in for biodiversity or ecosystems at large, and biodiversity itself typically becomes a shorthand for what particular communities value about nature. What is lost from nature is reinterpreted as something that the community itself lost from its collective identity, usually during processes of modernisation or colonisation. Narratives about biodiversity loss, outside of science and often even within it, are therefore also narratives about cultural identity and its historical changes. Biodiversity conservation stands a better chance of success through the understanding of and engagement with these narratives. Narrative analysis ultimately encourages a conceptual shift from biodiversity conservation to multispecies justice: debates about what it is right to do by other people and by other species, and what to do when ideas of justice diverge.

Gretchen Henderson: Listen for a pelican, owl, gull, hawk and chickadee

Can we write 'climate change' without causing readers to get stuck on the assumption of destruction? Like a bird getting stuck in a tar seep, we can get stuck in one way of perceiving the world. Humans may be lucky enough to avoid a sticky death trap, but may not notice ourselves getting stuck in a mode of thought, in a single frame of reference, in a single narrative. This piece examines narrative strategies around biodiversity. To rethink narratives, how can we rethink our place in the world? How can our narratives better accommodate metamorphosis and the unexpected, rather than fossilise around forms like apocalypse, prophecy, elegy and tug-of-warring tropes of progress and loss? Can we cultivate care around environmental aspects often neglected or dismissed as 'ugly,' like a tar seep or a dead sea? Can we move beyond a singular narrative and its correlated metaphors to multiply possibilities, make connections and ask: what else are we not perceiving here and elsewhere? What narratives may emerge from more listening: to one bird, to another and each other?

Jonathan Hutton: Biodiversity and the biosphere: can we rebuild a coherent system?

We invented the 'biodiversity' construct a few decades ago and have had significant success in using it as a tool to measure trends, characterise a crisis and monitor how the natural world is getting along over time (it is declining alarmingly). Despite generating a notable presence in the scientific community, we have had much less success in mobilising society to take real action to address the emerging crisis. This essay considers a range of possible reasons why biodiversity has failed to mobilise sufficient traction beyond the conservation community and considers the potential opportunities and pitfalls that come with putting biodiversity alongside the climate agenda. It concludes by suggesting two critical courses of action for supporting a more integrated approach to support life on Earth.

Ray Ison and Ed Straw: Systemic 'biodiversity' governing

Stemming biodiversity loss requires taking responsibility for the quality and trajectory of unfolding social-biosphere dynamics through transformations to systemic governance. Existing systems are woefully inadequate for the task at hand – from preferential lobbying by big business corrupting decision-making to conventional economics treating the 'environment' as an externality. Biodiversity will continue to decline without the reinvention of governance at all levels. We propose a new model through the addition of the 'Biosphere', 'Technosphere', and 'Social Purpose' to the contemporary governance model. This would place biosphere-human relations at its centre, with the invention and enactment of new institutions for social purpose, using expressions of democracy going far beyond electoral representation. Biodiversity conservation is dependent on co-design with local actors – it cannot succeed from a remote desk. In turn, this will mean taking responsibility for the framing choices applied to situations of concern as the first critical steps for thinking differently; incorporating multiple perspectives; and designing for purpose. Designed human activity systems to carry out these steps will come in many forms. All will need systemic sensibilities characterised by relational thinking and practice, investment in systems literacy and the deployment of STiP (systems thinking in practice) by co-designers and enactors of new governance systems.

Santiago Izquierdo-Tort: Bridging aspirations and conservation in research and practice**

Effective action to address massive biodiversity loss worldwide has not been achieved despite well-documented effects of the existential significance of biodiversity to human societies, as well as several decades of experiments with 'sticks and carrots' for environmental protection. The field of biodiversity conservation seems to be running out of ideas to protect its very being and the world's biological diversity is certainly running out of time. In this essay, I propose that reconceptualising biodiversity research and practice in terms of 'aspirations' – broadly understood as people's hopes or ambitions of achieving certain goals – opens an unexplored space for ideas and solutions to help protect the world's biodiversity. In developing this provocative idea, I highlight how a focus on aspirations helps to overcome two important limitations of previous conservation interventions – namely short-term scope and superficial underpinnings of human behaviour – and how it offers a novel and useful analytical lens for biodiversity conservation research that leads to the design and implementation of more effective and resilient interventions.

Natalie Knowles: When is growth good enough? **

In the absence of rights, Nature is primarily thought of as a resource for use by rights-holding individuals and corporations, where inflicted environmental damage often goes unnoticed. We have over-consumed and under-paid Nature to a point of unprecedented biodiversity and habitat loss, greenhouse gas emissions leading to global climate change, and a pervasive plastic pollution problem. To return the balance of consumption and regeneration, Nature must be given rights. With rights comes a voice and a legal stance to tell corporations their consumption has reached a state of good enough and demand payment for excess damage. Whilst degrowth and economic restructuring, where achieved, may provide larger-scale systemic change, the rapid timelines to stop our current environmental crises means we may not have sufficient time to pursue this. Instead, giving Nature legal rights would be a simple and effective mechanism, compatible with our current capitalist socio-economic system, which could incentivise individuals and corporations to operate within our planetary boundaries and help rejuvenate Nature if they exceed them.

Eszter Kovacs: Rethinking biodiversity before the law**

‘Revisiting’ how we do biodiversity conservation demands active political engagement and asking questions around political economy and the development of pluralistic rights of nature in public law. This essay examines why conservation’s pursuit of project-based interventions replicate environmental and social injustices and goes on to suggest that developments in rights-based environmental law can provide a potential framework through which conservation may achieve the ‘effective broad-based action’ that it seeks.

Sharachchandra Lele: From elite wildlife-ism and ecosystem service jugglery to an inclusive environmentalism

The term biodiversity conservation is a catch-all encompassing different components of the biotic world: wildlife, wilderness or pristine nature that provides us with non-material, spiritual or aesthetic wellbeing, biological products and processes that provide food and other materials, and regulatory services that underpin our life. Wildlife lovers were honest in their love for megafauna and did not claim that everything in nature was worthy of saving. The ecosystem services formulation cloaked this wildlife love in instrumental arguments, forgetting that much of wild nature is instrumentally useless, and some even dangerous. Re-engaging with ‘honest’ wildlife conservation, one can discuss the criticism about its elitism head-on. Conservation becomes elitist when it ignores other ethical values that we all hold. These include value for our survival and material wellbeing and that of future generations, and, importantly, value for fair distribution of costs and benefits and democratic decision-making. Even the most ardent wildlife lover takes electricity, refrigerators and mobile phones for granted. Fairness then demands that we must support that lifestyle for all human beings. This will involve trade-offs between material wellbeing, wildlife, and essential resources and services for the future, which must be resolved democratically. Rather than presume all biodiversity must be saved and then making up arguments for doing so, we can then engage in an honest, inclusive environmentalism.

Jamie Lorimer: Going probiotic

The Anthropocene marks an ‘antibiotic’ age’ caused by systematic efforts to rationalise and control nonhuman life. It also heralds the growing anxiety about the blowback caused by the loss of ecological function and resilience. This article reflects on the rise of probiotic alternatives to managing life, where probiotic describes proactive efforts to use life to manage life so as to manipulate ecological interactions to secure desired services. It offers a narrative of a probiotic turn that is underway across a range of policy domains, identifying common scientific foundations before highlighting some political challenges to this future vision. It focuses in particular on the rise of rewilding as an alternative model of conservation that claims to overcome some of the problems associated with the concept of biodiversity. It identifies the potential of rewilding to deliver benefits to human and nonhuman life and also draws attention to its distributional impacts for both the humans and the animals that will be caught up in this new model of environmental governance.

Georgina Mace: Where to next for biodiversity science?

Biodiversity science has developed, broadened and deepened over recent decades but there are many different perceptions of what its core focus is – especially the extent to which it is a science, a conservation mission or a policy focus. This situation is different in climate change science – arguably a comparable area of science and policy – but one where there is a much clearer understanding of what the science is about and why it is important. I unpick some sources of confusion. I argue against equating biodiversity with life on Earth – against conflating biodiversity with ecosystem services – and I reject a narrow focus on metrics and observations. I argue for a three-pronged approach. The fundamental science of biodiversity is about understanding the origins and maintenance of the diversity of life, irrespective of people’s immediate needs and demands. This topic, important on its own, needs to be confronted with a much clearer articulation of human needs and demands; what are the forms, functions and scales of diversity that we need, or whose loss places our life support systems at the greatest risk? Given the importance of the challenges, there then needs to be a serious ramping up of efforts to deploy the very best science to develop technologies and tools to discover, document and find solutions to biodiversity loss and embed biodiversity science as a core component of sustainability science on a changing planet.

Anselmo Matusse: The art of living in threatened worlds**

In this essay, I explore villagers’ relationship with Mount Mabo, the River Múgue and Mount Muriba located in Zambézia Province, central Mozambique. After Mount Mabo was ‘discovered’ in 2005, it soon became a ‘biodiversity hotspot’. With the increasing occurrence of extractivism, coupled with the extinction of local species of flora and fauna on a massive scale, Mount Mabo is considered an important biodiversity hotspot. However, this ‘conservationism’ intersects with colonial legacies, civil war, socialism, state failure and neoliberalism – and by default ignores villagers’ modes of relating and knowing Mabo. I argue that Mount Mabo is connected to the villagers through kinship networks, spirituality, and the *mwene* (local leader) based on the ethics of *ori’a* (respect) in which Mabo is much more than a ‘biodiversity hotspot’, but

a moral entity. In this essay, I will debate the potential for convivial conservation connecting the NGOs' and scientists' work with the villagers' modes of living, beyond the current landscape of violence and suspicion.

Juliana Merçon: The last biocultural frontiers

Not all cultural groups co-existing on the planet are accountable for the social-ecological crisis that currently defies the whole of humanity. Making clear connections between biological diversity and cultural diversity is an important step towards a more holistic understanding of the types of human activities, knowledge, governance systems, and values that underpin social-ecological pathways towards conservation. Indigenous and local communities' sustainable practices contribute to biodiversity beyond their landscapes. Biocultural perspectives highlight these different forms of relationship with nature, as well as the economic and political inequalities that lie at the basis of intercultural exchanges and environmental conflicts. Key areas of biocultural diversity are under intense dispute, with a great number of indigenous, local communities facing challenges such as land dispossession and impacts caused by development projects and industrial enterprises. The transformative potential of the biocultural perspectives used by scientists, local communities, civil society organisations and policymakers rests on their ability to understand and effectively deal with power relations. Recognition of biocultural diversity, multi-actor engagement, and peoples' rights to self-determination are presented in this commentary as some of the means by which biocultural approaches can contribute to changing existing power structures, whilst promoting social justice and protecting biodiversity.

Sarah Milne: Corporate nature

The way we conceptualise biodiversity and the organisational forms that we deploy to conserve it together shape nature. Here, I explore the kind of nature that emerges from dominant approaches in global conservation – those practiced by big, international, non-government organisations (BINGOs). These groups consume and channel a significant portion of available conservation funding and they often generate the loudest voices on global biodiversity. After more than a decade of ethnographic observation and practical experience within these BINGOs, I propose that they are generating a form of socio-nature that I term corporate nature – that which emerges from the technocratic, bureaucratic, neoliberal and power-laden practices of mainstream global conservation. These practices are now endemic within the organisational structures and cultures of the BINGOs: business models are the norm, branding is fundamental, market-based and technocratic solutions are naturalised, and the appearance or performance of success underpins both organisational survival and the generation of financial value. Ultimately, this is a form of governance that relies upon a deep politics of knowledge, including the production of ignorance in relation to complexity, diversity, and contestation. Corporate nature therefore risks being top-down, impervious and homogenous. This calls for a rethinking of how global conservation works to produce socio-natures that inspire and sustain life.

Noor A. Noor: Sex, drugs & biodiversity**

With growing recognition of the importance for transformational change to prevent ecological destruction and climate collapse comes the need to identify and address root causes through multidisciplinary approaches that transcend the traditional boundaries of conservation. This essay proposes 'intersectionality' as a theoretical approach to conservation, incorporating a multitude of social, economic and political struggles that intersect different communities and the disciplines they have formed to achieve social and ecological justice. Using 'sex, drugs, and biodiversity' as a set of guiding themes, we can consider a number of critical intersections for the wellbeing of nature and people, highlighting potential opportunities for synergies and collaborations to address a number of interconnected struggles. Illegal wildlife trade (IWT) of some plants and animals is driven by growing demand for their consumption, highlighting the need to contextualise the trade within nutritional security, agriculture, and culinary heritage. Wild species are sometimes consumed for their perceived sexual health and fertility benefits, which may indicate a need to address this trade within the context of public health, gender, and sexuality. Conversely, the recent militarisation of conservation to combat poaching risks injustice resembles the Global North's 'war on drugs'. From here, we shed light on different global movements and cultures calling for a reformed approach to cannabis and psychedelics, embracing their potential for increasing connectivity between nature and people, and broadening the scope for how we communicate conservation.

Emmanuel Nuesiri: Biodiversity conservation, mindfulness and the future of humanity

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)' recent global assessment report, provides some bleak highlights. Among its most alarming findings are that 'nature is declining globally at rates unprecedented' and radical transformative changes are needed to halt this catastrophe. How would this happen in a context where powerful interests wish to maintain the status quo? The starting point is a diagnosis of the problem that looks beyond the symptoms. This piece draws attention to our lack of mindfulness as a fundamental problem we need to address. Mindfulness results from using all our senses (sight, sound, smell, taste and touch) to understand our world. It is to be fully present and not mindlessly sail on autopilot as we engage with people and planet. In this regard, Howard Gardner's 'five minds for the future' is a helpful tool for promoting mindful engagement with biodiversity. These are the disciplined, synthesising, creating, respectful, and ethical minds. Employing this tool, agile conservation institutions, working with local conservation leaders, can move policy makers to go beyond designing biodiversity action plans, to developing effective follow through adoption frameworks.

Unai Pascual: Why do we need a more pluralistic approach to valuing biodiversity?

The 'value of biodiversity' is a fuzzy concept that is hard to convey to policymakers. Transformation to a just and sustainable future requires recognition that biodiversity may not only mean different things to different people, but also that its associated values are diverse and often incommensurable. If such diverse values are not adequately captured in decision-making, conservation strategies may not only fail but will likely perpetuate a skewed distribution of benefits (winners) and burdens (losers) in society. Here, I provide some insights around the diversity of values of nature, which go beyond the dichotomy of intrinsic

versus instrumental values, and call for addressing relational values of and about nature. I also posit that in situations of conflict around the use and conservation of biodiversity, valuation of biodiversity should pay more attention to the different and often opposed cognitive models that social actors have when they (implicitly or explicitly) articulate the worth of biodiversity.

Victoria Pilbeam: Revisiting conservation through evaluative thinking **

The goal of this essay is to bring together evaluative thinking and conservation to aid our understanding around the failures in our current models of conservation practice and to inform a brighter future for biodiversity conservation. This essay demonstrates how evaluation and evaluative thinking can redefine not only the way that we understand the impacts of specific conservation interventions, but also how the wider conservation narrative shapes these activities. I articulate the ‘theory of change’ underpinning the dominant conservation narrative and argue that evidence indicates these core assumptions have not held; for conservation to succeed, it must develop a more robust theory of change. I offer some initial guidance on how the conservation community might develop a stronger theory of change to inform a more effective conservation agenda – through considering a wider group of conservation stakeholders, being explicit about the normative stance and assumptions behind this theory of change, and committing to only undertaking impactful conservation work.

Sarobidy Rakontoarivo: Conservation is not working

Forest conversion to agricultural land is both a major driver of biodiversity loss in the tropics and a means by which local dwellers may claim customary tenure for subsistence use. As such, conservation restrictions may have associated impacts on local use and access, which can have significant impact over many generations. If conservation is to do no harm, these costs must be compensated, particularly where state and customary tenures strongly conflict. When conservation restricts illegal activities, identifying who may be eligible for compensation – and how much – can be extremely complicated. Community forest management has been suggested as an alternative approach to less inclusive ‘protected area’, but evidence indicates that this approach has not delivered adequate compensation and is ineffective at solving the conservation crisis. Financial mechanisms might offer a solution but are problematic where forest users are not legal landowners. Securing local forest tenure with complete rights over forestlands can help tackle many of the above problems and should be addressed at the outset of all conservation efforts. Devolving tenure may come with many challenges, including how to decide who owns what, but securing tenure can build local community stakes in protecting natural capital against outsiders and deliver more effective biodiversity conservation.

Martin Reynolds, Joss Lyons-White, Andrew Knight: Systemic failure and the ‘Iron Triangle’ of conservation practice

Existing biodiversity conservation practice systems are not fit for purpose. The term “systemic failure” is often used to describe such dysfunctional systems, but often with little insight as to which attributes contribute to the failure. Drawing on a tradition of systems thinking in practice, viewing conservation practice through the idea of a ‘system of interest’ can illustrate where failure of practice may be present,

and where action might be directed to correct the failure. Conservation practice is here rendered as an iron triangle; a malign system that perpetuates failure. One of the dysfunctional attributes of conservation is the propensity for practice ('doing') at the expense of thinking ('knowing'). A core attribute of systems thinking in practice is the duality between being systemic (thinking holistically) and systematic (enacting systems amongst practitioners). In this essay, notions of 'knowing' and 'doing' are examined as synonyms for thinking and practice. One aspect of a malignant iron triangle might be characterised as manifesting a dualism rather than a duality. A dualism exists when there is a focus on either 'knowing' or 'doing', thinking or practice. Good systems thinking in conservation practice ought to exhibit a continual duality between being systemic and being systematic. The essay invites suggestions on what may constitute a more benign systemic conservation praxis.

Tlacacl Rivera-Núñez: Writing over that which is already written **

Not all significant large-scale environmental transformations by human societies are intrinsically destructive. Throughout the world deliberate, controlled, intermediate physical and/or biotic disturbances (or transformations) by local cultures using environmental management practices have been documented which result in positive cumulative effects for natural systems. Over centuries and even millennia, these cumulative effects mould cultural and domesticated landscapes. Successive layers of environmental change on to these landscapes may be understood using the concept of 'palimpsest' – re-recorded or written over that which has already been written. In many of these constructed or 'second world' landscapes, human-mediated disturbances impact habitat quality leading to new ecological niches and contributing to landscape heterogeneity. These disturbances can also favourably modify source-sink population dynamics (how variation in habitats affects population size) and wildlife migratory patterns in high connectivity matrices, as well as the species diversity of different habitats. Indigenous Peoples – with a long history in a given landscape and with established livelihood systems which directly depend on these landscapes – have developed a variety of cultural expressions which are interdependent with biodiversity. Based on initial theorisation focusing on the concept of palimpsest, I present guidelines for connecting research programmes to biodiversity conservation efforts with an historic and biocultural focus. Given 21st century challenges the 'ecological handprints' of many Indigenous Peoples represent a human legacy which allows for reconceiving biodiversity conservation in a previously written world.

Dilys Roe: Should we, could we, adapt to biodiversity loss?

Discussions around the post-2020 international framework for biodiversity have focused on targets and actions. Projections have been made around different parameters, including how much land area could be restored, or how much natural habitat still exists and should be retained. These discussions focus on reducing – or halting – the rate of biodiversity loss. However, there has been no discussion on adaptation to biodiversity loss. For many years, adaptation was considered a taboo subject within climate change diplomacy, with international efforts focussed on mitigation primarily through emissions reductions. In 2002, the 'Delhi Declaration' called for greater attention to adaptation on the basis that damaging climate events would occur regardless of mitigation efforts. This provocation asks whether that turning point has

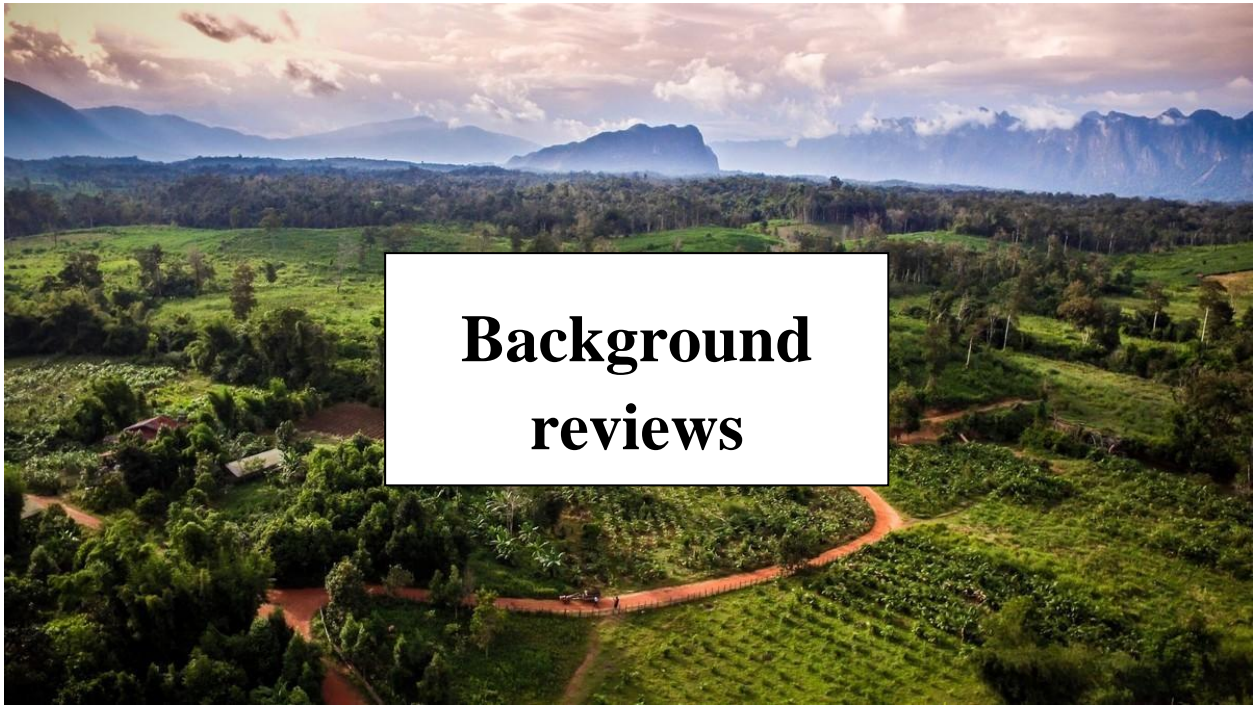
arrived for biodiversity diplomacy, and if not, should it? Human society has already adapted in different ways to biodiversity loss; through changing behaviour, diets, technological advances, or more controversially through synthetic biology or de-extinction. A key issue seems not so much to be the *potential* to adapt to biodiversity loss, but rather the *feasibility* given that the regions of highest biodiversity loss coincide with areas of high poverty – areas that are least able to afford the manufactured or technological options currently on offer.

Chris Sandbrook: From passion to professionalism and back again

The conservation movement has become increasingly professionalised in recent years. This has been achieved through the development of standard operating procedures, financial safeguards, targeted training courses and new ways of framing conservation, among others. In some respects, the benefits of this approach are clear. However, biodiversity has continued to be lost and radical new social movements that are not at all professionalised have achieved remarkable public and policy traction in a short space of time. This article asks whether conservation may have taken professionalism too far, at the expense of the passion and desire for change that initially brought people to the movement. It concludes with a call for the mainstream conservation movement to form stronger strategic links with radical movements and to find ways to learn from them.

Esther Turnhout: Inclusive knowledge for biodiversity governing

This essay takes the fundamental entwinement of conceptualising, classifying, measuring and governing biodiversity as the starting point: biodiversity knowledge shapes how we govern biodiversity and vice versa. This is not just a philosophical point but also a practical one: it has historically been the mission of ecology and conservation biology to generate knowledge that can inform conservation policy and management. We have witnessed a parade of different concepts that have been used to present and package knowledge in such a way to inform what are considered desirable policy measures. In this essay, I will use the examples of natural resources, wilderness, species, and ecosystem services to discuss how these concepts have informed biodiversity knowledge and governance. Subsequently, I will discuss how biodiversity knowledge-making can be innovated to enhance its societal and democratic legitimacy.



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The following six executive summaries are extracted from in-depth, background reviews¹ that were commissioned from leading scholars on the six themes related to Biodiversity Revisited: concepts, narratives, science, governance, systems and futures.

¹ The full background reviews are not included in these proceedings.

Concepts to shape thought and action

Elena Louder and Carina Wyborn

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Concepts shape how a phenomenon is understood, discussed and managed within society so are a critical foundation for both research and action. Although concepts can come to seem common-sense or be taken for granted, they contain particular understandings of the world and necessarily highlight some elements of a situation while rendering others invisible¹, in short, they define both how we think about problems and how we formulate solutions.

Much has been written about the concept of biodiversity, ranging from strong defence of the idea to criticisms that the concept has sparked a technocratic capture of myriad ways to understand nonhuman nature. In the context of unmet goals for biodiversity conservation, the concept of biodiversity has been problematised as an object of concern from various perspectives. This background review is an attempt to trace the origins, assumptions, and problematic elements of the biodiversity concept and to reflect on the work that concepts do in general: the ways they shape our thinking, order our understanding of the world, and become the basis of institutions and governance. The review presents a brief history of the concept of biodiversity and its main critiques. It also reviews the ways that social scientists have analysed other related concepts, and then outlines possible future research directions.

The emergence of biodiversity

The term 'biodiversity' emerged in the late 1980s and came to global prominence through publications like the Global Biodiversity Strategy and the Convention on Biological Diversity (CBD). An authoritative definition of the term comes from the CBD text and refers to diversity within and between species and of ecosystems. In his history of the concept, Takacs² details how biodiversity became more prominent than concepts like nature, wilderness, or endangered species because it maintains a scientific aura and yet is open to interpretation. According to Takacs, the term has always carried within it normative assumptions: it articulates a particular understanding of crisis based on ecological science and laments the destruction of life on earth. It is the primary focus of the field of conservation biology, which in itself also mixes scientific knowledge with normative commitment to halt the loss of biodiversity. From NGO mission statements to UN programmes, biodiversity has come to anchor vast networks of institutions and policy on global scales³. As such, the concept of biodiversity presented not just a new word for nature but grounded the institutionalisation of a new scale on which to think about humans and nature.

Scholars and conservation practitioners have criticised the concept on various fronts. On one pragmatic level, scholars argue that it appeals to a limited range of actors because it is too technical, specialised, and

inaccessible⁴. Others look at the concept from a more critical viewpoint, for example, suggesting that it has become been subsumed by instrumentalist arguments. Some scholars argue that in presenting it as synonymous with ecosystem services, the concept has become merely a veneer for economic logic⁵. Another area of criticism originates from Anthropocene discourses which fundamentally problematise the human-nature dualism at the core of biodiversity and conservation biology. Such thought insists that taking the idea of the Anthropocene seriously means acknowledging that there is no objectively knowable nature that is separate from humans and thus might make space for multiple conceptualisations of humans and nonhuman nature. While some scholars advocate for a new term that represents a similar concept, others argue for a widened interpretation of the idea of biodiversity that more fundamentally acknowledges the inextricable entanglements of humans and the rest of the planet.

Why concepts matter

Critical reflection on the concepts we use may unearth the ways these phenomena open up and constrain possible solutions. For example, scholarship on the 'environment' has detailed the ways that the very concept is premised on human-nature dichotomy. Similarly, critics of the concept of 'sustainable development' argue that built into this concept is the insistence that everyone everywhere conforms to capitalist development, suggesting the very term may contain assumptions inimical to its goals. Other voices from the conservation field show how certain concepts can imply trade-offs. For example, the concept of ecosystem services has mainstreamed the idea that human society needs a healthy planet, yet at the same time often resorts to a fairly limited range of actors (economists and ecologists) as the sources of expertise.

Concepts can also play the role of boundary objects⁶, or ideas used by distinct groups that might disagree on their precise meaning, but which allow for communication and consensus across academic or practical boundaries. For example, resiliency has been thought of as an idea where diverse actors can coalesce, yet this has been accompanied by a dulling of the scientific precision of the term⁷. Other scholars take a more philosophical approach to familiar concepts, like Foster et al.¹, who draw insights from anthropology to show how a taken-for-granted concept like 'land' could be seen as an animate being rather than a tradeable commodity.

One theme running through many critiques is the ways that concepts may limit the means for transformative resistance; although at face value, the concepts of 'environment,' 'sustainable development,' and 'ecosystem services' defend nonhuman nature, they limit the vocabulary for dissent and may ultimately fold it into dominant discourses.

Research frontiers

Social scientists illustrate how the concepts we use delimit what is possible and thinkable. One potentially fruitful direction could explore the tension mentioned by Brand and Jax⁷ between inclusion and precision. These authors suggest that while flexible interpretation of a concept may accommodate a greater variety of perspectives, this may come at the cost of conceptual acuity and precision. Future research could consider trade-offs between promoting biodiversity as a boundary concept where diverse actors can

convene and making it so malleable as to render it useless. Such research could consider whether the concept needs to be reinterpreted or replaced. However, as this review implies, there are many concepts already populating the conservation space. Thus, future research should also carefully consider if adding another concept will enrich conversations or confuse and distract. Future research could also engage with the provocation from critical Anthropocene thought, which suggests that Western, scientific ways of knowing could be brought into dialogue with multiple, non-Western ways of conceptualising nonhuman nature. We hope this review will inspire critical reflection and reflexivity on the concepts we use to think about biodiversity conservation in the development of a forward-looking research agenda.

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Time for a new narrative?

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Narratives shape human understanding and underscore policy, practice, and action. Narratives also structure individual cognition¹ and support the formation of laws, policies and funding streams². From individuals to multilateral institutions, we act based on the stories we tell ourselves and each other; it is compelling narratives, rather than reason, that drive much human action³. Narratives therefore have important implications for biodiversity conservation.

As biodiversity declines, despite established multilateral commitments and agreed-upon aspirations like the Aichi Targets, many voices from the conservation field call explicitly for a 'new narrative'. This review engages biodiversity with narratives to provide a basis to reflect on the categories, myths, and causal assumptions that make up conservation narratives. I establish why narrative is important and offer perspectives from social science about the role of narrative in shaping human- nonhuman relations. I also present some of the main contemporary narratives from within the biodiversity space. Finally, I indicate productive tensions, unanswered questions, and areas ripe for debate in a forward-looking research agenda.

The roles of narrative

Scholars from diverse disciplines examine the work that narratives do. On a pragmatic level, literature from conservation science focuses on narrative as a way to connect people to a cause. In a typical example, Rose⁴ argues that conservationists need to hone the "science of story-telling" and present narratives which resonate with people on emotional and personal levels, rather than a string of easily ignorable facts. This view takes narrative as a method to convince people of the importance of a given set of aspirations.

In contrast, other scholars examine the power of narrative to uphold, produce and reproduce power structures and hegemonic ideologies. Development studies scholars in particular examine how global narratives may caricature local actors as either victims of outside influence or as destructive and backwards, each leading to external, top-down solutions and rendering local level complexities illegible⁵.

Rather than conveying an objective situation, narratives are about locating responsibility amongst a range of possible actors⁶. Narratives contain ideas about who is to blame, who should solve the problem, and what sort of knowledge is necessary to do so. For example, Escobar⁷ suggests that narratives about 'the biodiversity crisis', as defined by conservation biologists, serve to reify Western scientific knowledge as the authority in addressing current environmental trends. Such scholarship shows how narratives make certain ideas seem natural or inevitable and may limit the means for resistance, debate and transformative change.

Conservation narratives and counter narratives

This section reviews principal narratives underpinning conservation practice and thought. Such archetypes are necessarily stylised, simplified, and non-exhaustive. I intend to capture the underlying storyline behind various conservation paradigms and to provide a heuristic for reflection on mainstream narratives in the conservation space.

Eco-centric – we need to conserve nature for nature’s sake: This narrative argues for the intrinsic importance of nature rather than any value relative to humans and often accompanies notions of wild or pristine nature. Contemporary deployments of this narrative can be seen in projects like *Half Earth* that works to set aside 50% of the planet in protected areas.

Faith, Spirituality, and Ethics – conservation needs to engage with religion and other values systems: This narrative suggests that religion may be an important source of ethical guidance that overlaps with the goals of conservation⁸. Campaigns like the ‘Rights of Nature’ ratified in the constitution of Ecuador exemplify the idea that religious understandings can promote conservation.

Anthropocentric – we need to conserve nature because it provides important things for humans: This narrative foregrounds the importance of nature for human societies and economies. Ecosystem service framings, like those seen in the IPBES recent report on *Nature’s Contribution to People*, are a typical example.

Economic – conservation needs to work with the economic powers that be, not against them: Similar to anthropocentric narratives, this narrative insists that there are win-win solutions for conservation and businesses. Typical examples can be seen in the ‘New Deal for Nature and People’ Campaign where practitioners and scholars suggest that conservation and economic goals are not at odds but rather mutually beneficial⁹.

Crisis narrative and 6th extinction – humans are destroying the planet and ourselves: This narrative leads with the idea that humans are unravelling our own life-support systems, spiralling out of control and heading towards collapse. Mainstream deployments of the narrative are seen from youth activists like *Extinction Rebellion* who insist that our current situation is so dire that panic is the appropriate response.

Big Data, 4th Industrial Revolution and Ecomodernisation – technology will save us: This narrative insists that the answers to ecological problems lie in the continued development of advanced technologies. One example of this narrative comes from *The Ecomodernist Manifesto* which argues that, with technology, we can decouple consumption from limited natural resources.

Anthropocene – there is no nature besides the one we make: This narrative tells the story that humanity’s impact on Earth is so pervasive and so profound that nature as independent, separate and un-impacted by humans no longer exists – we live in the age of the Anthropocene.

Research frontiers

One potentially fruitful tension raised by an examination of conservation narratives is between calls for unity and pluralism. Some scholars call for a unified conservation narrative that people can relate to and rally around¹⁰. Others take the idea of narrative on a more radical level – rather than a cosmetic change to an existing scientific narrative, narratives can help us reflect upon and question underlying epistemologies and ontologies, opening up space for diverse understanding¹⁰. Future research should critically reflect on whether finding *the* narrative for conservation is either possible or desirable, and if and how adding a new narrative to a crowded space will be effective. Efforts to search for a ‘new narrative’ for conservation should reflect critically on the power of narratives to entrench and cement old ways of thought, and alternatively, make space for new ones.

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Revisiting the role of science in biodiversity conservation

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Broadly speaking, science is the systematic study of the universe through observation and experiment. The scientific knowledge acquired through this process is dependent on the questions asked and the methods or tools used to answer those questions. A cursory look at the most prominent textbooks and articles published in conservation science over the past 40 years clearly points to the largely natural scientific foundation on which conservation lies¹⁻⁴. As Bennett and colleagues deftly highlighted⁵, it is also a matter of routine to emphasise the crucial role of the social sciences for biodiversity conservation. In this review, when referring to 'science', I consider this term to encompass natural, social and physical sciences, both pure and applied, and mono-, multi-, inter- and transdisciplinary.

It is, however, instructive to note that researchers working across different scientific disciplines and fields can have quite varied philosophies, including their conceptions of reality (i.e., ontology, what exists that we can acquire knowledge about) and knowledge (i.e., epistemology, how we create knowledge). Whether or not it is explicitly understood or communicated, philosophy underpins how science is designed and conducted, which in turn informs the ideas, concepts and theories considered, as well as the types of questions asked and the tools best suited to answer them. While these issues are discussed in detail elsewhere⁶⁻⁹, I make this point here since philosophy influences how and why conservation science is conducted, as well as how we anticipate this scientific knowledge will be used, by whom, and for what purpose.

Since the original conception of conservation biology^{3,4}, and more recently^{10,11}, science has primarily been considered to contribute to and inform conservation practice. That is, science provides the principles and tools necessary to achieve the goal(s) of biodiversity conservation⁴. The vast majority of conservationists agree that conservation goals should be based on science¹². Given that conservation biology was defined by its normative goal rather than by particular scientific disciplines¹³, an explicit instrumental role for science in biodiversity conservation is not surprising. But science is not necessarily conducted for the *direct* purpose of improving conservation practice – it may be to discover or expand knowledge for the sake of it, to test and build critical theory, interrogate or disrupt assumptions, or generate novel ideas^{6,8}. This knowledge may subsequently contribute to improved conservation outcomes, hence there is no clear distinction between science *for* or *on* conservation⁶.

Despite this diversity of roles and purposes of science, a prevailing assumption within the conservation community is that improvements in knowledge are necessary to inform biodiversity conservation efforts¹⁴.

And, as hinted earlier, improvements in a particular form of knowledge has dominated the conservation literature over the last four decades: scientific research on the status, trend and distributions of threatened biota, the processes that threaten their survival and the identification of priorities for conservation action. This theme becomes more evident when one considers that published reviews of conservation science have typically organised their findings by taxonomic group, ecological system, geographic region and threats^{15–17}. Such knowledge outputs are obviously characteristic of natural and physical scientific approaches, whether it involves field ecological research or global-scale predictive modelling. But they also underpinned by a common philosophy, which posits that valid knowledge can be generated from objective empirical observation, carried out according to the scientific method (positivism)^{7,9}. This research philosophy is extremely well suited to many scientific problems, and has revolutionised our understanding of the human body, the Earth, and our universe since at least the 17th century. However, the process of deriving objective truths (to be consumed by others) may not be as well suited to the purpose of hastening action to conserve biodiversity^{18,19}

There has undoubtedly been an increased research focus on the social, economic and political dimensions of biodiversity conservation over time^{20,21}, and persistent concerns around the effectiveness of conservation efforts^{22,23} has galvanised efforts to conduct science that is relevant for conservation policy and practice^{24,25}. Much progress has also been made in conservation science towards mainstreaming interdisciplinary (integrating knowledge and methods from different disciplines) and transdisciplinary (incorporating knowledge beyond disciplinary boundaries) research efforts. Conservation science has progressively focussed on species, ecosystems and “hotspots”, threatening processes²⁶, and now increasingly, human behaviours^{27,28}. But it is crucial to bear in mind that a shift in focus from natural to social sciences does not automatically indicate a shift in research philosophy, since many social sciences also assume a linear relationship between empirical knowledge and action⁹.

Arguably, the biggest challenge for science and scientists today is how we respond to the reality that increasing our knowledge of the problem, and even of the possible solutions, may not lead to the large scale changes necessary to conserve biodiversity²⁹. This is a humbling, and quite frankly terrifying proposition for those who dedicate their lives to studying the wonders of the natural world, only for it to disappear on their watch. The process of doing science to enable target setting, selecting appropriate indicators, prioritising actions and acting on the best available evidence^{30,31} is logically appealing, but science is just one input into decision-making processes that are inherently messy and political³². The urge to “shout louder”²⁹ is understandable in the face of overwhelming evidence. I’m certainly not going to pretend to have the answer.

Revisiting the role of science in biodiversity conservation provides us with an opportunity to take stock and consider how science – including our existing body of knowledge, the processes of doing science and the (co-)generation of new knowledge³³ – can effectively contribute to averting biodiversity loss. Conservation science has evolved, diversified and broadened its focus considerably over the last several decades and it will continue to do so. But it does need to better consider the value of diverse research philosophies and to

not miss sight of how different actors, institutions, and power can shape collective behaviour.

Reconceptualising the role of science in biodiversity conservation also requires us to make space for other ways of knowing³⁴, and going beyond the “usual suspects”³⁵ of “managers” and “policymakers” when considering the role and contribution of other actors. By practicing reflexivity, humility and being mindful of fads³⁶, science can continue to play an important role in biodiversity conservation into the future.

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Governance and biodiversity

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The concept of governance is highly relevant to understanding the array of societal responses to the issue of biodiversity loss. Indeed, from the establishment of the Convention on Biological Diversity as an international agenda setting forum, to the integration of natural capital accounting in national audit procedures, efforts to structure human responses to the loss of species and ecosystems can be understood under a definition of governance. The concept of governance includes efforts to establish rights, rules, decision-making procedures, and programmatic activities that are developed to guide human actions in specific times and places^{1,2}. At its core, the concept of governance is about guiding human actions (the origin of the word is from the Greek verb ‘to steer’ or *kybernan*)³. However, as governance systems are also spaces of negotiation between many actors, they are subject to responsive evolution over time⁴. It is for this reason that governance as a field of theory and of practice can raise a host of challenges about definitions, operations, jurisdictions, objectives, agencies and many other issues. In thinking about how the concept of governance can be further developed around the issue of biodiversity loss, there are ample areas available for fruitful future research.

In this background review, I offer an overview of the concept of governance and biodiversity for a general academic audience. This review is not intended to be a comprehensive account of the field, but rather a reference for discussion and debate in the development of future research frontiers around biodiversity.

The concept of governance

Like many concepts used in academic research or by policy practitioners, governance has the effect of emphasising (or making visible) certain features of the world that may otherwise remain hidden. In this respect, it is pertinent to ask: what does the concept of governance do in understanding/shaping responses to societal challenges? Here, I canvas five features of the world that the concept of governance emphasises, perhaps more so than related concepts such as ‘policy’ or ‘management’.

Directed at relations – the concept of governance typically considers directed efforts to improve or change the relations between things⁵ (i.e. between people and nature).

No monopoly of power – the concept of governance explicitly draws attention to the fact that for many societal issues, there is no monopoly of power (i.e. not just governments)⁶.

Beyond jurisdictional boundaries – the concept of governance allows problems to be understood at scales that traverse political and jurisdictional boundaries (i.e. beyond the nation state)⁷.

Distributed agency and accountability – the concept of governance recognises that the multitude of governance actors means that there is no single intentional action (i.e. agency) and no simple way to ascribe blame (i.e. accountability)⁸.

Value laden – This concept of governance explicitly recognises that any efforts to guide human action are value laden⁹ (and therefore subject to political contestation).

Governance and biodiversity in scholarship

There is a broad and growing literature on governance and biodiversity (Figure 1), as well as a wealth of literature of governance across disciplines¹⁰. Although not systematically synthesised in this report, I emphasise three strands of scholarship that can support deliberation on future research frontiers for biodiversity:

Governance as a solution space for biodiversity – This literature focuses on the opportunities presented by various configurations of governance for biodiversity. It seeks to understand and innovate the kinds of actors and actions that might be harnessed to reduce or avoid biodiversity loss.

Governance as a problem space for biodiversity – This literature focuses on the problems that emerge in efforts to govern for biodiversity loss, such as the extent to which governance efforts make a difference to reducing biodiversity loss and the particular faults in the design or implementation of governance that limit its effectiveness.

The politics of governance – This literature examines the underlying value systems that drive the human desire to govern and to govern in particular ways. This scholarship typically works with social theory, and ideas of ethics, justice and power in seeking to contribute to an understanding of governance.

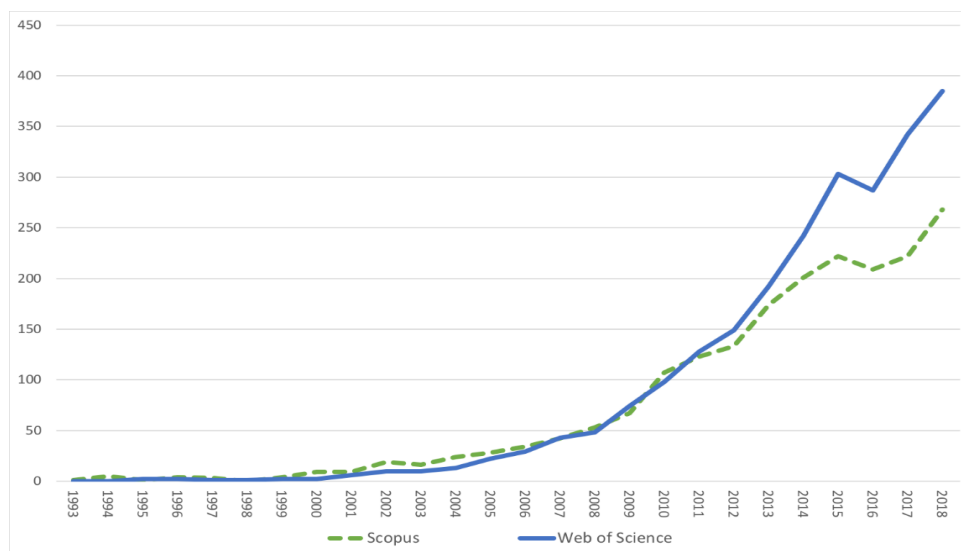


Figure 1. Number of publications by year in SCOPUS and Web of Science published with topic of biodiversity AND governance as of 26th July 2019.

Architectures, modes and contextual conditions of governance

In order to make the concept of governance more tangible, I provide additional background to the architectures, modes and contextual conditions for governance^{11,12}. Each of these concepts offers different entry points for exploring governance empirically and intervening in governance in practice. The definitions and boundaries around these concepts are varied, however I account for them as follows.

Actors of governance refers to the different kinds of organisations that ‘act’ in governance systems, such as governments, businesses, civil society organisations, but also local communities and individuals.

Scales of governance refers to the spatial (i.e. local, global), temporal (i.e. 2030, 2050, etc.), jurisdictional (i.e. national) and other scales that are often use to consider the extent of governance efforts¹³.

Organisation of governance refers to the organisational forms that governance takes, from a centralised monocentric form of governance to a distributed polycentric form of governance¹⁴.

Instruments of governance refers to the tools or implements available to different actors in order to carry out governance¹⁵. These might be national legislation to prevent biodiversity loss, ethical guidelines set out by a civil society organisation, a moral code of a religious institution, or any other number of formal or informal approaches.

Modes of governance refers to the underlying logics or set of human values that drive the conduct of governance. Examples might include anticipatory governance¹⁶, the militarisation of conservation¹⁷ or adherence to capital logics in science and policy institutions¹⁸.

Contextual conditions of governance refer to the general state of affairs in which governance efforts take place¹². Such conditions might include the advent of the idea of the Anthropocene, which not only suggests a new era in the Earth’s history, but also challenges previous assumptions about the nature-society divide¹⁹. Another very important contextual condition of governance is the centrality of science and technology to contemporary life, and science as a constitutive part of governance systems²⁰.

Research Frontiers

While research frontiers are often highly personal to individual scholars or particular scholarly communities, there are recent developments that are worth noting. There is clearly interesting research taking place on novel approaches to the architectures of governance, modes of governance and the concepts of governance – and their politics. There is value in further exploring and developing ways of thinking across the processes and outcomes of governance²¹, so that governance for biodiversity can be more purposefully designed and its effects more carefully monitored. There is scope to better understand the clear tension in the relations between governance, knowledge, reasoning and rationality. In particular, with increased interest in human behaviour, the role of thinking – but also the sharing of knowledge, the deliberation of ideas and the negotiation between different values in society become increasingly important²². Here, there is scope to develop work across critical approaches to the politics of governance and constructive approaches to governance in practice. Finally, there are opportunities to draw greater

attention to the role that everyday practices²³ of people in everyday life²⁴ have in governance for biodiversity. Whatever avenues are developed for future research on governance and biodiversity, there are rich debates in other fields, from ethics to political science, that the biodiversity community should engage with going forward.

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***Biodiversity Revisited* through systems thinking**

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Systems thinking provides a range of theories and methods which are useful for understanding and managing sustainability challenges. This diversity provides the conservation community with ways to understand systems and plan strategies that have systemic design. Conservation science has provided us with evidence on the importance of species and ecosystems, and has increasingly shifted the conservation discourse towards one that focuses on human and ecological systems as interacting¹. While scientific evidence provides guidance, wider issues of institutional structures, social practices and knowledge systems all influence how societies interact with biodiversity and nature. To re-energise biodiversity conservation discourses in a way that captures this epistemological diversity requires an understanding of how social systems create and use scientific knowledge on biodiversity conservation. Systems thinking offers a rich history of theories and methods that can support biodiversity conservation strategies through focusing on systems parameters, design, and intent.

Systems frameworks and methods can assist in advancing conservation science and practice, as they help identify feedbacks between environmental and social variables in a system^{2,3}. They support analysis into the root discourses and institutional structures that inhibit or enable changes⁴⁻⁷. While there are a diversity of ways of facilitating systems thinking, there are a set of common fundamental systems concepts. These include stocks and flows, biophysical limits, boundary setting, feedbacks and emergent properties. These concepts can be used to facilitate how socially constructed understandings of conservation, such as culture, attachment to place or belief systems operate alongside biophysical dimensions within specific systems.

Here we examine how different systems theories and methods can assist in capturing the epistemological diversity that exists in conservation. We propose that systems thinking offers a way of creating shared understandings of conservation problems, and supports the design of interventions to address 'wicked' conservation problems. Building this shared understanding is critical in light of the overwhelming availability of information on how to address conservation and the urgent need to include different knowledge types into efforts to understand, and engage with, the different socio-political and cultural contexts in which conservation takes place. The systems characteristics framework developed by Meadows offers a useful heuristic to organise the diversity of systems theories that have developed since the end of World War II; a point in time which saw increasing global attention to interactions between science, policy and social structures. Meadows' organisation of systems into parameters, design and intent can help inform a spectrum of activities related to biodiversity conservation; from measuring and understanding^{8,9}, to articulating the intent^{10,11} and discourse^{12,13} behind what the goal of the system should be^{4,7,14}.

Systems parameters are the numerical or other quantifiable entities that support the systems' behaviour. Focusing on parameters helps us understand the biophysical structure of a system, or the financial or human population changes if focusing on human systems. A study of systems focusing on parameters, for example, would focus on understanding how a specific protected area supports the changes of populations in an endangered bird species. Systems thinking focused on parameters has been core to biodiversity conservation thinking. The original concept of ecosystems⁹ is inherently systemic, setting foundational discourse on linking species and organisms to wider ecological systems. Feedbacks and interactions are core to the biological sciences, which can examine genes, species, populations and ecological communities. At a more global level, earth systems science has provided a foundational understanding of the interactions between human economic development and changes in the Earth System. Seminal within this type of quantitative systemic modelling is the work supporting the Anthropocene concept¹⁵, and more recently 'planetary boundaries'¹⁶. This type of systems thinking, often global in scale, focuses on identifying patterns and feedbacks between human activity and global environmental change. While parameters focus of systems can help us understand biological processes and feedbacks, other characteristics of systems help us delve into the human dimensions of systems, notably the human discourse and knowledge diversity that drive human-nature relations.

Systems design thinking, as Meadow's second characteristic, relates to the structure and organisation of systems in a specific scale. For example, this relates to how a national parks system chooses to manage a protected area in negotiation with various stakeholder groups, such as farmers and indigenous communities, and within the context of a changing environment in light of climate change or a specific biological threat. The seminal thinking presented in resilience theory, and the subsequent development of socio-ecological systems research, presents a comprehensive range of examples of how social and environmental systems are organised around natural resource and social structures. Socio-ecological systems helps guide analysis of how issues such as governance arrangements and institutional design influence socio-ecological outcomes^{17,18}. The field of knowledge systems, concerned with how stakeholders and groups come together to produce salient, credible and legitimate knowledge¹⁹, provides its own interpretation of how systems thinking forms part of social and policy design. Thinking of the interactions between human and environmental systems as core to policy and research design can help us define biodiversity conservation in a more systemic way.

Finally, systems intent thinking is concerned with the ontological and epistemological dimensions of systems. It is abstract and allows us to ask: what biodiversity exists for us to understand, why do we conserve biodiversity, what knowledge do we use to make decisions, how do we interpret the knowledge we are exposed to? Asking these questions is essential, notably given the fact that scientific pursuits, focused on building evidence base for action, have failed to grapple with the diversity of knowledges and social structures that influence biodiversity²⁰. For example, some scholars have noted the concept of biodiversity does not exist in isolation, but is rather a creation and interpretation of the relationships between nature and society²¹. The thinking and methods offered by the system parameters and design fields help us work towards critically examining how we can purposefully intervene in systems by

addressing root drivers of change^{5,7}, and capturing the diversity that exists in the human systems that face the day to day realities of biodiversity decline. Opening critique towards understanding the plurality that exists in human understanding and thinking can guide the design of biodiversity interventions to align with the day to day realities of communities facing biodiversity declines. For example, smallholder farming communities dependent on forest systems threatened by the commodification of cash crops presents an opportunity to question the land use pathways that exist in dominant policies and business practices.

Focusing on system characteristics helps us understand how different ways of thinking systemically helps tackle issues of biodiversity conservation. The focus on parameters helps us understand system feedbacks and boundaries, yet struggles to grapple with the human dimensions of how we manage and why we choose to care about biodiversity. Systems design methods and theories help us understand the interactions between human systems, such as policy and institutional structures, and biodiversity systems. Systems intent thinking, focusing on the abstract root drivers of how we choose to value biodiversity, guide us in identifying the diversity of values and perspectives associated with biodiversity conservation. This combination of characteristics can support the next wave of biodiversity conservation research and policy by supporting a more pluralistic way of framing the relationship between society, biodiversity, and nature.

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Biodiversity Futures

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Global environmental change will radically impact species and ecosystems, food production, water security and livelihoods of people around the world. These changes are increasingly discussed under the concept of the Anthropocene, which places humans as the central driving force on planetary change¹. While there has been limited engagement with the Anthropocene concept within the conservation community², it has profound implications for the future of biodiversity. Accepting the centrality of human agency within earth processes may destabilise notions of pristine nature. However, this term enables discussion about creating desirable forms of nature³ and opens space for a broader set of knowledge systems within biodiversity and global change research^{4,5}.

This background review considers how biodiversity futures are examined using models and scenarios of future change and associated conversations about future oriented conservation goals. It draws on research from social sciences on the Anthropocene, futures thinking and anticipatory governance to point to ways that the conservation community can more effectively engage with the possibility of radically different biodiversity futures to develop spaces for dialogue and processes for decision-making that enable action in the context of uncertainty.

Modelling the future

A range of approaches are used to project the future state of ecosystems under different scenarios of societal development. Two principal approaches include exploratory and target-seeking scenarios, which project direct and indirect drivers of ecosystem change to consider future ecosystem states. At a global scale, these projections are often based on the shared socio-economic pathways (SSPs) and representative concentration pathways (RCPs). The SSPs describe plausible futures of indirect drivers, including population growth, levels of education, levels of urbanisation and economic growth. These scenarios provide a basis for forecasts of direct drivers of ecosystem change, for example land use change⁶. The RCPs explore the impact of long-term climate targets under different emission trajectories. Recent projections based on these scenarios show that, for example, even in the absence of fisheries growth, increasing ocean temperatures could drive declines of between 5 (RCP 2.6) and 17% (RCP 8.5) in fish biomass⁷. An analogous assessment that considered terrestrial biodiversity responses to land use

change from the SSPs and climate change from the RCP scenarios, forecasted continued biodiversity declines even for the most optimistic scenarios of sustainable socio-economic growth and limited warming (2.6 W/m² by 2100)^{8,9}. More optimistically, a target-seeking scenario exercise suggests that “bending the curve”¹⁰ for biodiversity is possible. This study showed that scaled-up conservation and ecosystem restoration efforts combined with plausible but ambitious food system transformation could reverse the global biodiversity trend while meeting the food supply needs of the growing global population^{11,12}.

Conservation goals

Conservation policies and strategies have traditionally focused on maintaining the existing suite of species in particular places or concentrated investment on the most threatened species¹³. Uncertainties notwithstanding, it is, however, clear that in the future ecosystems are going to change, species will shift their ranges and some will go extinct. This has led to a growing realisation that existing conservation goals may be unrealistic and has ignited debates around the relative focus on managing for *change*, rather than persistence^{14,15}; whether goals should centre on sites and species or ecological function and processes¹⁶; or, more controversially, whether resources should be redirected from critically endangered species in order to save others¹⁷. As a representation of the desired condition of a landscape, conservation goals reflect human values¹⁴ and cannot be set in isolation from context-specific stakeholders. As such, this literature is replete with calls for processes that to bring together scholars, practitioners and citizens from across scientific, ethical, political and legal aspects of conservation^{16,18–21}. This review considers what such processes could look like and what types of institutions and governance structures are amenable to thinking about long term futures.

Futures thinking

The goal of futures thinking is to facilitate exercises that offer insight to the implications of present choices on future trajectories in the context of complex and uncertain problems. There are two central pillars to futures thinking: the future is not deterministic and efforts to predict a singular future will be in vain²². As such, while futures thinking draws from a range of quantitative and qualitative methodologies, scenarios are central to this approach. Scenarios are plausible representations of possible futures that are used to reflect on current dynamics, assumptions and relationships that govern the present and the potential drivers of change in the future^{23,24}. In acknowledging that we cannot predict the future, futures thinking also facilitates explicit engagement with uncertainty. Futures scholars argue that by engaging with a range of possible outcomes, we can prepare for and embrace uncertainty²⁵, rather than repressing or minimising it^{22,26}.

Anticipatory governance

Like futures thinking, anticipatory governance focuses on the design of flexible strategies that consider long-term consequences of current and future risks or the decisions taken to address them^{27–29}. This includes maintaining future options to avoid “path dependency,” or decisions that commit to certain courses of action³⁰. Anticipatory governance focuses on three primary capacities: *Foresight* the developable skill of constantly evaluating conditional assumptions about the future and their possible

consequences. *Engagement* of actors (e.g. the public, industry, experts, and government) and policies that develop, conduct and utilise scientific research across a range of scales and jurisdictional levels.

Integration of diverse knowledges across social and natural sciences as well as other forms of expertise.

Drawing on these capacities, the goal of anticipatory governance is to build distributed capacity for learning and interaction by reflecting on imagined and future socio-technical outcomes³¹. Implementing anticipatory governance requires openness, participation and coordination between actors, and engagement with complex and uncertain material²⁷.

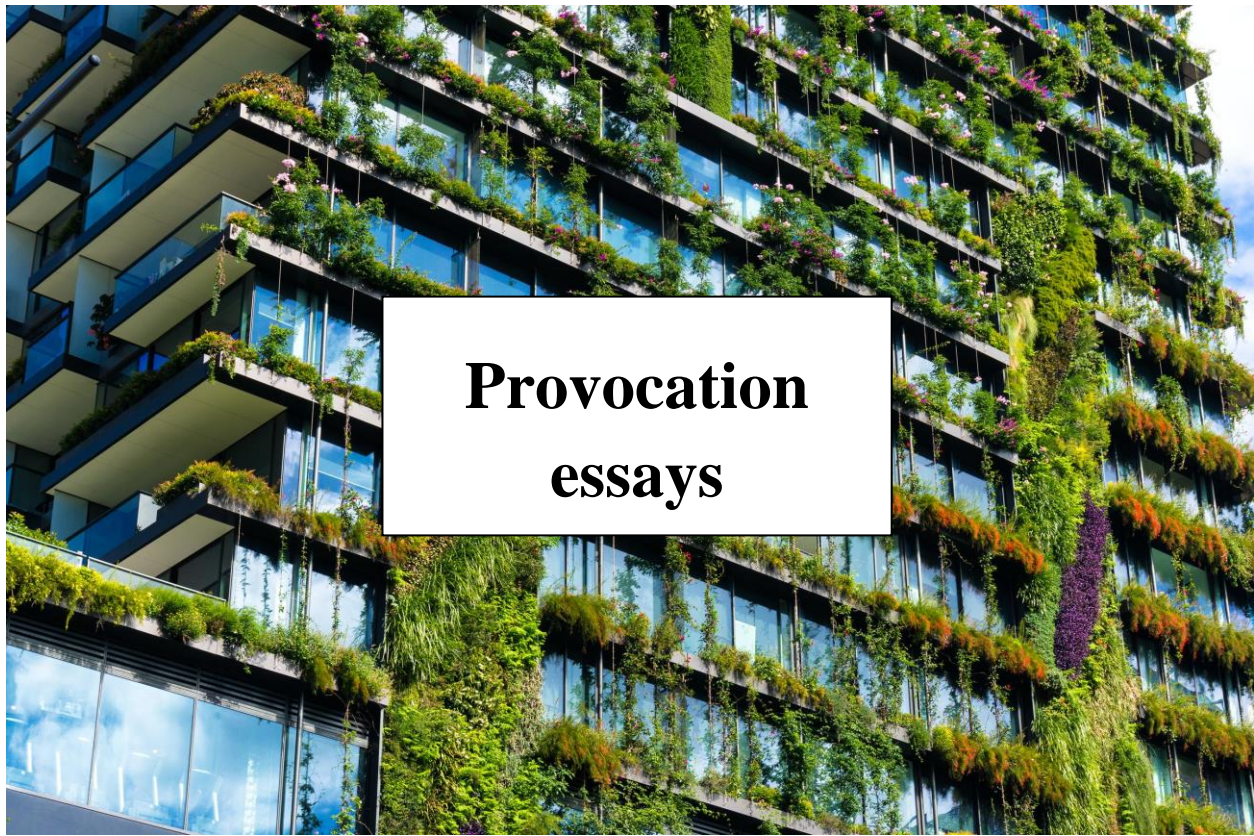
Research frontiers

Charting the future is an inherently political practice. To anticipate is to delineate the future realms of possibility by bringing certain futures to the fore, thereby marginalising other pathways or trajectories^{32,33}. As such, these practices require careful consideration of whose knowledge and values are embedded within efforts to calculate, imagine and perform different futures^{32,34–36}. We must ask: what is a desirable biodiversity future and for who? Recent literature suggests that these philosophical questions are central to the more practical agenda of determining what policies or actions are implemented, where and when^{16,37}. To this end, research could usefully examine the processes that enable diverse stakeholders to engage with scientific projections of future change while deliberating on more political questions about the nature of a desirable futures. There is also a need to address the philosophical and institutional barriers to adopting novel or interventionist approaches in order to mitigate the negative impacts of more transformative ecological changes. This includes considering how to confront the trade-offs and inequitable distribution of costs and benefits across and within human and nonhuman communities now and into the future.

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Provocation essays

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The following essays were commissioned from leading scholars and practitioners working on biodiversity topics to provocatively explore, question and discuss issues related to biodiversity. This section also includes the winning essays from the early-career competition.

It's not the terminology

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Global biodiversity is declining, despite almost a century and a half of action by conservation organisations. Conservationists start to fear something must be wrong in the way they present their case. In particular, the term 'biodiversity' is seen as a problem. Perhaps it is too scientific or too complicated, or simply not 'sufficiently compelling'¹.

This may be true, but failure to stop the loss of natural living diversity is not the result of poor packaging, or an ugly or difficult label. I want to explore the possibility that the problems lie elsewhere.

My concern is that conservationists (and I include myself here) are not really serious about biodiversity loss, or at least we do not demonstrate that we are serious about it. The term biodiversity was coined in the 1980s. The Convention on Biological Diversity in 1992 defined it as 'the variability among living organisms', including diversity within and between species and in all ecosystems.

But very often this is not what conservationists mean when we say 'biodiversity'. As defined, biodiversity was an adjective (the diversity of a system, an attribute), but it routinely treated as a noun (the species present, a set of objects). The label 'biodiversity' has simply been grafted onto the pre-existing concern for the preservation of species, which dated back to the end of the nineteenth century². The term was adopted, but the ideas behind it were not.

Species, particularly charismatic species, dominate the conservation imagination. Birds and mammals (especially the great apes) grab conservation headlines, distantly followed by unusual reptiles and amphibians. The occasional plant features (cue the baobab), and sometimes a flamboyant insect (butterflies and dragonflies enrolled as honorary birds). But of other invertebrates, rarely serious public attention, let alone the smaller organisms essential to ecosystem function – lower plants, fungi or bacteria.

The trouble is, people take this public focus on charismatic species seriously. If, as conservationists, we say 'biodiversity' when we appear to *mean* 'charismatic animals', people get confused. Or rather, they draw their own conclusions, and think that we are not really interested in all kinds of life, but only in the species we keep talking about – the elephants, or polar bears, or their like.

Conservationists are therefore in danger of mis-selling biodiversity. The term's meaning is clear, but its breadth is not reflected in the aspects of nature for which conservationists show most concern. This has several consequences.

First, relatively few of the species most beloved by conservationists have a significant role in sustaining global ecosystems. Despite the press coverage of the IPBES global assessment^{3,4}, and the success of *Extinction Rebellion* in linking biodiversity loss, climate change and human extinction in the public eye, the

loss of most of the species apparently of greatest concern to conservationists does not offer an existential risk to humankind. Rhinos are rare, wonderful and irreplaceable, but they do not have a globally significant ecological role. Their loss would tragically impoverish human futures, but would not threaten human extinction. Loss of the Earth's astonishing diversity is an outrage, a disgrace, a tragedy – perhaps even a cause for rebellion. It is as if someone were deliberately destroying all the world's renaissance paintings, or all medieval Islamic art, or all books published before 1950. But arguments that the species and ecosystems most strongly identified as of conservation concern are essential to the functioning of the biosphere are not very believable.

Of course, almost by definition every species has a place in an ecosystem, so their loss will surely to have some effect. And the popular science literature frequently mentions 'ecosystem engineers' (beavers, elephants and other bulldozer herbivores), and 'keystone species' (wolves, sea otters) with a major impact on significant ecosystem functions. Moreover, it is recognised that ecosystem 'services' have a value. But conservationists slip easily between the argument that all ecosystems provide services and the idea that those ecosystems have to be intact (with all their species, especially the big rare ones) to deliver services. This is not always true. Moreover, conservationists tend to confuse the preservation of species (arguing that the organisms themselves are ecosystem goods) with human dependence on ecological complexes that underpin ecosystem function (boringly titled 'supporting services'). This biodiversity is more obscure and less cute than conservation's charismatic poster children, and its importance is widely underplayed.

The second consequence of conservation's selective vision of biodiversity is the failure to find a simple metric to show the human implications of species extinctions. The climate community has dedicated significant scientific effort to show what level of atmospheric CO₂ will trigger precisely what kind of disaster. This has not been done for biodiversity⁵. We lack a scientifically defined level of biodiversity below which ecosystems globally will cease to function, and what the implications of this would be, although work continues to define a 'Planetary Boundary' for biodiversity⁶.

Third, conservation's focus on rare species, 'hotspots', and ecosystems where human influence is minimal, often suggests that they have limited interest in people, except when they threatened protected nature. With some exceptions (artisanal coast fisheries for example), the health of ecosystems in which people live and from which they draw their livelihoods and daily experiences of nature (fields, working forests, city streets) appear of secondary concern. Biodiversity conservation can therefore seem marginal to everyday human lives. The contrast with climate change in this regard, with its focus on threats to human welfare and subsistence, is striking.

The fourth consequence of biodiversity tunnel vision is that conservationists struggle to focus on the fundamental causes of global biodiversity loss, the global economy. The world economy is capitalist, and capitalism is an engine for creating wealth (although not, unfortunately, for distributing it fairly). It is a machine that scrunches up nature and human societies as it extracts profit. As capital hunts for places to invest, it leaves behind forests converted to agriculture (soya, palm oil, or cattle), oceans empty of fish, polluted sites of mineral extraction and manufacture, rust belt cities, unemployed workers, and slums. The

patterns of production and consumption that dominate the Anthropocene are restructuring and simplifying ecosystems from the Southern Ocean to tropical forest, from the inner city to the industrial farm: global trade in simple commodities like tea, coffee, palm oil, sugar and textiles is responsible for a third of threats to species on the IUCN Red List⁷.

These problems are, of course, widely recognised by conservationists, yet rarely systematically addressed, because conservation attention remains mostly focused on areas relatively untouched by capitalism. Here, fortuitously, conservation finds itself strong⁸. Its money goes a long way, and the people it needs to influence are poor and disorganised. Farmers, forest people and fishers are relatively easily won over by promises and a sprinkling of investment. They will often accept with good grace constraints on their freedom to use resources, and alternative arrangements that offer menial jobs showing rich strangers the charismatic species whose survival is apparently essential to human futures.

Biodiversity loss will continue until the world's economic metabolism changes. It is possible to imagine such change, where humanity would try to achieve prosperity without endless growth⁹, or develop strategies of creative degrowth¹⁰. Ideas about alternative economic futures are widely discussed by environmentalists, but much less so by conservationists. Indeed, far from questioning capitalism, the business model of many conservation organisations is based on closer integration¹¹. They depend on donations from corporations (or their retired executives) for sponsorship¹². They increasingly try to turn wildlife into commodities, saving biodiversity by creating markets where it can be bought and sold¹³. It is, for example, hard to imagine tropical conservation projects without the elite tourism industry with its dependence on carbon-gulping long-haul flights.

We see calls to conserve biodiversity falling on deaf ears. And like a weary corporate sales team, we redouble our efforts to 'sell' the idea that the loss of species and biodiverse spaces poses an existential risk to humankind. We treat conservation as if it were soap powder, worrying about the packaging and making ambitious claims for its merits. We demand more 'good news' stories and 'optimism' in our pitch. Yet, it is our very understanding of the product is the problem. We use the word biodiversity, but we don't really mean it. And that is why people do not listen.

We do not need a new terminology to describe the plight of nature. We need to take the word biodiversity more seriously. We need to work out which elements of living diversity are critical to ecosystem function at every scale from puddle to biosphere, and refocus conservation attention on keeping them working. We need to pitch for tardigrades or mycorrhizal fungi or bacteria alongside turtles and pangolins.

If we do this, people might be more willing to listen when we speak of a biodiversity crisis that truly threatens their wellbeing. Perhaps they would see how biodiversity conservation could contribute to a better future, both for humanity and for all other life on earth. Perhaps they will begin to conceive of an alternative future on earth.

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Balancing power: Framing gender inclusive and effective environmental policy

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It's been almost 50 years since it was first acknowledged that the "Earth's carrying capacity had already been severely affected by human lifestyles while treating Nature as commodity¹." These discussions back in 1972 at the United Nations Human Environment Conference (UNHEC) paved the way for other environmental legal instruments that developed over time. In 1992, during the Earth Summit in Rio de Janeiro, there was broad agreement among the 172 Member States that development must be sustainable and its three pillars were established: social, economic, and environmental. Thus three important conventions materialised: the United Nations' Framework Convention on Climate Change (UNFCCC), the United Nations' Convention to Combat Desertification (UNCCD), and the United Nations' Convention on Biological Diversity (CBD), this last one being the only to explicitly recognise in its preamble the important role of women in biodiversity conservation and sustainable use and the importance of women's participation in decision-making². However, none of these agreements have been enough to protect biodiversity and ecosystems from continued overuse and destruction.

Recently, a group of experts recognised that international environmental law and environment-related instruments, as well as its governance structure and implementation, were characterised by fragmentation and a general lack of coherence and synergy among the different sectoral regulatory frameworks¹. These separate silos represent one of many factors hindering effective biodiversity conservation. The Global Pact for the Environment (GEP) was proposed as a legal instrument to overcome institutional fragmentation and create the links between biodiversity loss, food security, and climate change.

Gender

The recognition of the key role that women play in biodiversity conservation comes from a deeper understanding of the differentiated use and management of natural resources that rural and peri-urban men and women have. Whilst rural women are often more dependent on biodiversity for their livelihoods, men tend to be more involved in the market value chain of derived products (wood for timber, or charcoal, for example)^{3,4}. Women and girls face multiple and intersecting inequalities that can bar them from education and other opportunities such as participation of decisions that affect them. Despite the CBD's decisions on women's participation at different levels⁵ and a Gender Plan of Action in place, no satisfactory results from its implementation have been reached. Thus, the main drivers behind women and girls' vulnerability and marginalisation remain unaddressed; for instance, market-based approaches to biodiversity conservation put women at a disadvantage as they earn less, own less, have fewer capital assets, and fewer inheritance rights. Conversely, most of the world's richest people are men, who own

50% more wealth than women and control over 86% of corporations, yet 'economic growth' is made possible by the unpaid care and domestic work of women and girls⁶. It appears that resulting inequalities have been endorsed by some governments and the private sector alike, and this could actually explain why years of environmental policy aimed at protecting biodiversity and ecosystems, still fails.

Markets, private sector and corporate capture

Some of the current strategies designed to tackle climate change and biodiversity loss show the big power imbalance between stakeholders and even a failure to recognise 'rightsholders'. The 'Green Economy' (GE) proposal at 'Rio+20' – the Earth Summit 20 years later – brought a new wave of privatisation and commodification of the natural environment, with severe impacts felt upon Indigenous Peoples and local communities. The Payment for Environmental Services (PES) opened the carbon stored in trees for commercialisation, essentially allowing polluters to continue to pollute as long as they 'offset' their emissions. But this 'logic' quickly illustrated how the PES approach did not address the root problem and actually resulted in high social costs. Examples from Reduced Emissions from Deforestation and Forest Degradation (REDD+) projects showed that privatising resources affected vulnerable communities, especially women⁷, while few external actors received all the benefits.

Such power imbalances have also been evident at the CBD. Civil society pushed for a decision on 'conflict of interests' after certain industries with vested interests participated at the CBD's Ad-Hoc Technical Expert Group on Synthetic Biology⁸, among other events. Similarly, at the UNFCCC, the five largest publicly traded oil and gas majors (ExxonMobil, Royal Dutch Shell, Chevron, BP and Total) invested over US\$1 billion of shareholder funds in the three years following the Paris Agreement on misleading climate-related branding and lobbying⁹. As a 'conflict of interests policy' is being discussed at the climate negotiations, a few powerful governments have been blocking its adoption¹⁰.

Alternatives

A deep transformation in environmental governance is urgently needed starting with debunking an anthropocentric point of view environmental issues. Women's traditional knowledge and their valuable role in biodiversity conservation should be made visible and supported in order to be part of the decisions that affect them. The patriarchal system that has barred women from participation and opportunities for empowerment should also be identified and abolished as should be any discriminatory legislation at the national level (i.e. inheritance rights). Recognition of women's human rights and gender equality should be at the core of any governance framework, where monitoring and reporting on the gender component are duly integrated. Greater transparency and accountability over corporate activities must be at the heart of any conservation or climate mitigation agenda.

Indigenous Peoples and local communities worldwide have demonstrated that their practices are as effective, or arguably more so than top-down approaches. In fact, many of today's 'on-the ground' biodiversity conservation and climate change adaptation efforts are led by women, and/or women's groups, who have helped ensure their peoples' subsistence for centuries. Why are these strategies considered less popular, or seldom receive the kind of support that *imposed* 'Western' strategies do?

Innovative proposals have the potential to advance nature conservation across the world; some now recognise the Rights of Mother Nature; Indigenous Peoples and Community Conserved Areas and Territories (ICCAs)¹ constitute a good model of inclusive conservation; eco-feminism and decolonisation also bring valuable contributions to open up an intercultural dialogue towards a transition. Initiatives along these lines are in urgent need of support, particularly at a moment in time when environmental and social defenders around the world are facing increasing threats, criminalisation and murder. In short, the same rationale which has been used around environmental governance, cannot and should not continue to dictate 'solutions' to biodiversity loss and climate change.

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¹ A close association often found between a specific Indigenous People or local community and a specific territory, area or body of natural resources, combined with effective local governance and conservation of nature.

Perceiving the living landscape we are within

Winner of early-career essay competition

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If I were to trace the outline of the horizon where I live now it would be a few distant, low ridges that break the flat plains – except for a single, large, majestic and ancient hill, in close range that rises to the sky. I look towards it as it breathes, covered now in a regenerated, young forest. The Arunachala hill with its granite boulders, is part of the Archean, the first rock formations from the initial cooling of the then new, molten Earth. It stands – embodying the oldest evidence of studied geology – and a tapestry of cultural stories of origin and worship since.

The literature of the language of the land, from over two thousand years ago, created beautiful love poems describing the inner landscape of the emotions of two lovers reflected in the outer scape of the land. The names of the *thinai*s or landscapes, were given from the most characteristic flower of that landscape. They are *kurunji*, *mullai*, *marudam*, *neithal* and *paalai* – mountain, forest, grassland, coast and parched wasteland respectively; associated with emotions of love and union, a time of waiting, the quarrelling of lovers' differences, the pining of distance and the hurt of separation.

An elegant exercise is to imagine how interwoven a language and culture would have been to the land that birthed its people. Every grain coaxed from its fertile earth, each fruit from the generosity of its season, each pot fired from its rich soils homemade from mud and thatch, each cloth from fibres given from a plant and all medicine, every tool, every dye and adornment. All expressions of people being a request from the living landscape that they are within. Is it not presumptuous then, to think that such an epic work of poetry would be speaking merely of just humans?

I ask then, what if the lovers embodied in the poems are the sky and the Earth? Each intricate description in those landscapes – of its plants, its creatures, its people – and the lives enveloped in their symphony. Making the mountains where clouds birth rain for the thick groves and high grassland to pour down as streams and rivers for all time the description of true union. Forests, where with the wisdom of lovers who know themselves to be soulmates, do the trees and water stored deep in the soil reach out to meet the abundant seasonal rains.

Grasslands, a naturally sensitive balance where people – through cultivation and grazing of their cattle – inevitably change the relationship between the rain and the land, onto which its drops merge; as an aggressive third wheel could wobble the lovers' balance. The furrowing line drawn between the coastal land and the sea, where clouds gather over the water and are quickly swept inland; of intermittent, brief and fleeting moments of meeting that can leave one pining for the other's presence. And lastly, desert land

as a severing of all life of the land, life that was a messenger of this love between the sky and earth; a severing caused not by the lovers themselves, but by another force that traumatically separates them.

Consider this: each continuous landscape holds within it multiple events in geological time that define the shape of the land, the composition of its rocks, the types of its soils – all of which would change several times over with the folding, rising, crumbling and sinking of the Earth's crust. Consider this: the same continuous land holds within its atmosphere different flows of ocean currents, different cloud formations, types and amounts of precipitation, shifting shapes of stored and flowing water – all of which would have rhythmic patterns over millennia, gradually shifting with different climatic epochs based on deep time cycles of the planet. Consider this: life, which holds infinite possibility genetically, would respond to long periods of stability and also conditions of extreme change through variation. To look for and acknowledge these signatures and imprints in a landscape, to me, is perceiving a living landscape.

A recently recurring question whenever I pass stretches of land from a train or bus is: what is the true expression of deep time evolution of life in this landscape? The question occurs with serrated edges in my mind when I see how we have almost no uninterrupted native living landscapes left from just the last several centuries of relentless extraction.

I take you back to Arunachala. At the base of the hill self-seeded saplings of the *Paalai maram* (*Wrightia tinctora*) stand with leaves of a light and soft green this time of the year – a contrast to some of the more brambly, thorny looking thickets with smaller, dark green leaves you find walking a little further on the hill. The *modirakanni* (*Hugonia mystax*) was in bloom just a few days ago. We watched in awe, in the midst of this dry forest, as its yellow blooms drew an incredible number of butterflies. Its name comes from the ring-like curls formed by the bracts on extending branches, where *modiram* means ring. The life that is seen on the hill today was catalysed by a beautiful initiative begun 16 years ago to bring that which is sacred, life, back to the hill. At the time the hill was largely covered in lemongrass. As a *poramboku* or common land, the grass dominated hill stood in connection with the herders and for the people of the town for whom the thatch of their homes was made from. The grass was regularly set on fire in the dry seasons and the hill would stand scorched and black. But the same wind that carried change to the world twenty years ago, saw fewer people herding goats and more people building their homes from concrete here. What discrete irony allowed for this forest to return, and at the same time, what a sign it is for things to come.

Scientific rationale and objectivity – which includes the passive-aggressive unwillingness to accept or imagine possibilities without proof that fits into the language and parameters of itself – has been steadily fragmenting our ability to perceive a more wholesome truth.

The definitions created around natural phenomena and life determine and reflect the intention of our thoughts at their core. Naming and claiming land and water as a resource – such as forests as ecosystem-services benefiting us through their main function of sequestering carbon to offset our actions – this way of looking at the living world is allowing us to destroy it. It allows us to continue making decisions that dismantle living landscapes because most people believe in the idea of the natural world existing only in relation to humans needs. Dominant culture teaches that we are in no way implicated in participating and

giving back to natural cycles and flows of the Earth through direct means of each individual's everyday life. The time is presenting itself for the dominant culture to be challenged and an organised movement of revolution.

Each culture has a history of being custodians of common lands – lands that had their own will and existed for themselves – these true world relationships acknowledged that only wild lands could give some of what people needed and in a delicate way that did not sever the sacred balance of these livingscapes. The future must see us (re)finding ways to organise and live as true custodians of a livinglandscape.

Once again, we are on the hill. Today has been an emotional one – we are gathered because of the very real possibility that we may lose part of the forest if the land is allocated to build a tourism horticulture park. We stood between the rocks and boulders that were shaded by trees standing twenty feet tall, among thorny shrubs and climbers, some of which had been bent to make deer paths. Two trees to our left had the markings of a porcupine which had eaten the stripped bark, a lime butterfly fluttered past as we took it in that all of this could be swallowed in a crass, concrete and nature devoid aesthetic of modern Indian development. We were looking at about 10 hectares of land that would be ravaged and scrawled over. How did we reach a place where sacrificing a livinglandscape was justified by material needs or wants of experience? The indiscrete irony is that it could be replaced with a park of manicured plants and cement paths, fences and walls.

If one were to trace multiple fault lines that caused the rift between humans and their relationship with the living world, it would be a different map for each land, its culture and people, layering its histories and traumas.

If we restrict ourselves to look only at the last century for alternative narratives to draw from, it would be too myopic. Seeking understanding from livinglandscape perspectives invites the leaning into true questions around relationships and ethical ways of living as part of it. Consider that a transformation of consciousness, awareness and true wellbeing can begin with people beginning to read and understand 'their livinglandscape' together. If enough individuals ask truth-based questions, there will be a revolution. So, what do you inhabit as living space, how much around it can you hold in your peripheral sense of belonging?

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Bridging science and culture: participation and representation of transformative change in biodiversity assessments

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The latest IPCC and IPBES global assessments provide scientific evidence on the biodiversity and ecosystem threats, demonstrating the (lack of) progress towards achieving the 1.5°C Target, the Aichi Biodiversity Targets, or the 2030 Agenda for Sustainable Development. Increasingly, however, representatives from the IPCC and IPBES urged scientific assessments move beyond analysis to identify solutions and projections of transformative social and economic change that address environmental damage. The focus on transformative change requires new approaches to integrate scientific assessment with visions of future social order. We highlight the political implications of this integration, arguing for a deeper, more critical consideration of public participation within biodiversity assessments that encompasses more inclusive conversation about the normative visions and values shaping societal transformation.

What is transformation?

Calls for transformative research to achieve social innovations abound¹. These calls encompass economic, social, political, and technological drivers of fundamental, system-wide change including paradigms, goals and values². Transformation, in this context, involves moving away from current, relatively short-term adaptive changes to holistic development pathways that contribute to environmental protection and social justice³.

Yet, how to identify these pathways? Both the IPCC and IPBES share a mandate to be policy-relevant but not prescriptive. IPBES has adopted scenario planning to explore the impacts of various projections for population and economic growth on ecosystem services. Scenarios can project and help implement transformative change⁴. IPBES has undertaken societal consultation as a strategic instrument to make scientific findings interactive and ‘usable’, working with a broader range of societal actors than usually consulted by global assessments.¹

¹ It has, however, been noted that more could be done to include social sciences and humanities as well as indigenous and local knowledge systems.

There is, however, insufficient consideration of how the objectives of biodiversity or climate assessments are framed, who is involved in developing these frames and how they shape and reduce the variety of problems addressed, and how social perspectives are sought in the assessment process.

Biodiversity, participation and representation

Biodiversity analysts have long acknowledged the need to be participatory and to reflect social values relating to biodiversity. Biodiversity assessments have, however, been slow to adopt insights from social sciences, particularly social studies around values, scientific framings, and social representation.

The Millennium Ecosystem Assessment (MA) provides a controversial example. The inclusion of different spatial scales could have provided an opportunity to reframe the objectives, meaning, or definitions biodiversity or ecosystem services. However, in the end, local actors, concerns and examples were identified in a highly reductive way to provide apparent alternatives to global systems thinking⁵. Critics have suggested the push for a single scientific voice required local knowledge to be translated into “scientific language” and mediated through the global, simplified categories⁶. The MA acknowledged scale choices are political because their selection may intentionally or unintentionally privilege some groups. Yet such statements say little about how those groups are identified nor their role in providing a counterbalance to consensus statements. Similarly, indigeneity is a common indicator of inclusivity and participation, yet this hides differences within heterogeneous, indigenous groups that undermine their very inclusion. Likewise, the politics of claiming indigeneity may empower some actors, while making others less visible. These concerns point to the need to study how scientific assessments create conditions where people and problems are presented in reductive ways.

IPBES has adopted a more iterative, critical approach to local engagement in pursuing a multi-scalar structure, with representatives of 'local' and 'indigenous' knowledge participating in the process from the outset⁷⁻⁹. Nonetheless, questions remain around how to achieve adequate representation. IPBES procedures for participation were largely negotiated under the premise of ideals of numerical balance from different world regions¹⁰. These choices determine who or what is recognised – or not – and therefore who is accountable to whom and in what ways¹¹. Orthodox literature urges standardised assessment procedures to achieve a supposedly aggregate, neutral point of view¹².

These concerns illuminate questions of what is meant by participation, what functions it serves, and the politics that enables or constrains it. 'Consultation' does not, in itself, imply mutual co-construction of problem framings central to genuinely participatory research, nor does simply mentioning 'participation' achieve deeper knowledge co-production. IPBES procedures limit possibilities for wider representation, overlooking differences in regional scientific capacities by conflating researcher citizenship with region-specific expertise. This ignores global politics of research funding, geographical biases of academic institutions and knowledge flows¹³. Indigenous Peoples and local communities are commonly portrayed as most impacted by biodiversity loss, yet their role in reshaping the frames guiding assessments remains limited.

Geopolitical participation is not simply a problem of injustice solved by bringing non-experts together for instrumental reasons. The links between scientific and political representation emerge from the overarching social values driving assessment processes or the historical influences on their framings. Understanding these processes requires attention to ‘constitutional moments’ – the periods when political practises are rewritten or controversies apparently settled. These moments involve tacit acts that impose some normative values and visions of society, but exclude others.

Democratising transformative change

Current discussions about democratising biodiversity assessments focuses on increasing space for social sciences and humanities in balance with economics and natural sciences^{14,15}. This seeks to rectify the overdominance of natural sciences and economics in the MA through, for example, use of ‘nature’s contribution to people’ as opposed to ‘ecosystem services’¹⁶. To displace the underlying neoliberalism within the ecosystem services, new scenarios for transformative change include alternative and non-neoliberal projections for social and economic organisation¹⁷.

The framing of societal transformation within assessments must also be examined. In its Fifth Assessment Report, the IPCC defines future socio-economic development as a scientific matter to be projected by numerical models where socio-economic pathways are mainly evaluated on their technical and economic feasibility. This approach creates a false sense of path dependency around market-based policy following physical or quantified trajectories of plausible environmental change. This reduces, rather than diversifies, framings and choice for biodiversity¹⁸. A more critical approach considers how those pathways (and respective numbers providing their scientific evidence) have been generated.

Transformative change should not be seen as a technically viable process of changing society to achieve already-defined objectives, but rather as a democratising process where transformation also refers to how, and with which perspectives, objectives are set by whom and on what legitimacy. Debates about societal transformation project visions of what is good, desirable and worth attaining; they articulate what are both technically *feasible* and normatively *desirable* futures that political collectives (e.g. the Convention on Biological Diversity or local communities) actively wish to embrace. Since collective visions about the future are profoundly normative, they cannot only be based on scientific numbers and projected pathways, but instead need to reflect values about human wellbeing and acceptable risks. Assessment design requires less attention to *who* is included or excluded and more consideration of *how* included actors bring the perspectives of others with them into negotiations. If global assessments are to ethically and effectively engage with societal transformation, there is a need to critically examine the politics of participation and apply these insights practically to biodiversity assessments.

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Culture, conservation, and the Anthropocene

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Biodiversity governance and the Anthropocene

The Anthropocene concept emerged in the wake of growing awareness that human activities have left permanent fingerprints on the geologic record¹. Technical debates (around whether we are in a new epoch, when it began, and whether the Anthropocene is a useful way of framing environmental policy) aside, it is clear that drivers of biodiversity loss and ecosystem decline have been increasing in both pace and intensity. Although biodiversity has been embedded in formal legal frameworks for several decades and despite some success stories, biodiversity governance has failed to deliver against many parameters. Growing lists of threatened and endangered species and accelerating extinction rates suggests we are in the sixth extinction event and climate change is expected to accelerate this loss². Delays between habitat degradation and extinction suggest an even more grim future as potentially large 'extinction debts' will need to be paid back, meaning even greater losses in future that have not been effectively considered in decision-making³. Whilst this presents a bleak view of the future of ecosystems, governance provides a forum through which society can intervene.

The Anthropocene has created novel social and ecological conditions requiring modernised governance systems to resolve societal challenges through the establishment of rules, strategies, norms and policies. This process can provide a forum for discussion and debate amongst actors about how we might best intervene to tackle the challenges in this new epoch and confront future challenges. Although some degree of ecosystem change is inevitable, measurable impacts on geological timescales suggests we have pushed beyond reasonable levels of change, even within dynamic ecosystems. If we agree that we have a responsibility to intervene – and the existence of legal frameworks targeting biodiversity conservation suggests we do – then these unprecedented changes may require us to reflect on why and how we are 'doing' conservation and make substantial changes to governance and policy. If this is indeed a 'new ecological world order'⁴, the Anthropocene presents a fundamental, almost existential challenge, for our current systems of biodiversity governance. These systems are inherently conservative, anchoring biodiversity objectives to historical baselines to return to 'ideal' landscapes of a region's past. The notion of an 'ideal' state is normative, incorporating varying degrees of ecology, history, and culture. This essay focuses on the intersection between conservation and culture, considering the ways in which the transformation of ecosystems is confronting for both society at large as well as for biodiversity experts.

Ecosystem transformation and governance

Debates about the Anthropocene, ecosystem transformation, and novel ecosystems strike at the heart of conservation. Also called anthromes or constructed ecologies, novel ecosystems are areas where new

species, interactions, and ecological functions (or dysfunction) are emerging, creating landscapes unlike anything seen before. A novel ecosystem that cannot be restored to its historic state, presents moral, legal, and practical challenges. Ecosystem transformation raises questions about decision-making, responsibility, and social desirability which cannot be answered by collecting more scientific data. Some authors raise technical questions about how to identify these ecosystems or how to reverse their existence, and others worry that accepting them will “open the door to impunity”⁵ and that – rather than representing an adaptive response to change – it is ‘giving up’ on conservation and ‘giving in’ to the Anthropocene⁶. In part, this is because acceptance and intentional management of novel ecosystems explicitly acknowledges that the tenants of conservation and restoration – particularly historical baselines – are no longer tenable⁴. The concept also challenges notions of ‘nativeness’ and exoticism, attracting criticism for embracing non-native species – intentionally or inevitably – as part of the landscape⁷.

Some of these critiques seem naïve against the backdrop of a world where more than half of the biomes are intensively used, almost all ecosystems show signs of human influence, and future models project transformation in most ecosystems⁸. Critiques of novel ecosystems also often fly in the face of evidence. Non-native species are a feature already of many of the world’s ecosystems and efforts to remove them are costly in terms of time and money and can require maintenance in perpetuity. The Anthropocene could even increase biodiversity through the spread of non-native species⁹. While anxiety around novel ecosystems is rooted in legitimate concerns about how changing law and practice could empower or authorise further degradation, a common thread in the debate blames the culture of the public and the norms of experts for impeding progress⁶.

Though the outrage at those challenging conservation orthodoxies is often directed at advocates calling for acceptance and intentional management of novel ecosystems, this is not really about novel ecosystems. In reality, the extent to which the Anthropocene will challenge the cultural and normative ideas underpinning biodiversity conservation policy and practice cannot be overstated. It is well known that culture and cognition together form one of the three main pillars driving behaviour in institutions¹⁰ and shape the ways in which we interpret empirical evidence¹¹. It is perhaps fitting that culture has not only created this new geologic epoch, but it also permeates the ways in which we understand and respond to the challenges it brings.

Cultural severance, cultural landscapes and untenable baselines

The concept of novel ecosystems has been seen as largely irrelevant in Europe where cultural landscapes are common and conceptions of nature more readily embrace human influence. Whether dubbed ‘novel ecosystems’ or something else, transformation will occur across the globe. Ignoring the potential for transformation of cultural landscapes is not just misguided but represents a fundamental misunderstanding of the relationship between culture and conservation. This can be illustrated with two contrasting examples: lowland heath in the UK and subalpine snowgum forest in Australia¹².

Lowland heath is a cultural ecosystem shaped over millennia by a range of human activities that have created a diverse patchwork across the landscape. Historically, a great deal of UK forest was transformed

into heathland, but it is the heathland that is now protected by legislation because it is deemed ecologically and culturally valuable. All over the UK, former heathland areas could be considered by most measures to be novel ecosystems. Many projects seek to restore lowland heath to its former glory, but this ignores a major change: cultural severance. Heathland is in decline because most of the cultural activities that maintain it have waned since the Industrial Revolution.

Originally coined to refer to the physical and psychological disassociation between cultural activities and landscapes¹³, cultural severance has been used as a call to action for people to reconnect with land management. Yet viewing this from the perspective of the Anthropocene, it is perhaps more useful to consider whether it is still worthwhile to mimic the activities that brought heathland into being, with successful heathland restoration requiring perpetual investment in the absence of the cultural drivers that created them. Although these ecosystems are diverse, there is no strong argument to say that they are any more ecologically valuable than other ecosystems in the UK. Whilst acknowledging many people love heathland habitat, it is practically a matter of historic accident that it came to be listed as a priority habitat. Surely a modernised governance regime for the Anthropocene would consider not just how to maintain such habitats, but whether it is still sensible to strive to protect and restore these habitats at all.

When burning practices were brought from the British Isles to Australia, cultural drivers of fire management actually increased flammability in some ecosystems/biomes – including subalpine snow gum – adding to the elevated fire risks generated by climate change¹⁴. Based on cultural understandings of how fire was used in Europe and cultural misunderstandings of how Aboriginal people used fire, widespread ‘prescribed burning’ programmes expanded steadily after a series of catastrophic bushfires. Despite additional evidence that this negatively impacts upon biodiversity – and seldom reduces the risk of catastrophic bushfires – many practitioners and academics have been resistant to challenging the received wisdom underpinning most prescribed burning activities. The argument for burning is in part that it signals that ‘something’ is being done to protect communities from bushfires, but this is based more on perception than evidence. As with the heathland example, it is our assumptions of cultural perceptions that often mismatch with reality and call into question the idea that culture *per se* is preventing us from moving toward a more fit-for-purpose governance in the Anthropocene. There are a few local governments that have discussed these issues openly with their communities and the results so far have been promising, with a few communities open to accepting greater risk to property in return for biodiversity and amenity value.

Both examples illustrate a final point worth considering: the culture of experts. The preferences of experts influence how we intervene and how evidence is used. In both examples above, resistance to change is partly down to resistance from researchers, practitioners, and decision-makers to change tactics. Little published data exists on this topic but what does exist is provocative, suggesting experts are inherently conservative and despite accepting in principle the need for change, shun innovative or ‘taboo’ options instead¹⁵. When experts repeatedly highlight how the culture of society at large is impeding progress, it is worth reminding ourselves that we, too, are partly to blame for the slow pace of adaptation. Now that

humans have created this new epoch characterised by change, it is time to reflect on how it should actually change us.

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Why care about nature? A pluralistic agenda for biodiversity

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During most of the past 50 years, biodiversity did not capture the imagination of the general public or most natural scientists. While this may be changing, it is uncertain whether new attention will lead to effective action. The *Biodiversity Revisited* proposition statement suggests lack of sufficient action to halt the deterioration of biodiversity is due to dominant biophysical focus. Here, I examine this proposition in the light of the proposed themes of 'Concepts and Narratives'.

From biological concept to boundary object

The notion of biological diversity existed as a purely biological concept well before the word 'biodiversity' emerged. The term was defined simply as species richness and relative abundance in space and time¹. Consistent with its intent to be comprehensive and inclusive of the wider social and political arena, the 1992 definition adopted by the Convention on Biological Diversity (CBD) was much broader. ¹ Faced with the new challenge and desire to be useful to society, biological diversity scientists mustered the best tools they had: mathematical and statistical models and indices, which required a single and simple 'currency' – the number of species, sometimes accompanied by relative abundance. While producing much insight, such framing and tools fell short of capturing the imagination of the wider community. It is now clear that whilst 'biodiversity' is about the biological realm, its crisis and potential solutions pertain to the social, cultural, economic and political realms. Therefore, diverse perspectives are needed in reframing biodiversity more broadly. Very few would contest this general statement; indeed, the concept of biodiversity seems to be already acting as a boundary object² articulating disciplines and sectors. International science programmes, networks and consortia have expanded their focus from almost

¹ According to the CBD 1992 definition (<https://www.cbd.int/doc/legal/cbd-en.pdf>), biodiversity (or biological diversity) is "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic systems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems". While previous definitions implicitly included the terrestrial, marine and freshwater realms, they did not include ecosystems, for good reasons: ecosystems consist of living components and also non-living ones (which by definition cannot be part of *biodiversity*), such as water, mineral components of the substrate and other elements of the physical environment. While the inclusion of ecosystems in the CBD definition made sense from the point of view of the science-policy interface, many ecologists took, and still take exception¹¹. The latest definition of biodiversity in the science policy interface, that of IPBES ('the variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part. This includes variation in *genetic, phenotypic, phylogenetic, and functional attributes*, as well as changes in abundance and distribution over time and space within and among species, biological communities and ecosystems'; my italics)¹⁰, while strongly based on the CBD's, emphasises that the focus is on the living components, in an attempt to keep to the spirit of the CBD definition while better aligning it with standard ecological theory.

² A boundary object is one that can link different disciplines, knowledge systems, and/or communities of practice together via collaboration on a common task¹².

exclusively fundamental science to informing policy and practice at different scales. The difficult question is how to move to implementation.

Evolving narratives

Broadening the concept of biodiversity – from a property of measurable biological systems to a socio-ecological boundary object – is part of a wider transformation in the social narratives that link nature and people. Major international assessments on the nature-people nexus provide landmarks for describing these changes because they influence conceptual frameworks, research programmes and science-policy agendas. The evolution of nature conservation narratives as described by Mace² reflects a shift in how links between nature and society are framed.

Up to the 1980s, nature was primarily viewed as starkly separate from society – what Mace² terms “nature for itself” and “nature despite people.” The International Biological Programme (1964-1974)³ is a classic example. Nature was framed either as natural resources and thus collateral damage from the human enterprise, or as an Edenic nature that must be preserved in isolation from people. Diversity – still conceived as the number and relative abundance of species in an ecosystem – is an academic parameter that features weakly, if at all, in policy recommendations. In the early 1990s, ‘biodiversity’ emerges and, for example, in the Global Biodiversity Assessment⁴, is presented as being affected by external direct drivers and as an active factor driving ecosystem processes. The focus remained almost exclusively biological.

In the early 2000s, the Millennium Ecosystem Assessment (MEA)⁵ showcased ecosystem services in the science-policy interface. This explicitly instrumental/utilitarian focus corresponded to the “nature for people” approach². ‘People’ here refers to a mostly generic, homogenous humanity, and whilst still strongly dominated by ecological science, economics is included. Biodiversity – mostly as species richness – featured more than before and was assumed to ‘improve’ functions and services of ecosystems. People started to stress and empirically document the differential perceptions, needs and interests related to ecosystem services between and within societies, across a highly heterogeneous humanity. This transitional “nature for different people” approach brings in more academic disciplines and the values of nature extended to the social as well as biophysical and economic.

Increasing awareness and wider societal ‘ownership’ of biodiversity and environmental issues have accentuated this past decade. This corresponds with the emergence of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), with a highly ambitious mandate: document the status and trends of biodiversity, ecosystems, and their contributions to people, incorporating multiple academic disciplines and knowledge systems, including those of Indigenous Peoples and local practitioners. Accordingly, the IPBES conceptual framework⁶ was co-constructed through a two-year participatory process with six mayor elements – nature, nature’s contributions to people, quality of life, and direct and indirect drivers. Each was conceived as an inclusive category with an equally inclusive name, approachable from different perspectives and cultural lenses. Building on Mace², this approach could be considered ‘people and nature’. IPBES placed institutions, governance systems and other indirect drivers – embodying different values and worldviews – centrally in its model. There was

no homogeneous ‘humankind’ separate from and simply destroying biodiversity, but rather a heterogeneous constellation of societies differentially manipulating and accessing nature and its benefits and placing it within intricate value systems. Human work and agency were explicitly acknowledged as essential in co-producing these benefits.

Two elements – nature and ‘nature’s contribution to people’ – are of particular interest to *Biodiversity Revisited*. Nature here means the ‘fabric of life on Earth’: the living world around and even inside people, from house plants and vegetable gardens to the remote wildernesses. Biodiversity sits alongside other ways to conceptualise nature including natural capital (economics), the Earth’s life support systems (systems ecology), or the indigenous notions Mother Earth (South American Andes), *senlao wanxiang* (South East Asia), or country (Australia).

Similarly, nature’s contributions to people – the benefits and detriments humans derive from nature as individuals or members of societies – can be approached from very different perspectives, including natural resources, ecosystem services or nature’s gifts and retaliations⁷. The links between nature, its contributions to people and quality of life can be conceived as a unidirectional flow from supply to demand (economics) or as a multiple, reciprocal flows with mutual care, responsibility and agency on both sides. There are multiple values at stake^{6,8} and benefits from nature do not simply flow into human wellbeing; mediating the process is co-production and institutions regulate production and differential access.

Communication and implementation: back to nature?

The current definition of biodiversity is arguably complex and convoluted, reflecting different streams of knowledge, interests, and perceptions implicated in its construction. This complexity strikes some as logical untidiness, which is the hallmark of boundary objects. There is little hope and probably not much to gain in developing a more parsimonious technical *definition*. Rather, we can find a better *name and conceptualisation* that includes the entities (genes, populations, communities, etc.) and what they ‘do’ (e.g. ecosystem processes) to better engage the hearts and minds of people across all levels of decision-making. ‘Nature’ or ‘the fabric of life’ have generated notable attention from government offices to executive boards and across the media. The proportion of society realising that the living world is important is much higher than to those whom the word ‘biodiversity’ resonates.

The ‘people and nature’ narrative embodied by the IPBES conceptual framework opens more space than ever before to the knowledge and interests of different social actors. This should generate a richer picture with less risk of some disciplines crowding out others and enable more people to identify issues they care about be legitimately represented. While it is early days in an enormous social experiment in knowledge generation for action, initial enthusiastic reactions are encouraging. Limited interoperability between knowledge systems – in terms of ontologies, validation rules, intent and scale – is a massive obstacle. Asymmetries between disciplines and knowledge systems remain sizable in terms of public and governmental acceptance, degree of organisation of the communities of practice, and widely accessible information. While transdisciplinary teams, multiple evidence-based work, organised dialogues and

systematic reviews can address these knowledge-based obstacles⁷, asymmetries of power in wider society remain, particularly when it comes to implementation.

What is done or not across heterogeneous societies may not necessarily be good for everyone, so implementation is often not based on relevant information and ‘rational choice’^{8,9}. The monetary valuation of ecosystem services was received enthusiastically by governmental agencies and intergovernmental bodies and contributed to place ecosystems – and to a lesser degree biodiversity – on international agendas. However, judging by the biodiversity and ecosystem trends reported in the most recent and comprehensive assessment¹⁰, it does not seem to have resulted in enough action. Most successful bottom-up approaches for the global protection of nature have been based on relational rather than instrumental-value considerations. Implementation often relies more on power dynamics and personal morality, entitlement, and acceptable costs. Where unequal power exists, so does conflict, which has been largely ignored in the narratives about nature. We often talk about synergies, enriched pictures, cross-fertilisation, and win-win options. Whilst these are essential, conflict is unavoidable when it comes to implementation and we gloss over it at our peril.

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The values embedded within scientific language: how ‘biodiversity’ separates humans and nature

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The values embedded within scientific language

Philosophers of science have recently emphasised how scientific research is value-laden in many ways^{1,2}. Scientists make numerous choices or judgements that are not settled by the available evidence but that end up supporting particular social or ethical values. For example, scientists have to decide what topics to study, what questions to ask about those topics, how to design their studies, what methods to use for collecting and analysing data, how to interpret ambiguous results, and how to frame and conceptualise their findings³. When undertaking applied research around environmental issues, it is not uncommon for particular judgements to produce results that are more supportive of particular values, like public and environmental health, in the same way that other choices could support different values such as short-term economic growth.

There are at least three important kinds of value-laden choices involving scientific language³. Firstly, scientists can end up supporting some values over others depending on how they *frame* the topics under investigation, as illustrated by members of the public responding differently to climate change depending on whether it is framed as a matter of scientific uncertainty, unfair economic burden, religious morality, or public accountability⁴. Secondly, scientists often use *metaphors* or *terms* that describe their work in value-laden ways. For example, Brendon Larson argues that it is important to consider the metaphorical significance of terms like ‘invasive,’ ‘alien,’ or ‘exotic’ species, which may subtly encourage people to draw connections between biological issues involving these species and social issues like military invasions or disputes over immigration⁵. Thirdly, choices about defining and choosing the *categories* used in scientific research are often value-laden. For example, the increasing use of the concept of ‘wetlands’ in the second half of the twentieth century helped prompt conservation of these areas but major political disputes have arisen about how to define what counts as a wetland. During the George H. W. Bush Presidency, his administration tried to shrink the number of lands classified as wetlands – thereby facilitating his campaign promise of ‘no net loss’ of wetlands – but this plan came under intense opposition from environmental groups⁶.

These choices about frames, terms and categories can have major social and ethical consequences when dealing with environmental issues and can influence the future course of research by drawing scientists’ attention to some problems whilst shifting it away from others. These choices can also influence the extent to which members of the public and policymakers pay attention to environmental problems and they can

change the burdens of proof or the kinds of evidence required to act in response to environmental concerns⁷.

The values embedded within 'biodiversity'

It is instructive to examine how the *Biodiversity Revisited* proposition discusses the values embedded within scientific language. The proposition states “biodiversity has not, broadly speaking, proven to be a compelling object for sufficient action to halt the degradation of the diversity of life on earth....

Furthermore, the predominant focus of research on describing biophysical change does not provide the necessary insight into the social and policy dynamics that would facilitate effective action.” This statement resonates with philosophers’ claims that some concepts are more likely to generate public attention to environmental problems than others and some concepts are more likely to direct the attention of scientists to important problems than others. The statement argues that the concept of biodiversity has not been particularly successful at galvanising public attention and it has not directed scientists toward thinking about the social and policy issues that they need to be addressing.

I agree with these concerns. The biodiversity concept tends to focus scientific and public attention on elements of nature (such as genes, individuals, populations, or species) that are regarded as separate from human beings and sometimes opposed to human interests. Journalist Mark Dowie has proposed that efforts to preserve biodiversity have resulted in pushing Indigenous Peoples off their historic lands because some conservationists felt it was easier to achieve their goal of preserving biodiversity in the absence of human interference⁸. Dowie cites the example of Martin Saning’o, a Maasai leader from Tanzania who addressed the Third Congress of the World Conservation Union in 2004, claiming that “in the interest of a relatively new vogue in conservation called ‘biodiversity’ ..., more than one hundred thousand Maasai pastoralists have been displaced from their traditional homeland⁸. ” Saning’o asserted that “We [the Maasai] were the original conservationists,’ but ‘now you [conservationists focused on biodiversity] have made us enemies of conservation⁸. ”

In their well-known essay, *Conservation in the Anthropocene: Beyond Solitude and Fragility*, Peter Kareiva, Michelle Marvier, and Robert Lalasz make a similar argument⁹. Like Dowie, they worry that because the concept of biodiversity does not explicitly draw connections between humans and nature, it encourages the notion that biodiversity is most easily preserved in pristine wildernesses devoid of human beings. They argue that this has marginalised the environmental movement and left it open to the criticism that it neglects the concerns of human beings.

Paths forward

To address the concerns raised in the *Biodiversity Revisited* Proposition, the environmental community should explore new ways of framing and conceptualising environmental problems to highlight the intertwined flourishing of humans and nature. It is crucial that scientists, activists, and policymakers take lessons from the philosophy of science to heart and explore language choices that are more effective at galvanising public attention and action. Proponents of the biodiversity concept are likely to object that we do not need to develop new concepts or approaches to framing environmental problems. They will insist

that we can convince people to address environmental problems by identifying the many ways in which the destruction of biodiversity is harmful to human beings. This is not sufficient. We need to develop concepts that express intrinsic links between humans and nature thereby promoting greater public attention to environmental problems, fewer perceived conflicts between human flourishing and environmental protection, more effective policy making, and new lines of scientific investigation.

Dowie points out that concepts like 'wild,' 'wilderness,' and 'biodiversity' – all of which tend to distinguish humans from nature – do not even make sense in many indigenous cultures, as illustrated by the perspective of a Khomani hunter who said "The Kalahari is like a big farmyard.... It is not wilderness to us⁸." Indeed, the O'odham Native American tribe's word for wilderness is related to their terms for health, wholeness, and livelihood, and the closest approximation for the word 'biodiversity' among the Yupik people of Alaska is their word for 'food'⁸. It is noteworthy that terms like 'livelihood', 'food', 'health', and 'wholeness' all foster more or less explicit links between human and environmental wellbeing.

As we move forward to develop new conceptual schemes that link humans with their environments, I recommend focusing less on specific *items* in the natural world that we want to maintain and more on developing resilient and sustainable *systems* that facilitate the myriad relationships between humans and nature. These relationships include "attraction and curiosity, affection and kinship, knowledge and understanding, mastery and control, moral and spiritual relation, even fear of and aversion to the natural world¹⁰." Stephen Kellert uses the term 'biophilia' to describe our multifaceted affinity for the natural world, affirming that "we are formed by the quality of our relationship with the natural environment¹⁰." While some might object that this sounds like an anthropocentric or human-centred perspective, it actually blurs the boundaries between anthropocentric and non-anthropocentric thinking in fruitful ways by emphasising the variety of ways in which humans relate to nature.

Exploring the best ways of conceptualising our relationships with nature in the future will ideally require collaborative efforts that incorporate experts spanning the natural sciences, the social sciences, and the humanities. As a philosopher of science, my 'charge' for those engaged in these efforts is to remain cognisant of the values within scientific language and the many consequences of our language choices.

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Toward a new narrative: from biodiversity conservation to multispecies justice

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The current biodiversity crisis, whose scope was recently highlighted by the advance summary of the 2019 IPBES report, is both a scientific and a cultural concern. It is biodiversity decline as a cultural concern that I will focus on in this essay.

But first some scientific context: the causes and consequences of species loss that ranges well above the evolutionary background level have been scientifically studied in detail over the last five decades. Palaeobiologists Jack Sepkoski and David Raup, among others, highlighted the importance of mass extinctions for evolutionary processes in the 1970s and 80s. Following their insights, environmentalists' concern began to shift from the extinction of individual species to the possibility of an ongoing mass extinction of species; the sixth in evolutionary history. For the first time, human activities such as land use change and overhunting would be responsible for rapid species decline. Consequently, individual biologists and organisations – from Norman Myers, Paul and Anne Ehrlich, and E.O. Wilson to the Center for Biological Diversity – sought to investigate, publicise and advocate for collective action against biodiversity loss.

The science of biodiversity decline itself is complex. While there is no disagreement about the general trend – it is significantly faster than normal global loss of species – both basic questions and more detailed findings about this decline have been widely discussed during the last few decades. How biodiversity should be defined and measured at different levels have been hotly debated at genome, species and ecosystem level: the criteria species and ecosystems should be selected for conservation; to what historical state and what set of species a particular ecosystem should be restored; how biodiversity is developing differently at different levels of scale from the local to the national, regional, and global levels; and how species loss should be tallied in relation to speciation and hybridisation processes.

These nuances tend to get lost when species' decline is discussed in the public sphere. Nevertheless – in no small measure due to the efforts of thousands of conservation individuals and institutions – biodiversity loss has become a major topic of debate and a cultural concern in many countries. Hundreds of books, films, and paintings, thousands of websites, and tens of thousands of news items and photographs have focused on biodiversity loss since the 1970s. Many literary and musical works show great diversity and originality in their approaches to biodiversity.

Nevertheless, certain conceptual structures and narrative templates tend to recur in portrayals of vanishing species across a wide range of media, languages, and cultures¹. These narratives generally hew to a

pervasive proxy logic that governs most public perceptions of biodiversity loss. According to this logic, certain charismatic species are taken to be proxies for all species. Species, in turn, are understood to stand in for biodiversity or ecosystems at large. Biodiversity itself typically becomes a shorthand for what particular communities value about nature. And what is lost from nature is reinterpreted as something that the community itself lost from its collective identity, usually during processes of modernisation or colonisation (or a combination of both). Narratives about biodiversity loss, therefore, outside of science and often even within it, are also almost always narratives about cultural identity and its historical changes.

Even at first glance, it is clear that cultural engagements with biodiversity do not usually engage with the full spectrum of species, from microbes and bacteria to plants and animals. Rather, public attention typically focuses on animals more than on plants; on vertebrates more than invertebrates; and, among vertebrates, on birds and mammals more than reptiles, amphibians, or fish. Recent exceptions such as coral reefs and monarch butterflies notwithstanding, most public conservation discourse has focussed on what environmentalists half-seriously and half-humorously refer to as 'charismatic megafauna': mammals and birds that attract broad attention because of their size, aesthetic appeal (which can range from the majestic or the exotic to the colourful or the cute), and their cultural associations.

Some of the most iconic endangered species are associated with national identity. The giant panda and the Bengal tiger function as powerful proxies for national self-identification in China and India, for example. The demise of the thylacine (a large carnivorous marsupial) due to determined extermination efforts in nineteenth and early twentieth-century Tasmania is frequently evoked in contemporary Australian debates about national environmental history, guilt, and responsibility. And the disappearance of the passenger pigeon in the United States at around the same time often combines in national memory with visions of a wilder, more abundant and more beautiful country that was thought of as 'nature's nation'.

For former European colonies and indigenous communities, the vanishing of native species often stands in for broader, traumatic memories of invasion and oppression: on many Caribbean islands, biodiversity was brutally reduced through the introduction of sugar plantations, for example; for Inuit communities in northern Canada, the current endangerment of the polar bear is understood less as a consequence of climate change than as a result of the more palpable intrusion of 'southern' – that is, non-indigenous – wildlife biologists and their manipulations of wildlife². In these contexts, a prominent endangered or extinct species comes to stand in for what a particular cultural community has lost – or believes it has lost – during modernisation or colonisation (the latter often accompanied by modernisation imposed from outside).

'Biodiversity' as a concept remains, for most communities in most regions, an abstraction. But what does matter to these communities is the endangerment or disappearance of species with concrete cultural significance. For the conservation community, engaging with these narratives of modernisation, colonisation, and change of identity is important for two reasons.

First, while individuals come to be engaged in conservation efforts for any number of reasons, communities engage with biodiversity through these stories they tell about themselves through nonhuman

species. Whether these stories are historically or scientifically accurate is less important in this context than how they function culturally. Biodiversity conservation efforts therefore cannot hope to be successful without a solid understanding of cultural and narrative analysis.

Second, conservation science itself is not exempt from the impact of such narratives. The pronounced preference of many conservation scientists in former settler colonies such as Australia, Canada, and the United States for restoring ecosystems to their state before the arrival of Europeans does not rely on simple ecological reasoning. As environmental historians have amply demonstrated, no such thing as pristine wilderness existed before the colonial venture: Indigenous Peoples had altered ecosystems for millennia before, albeit by different means, at different scales, and for their own purposes. Whether an ecosystem before or after the European arrival is more worth conserving or restoring than one after involves complex historical and cultural thinking and storytelling about what kinds of people – both human and nonhuman – belong in a particular place at a particular time.

Once we acknowledge the role of historical narrative and culture in public as well as scientific thought, writing, and debates about conservation, questions of justice also impose themselves. What species and ecosystems are worth preserving, at what cost, and for what purposes are questions that should not – but have in the past often been – addressed without consultation of the communities who are most affected by these decisions. Even equipped with the best moral intentions and scientific arguments, conservationists have often fallen short of recognising that ‘environmental communication’ is a two-way street: not just scientists instructing a less-than-knowledgeable public in ecology (necessary as such education may often be), but also communities teaching ‘experts’ about their ways of living with and among nonhuman species – including their visions of what the natural environments they inhabit should look like in the future.

This does not mean that communities are always right, nor that preferences for and dislikes of particular species should simply be accepted by conservationists as popular dictates. But it does mean that biodiversity conservation is really a multi-participant conversation about what I prefer to call ‘multispecies justice’: the question of what is and is not right to do by other people and other species, on what grounds, and how to proceed when ideas of justice diverge. Endangered tigers in India are a majestic species worth preserving to some and a lethal danger to be eliminated by others. Free-roaming cats are an abandoned species worth caring for to some urban residents and a deadly risk to songbirds and lizards for others. A US\$50 million price tag for a wildlife overpass is a worthwhile investment to some, while others might argue it would do more good if it were invested in homeless humans. Who has the power to make such decisions and why? Taking these questions into account does not make conservation easier – it makes it more difficult. But that is a price well worth paying if it allows more individuals and communities to participate in envisioning and advocating for multispecies justice for the future.

Note: The arguments in this short commentary are developed more fully and with detailed references in Ursula K. Heise, *Imagining Extinction: The Cultural Meanings of Endangered Species*, University of Chicago Press, 2016.

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Listen for a pelican, owl, gull, hawk and chickadee: narratives for *Biodiversity Revisited*

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I have been visiting dead birds. This may seem a dubious pursuit, yet unintended. At the Great Salt Lake in Utah, near the convergence of two of the four major bird flyways of North America, I have been following scientists who study white pelicans and other animals getting stuck in tar seeps. As they seek answers, I am reminded how easy it is to get stuck on the wrong questions.

A tar seep is natural asphalt that spreads out like flypaper and acts as a 'death trap'. Visitors to Utah never come for its tar seeps, and rarely for its 'dead sea', bypassing the saline lake for renowned ski slopes and red rock canyons. Inhabitants of Salt Lake City likewise overlook their namesake lake, even calling it 'ugly'. 'It's a place of paradoxes', says Jaimi Butler, coordinator of the decade-old Great Salt Lake Institute, an interdisciplinary environmental research centre dedicated to this understudied ecosystem in the high desert. 'Who connects to brine shrimp and microbes? It's stinky. You go out and find dead birds. You float and itch when you swim. There are all these funny weird things about Great Salt Lake that aren't always described¹.'

The issue rests not only on describing what isn't described, but on exploring different narratives for 'dead' and 'ugly' content. Like the blobfish ('the world's ugliest animal' that is easily neglected), there's a silver lining to Great Salt Lake's story². Since biodiversity needs blobfish as much as the poster-friendly polar bears, we miss something vital if we overlook 'death traps' in a reputedly 'dead sea'. But let me ask this question a different way: can I write 'climate change' without causing you to get stuck on the assumption of destruction before I have a chance to say: *what I am about to tell you is a narrative of narratives, of rejuvenation and life?*

*

The first time that I visited the tar seeps it was winter. February, chilled, spare snow. We were looking for a particular tar seep where four barn owls had become stuck a few months earlier.

After getting lost on the frozen, seemingly endless mudflats, we found the spot. Bones and feathers splayed in disintegrating states. The seeps pooled together as a shallow black pond, pocked with small tar volcanoes. One volcano was larger than the rest and radiated like a big black star. Its tentacles swirled into what resembled an aerial view of a burnt alluvial plain.

As we walked around the frozen seeps, patterns swirled from the slowly exploding star. Like a massive ink blot written on the planet, the seep seemed an indecipherable ideogram, defying language even as we

groped to articulate its qualities. Greg used the fossilised vocabulary of palaeontology; Jaimi honed in on ornithology; others would have described the value of the oil in terms of economic extraction. Many narratives kept emerging around the same thing. Even as I acquired terms, the terrain evaded classification.

Ultimately, the seep swallows all languages that attempt to describe it. Bacteria break it down. Destruction and creation all rolled into one. As studies currently explore how some bacteria even eat tar, they suggest hope for cleaning up future oil spills, as well as something more philosophical: about the power of microbial species, integrally interconnected with life cycles. Bacteria line our guts, maintain our body chemistry, and one day decompose us back to dirt – unless we get stuck in a tar seep. Tar is considered a perfect preservative – freezing, drying, encasing organisms as when they were alive – fossilising each blip of a lifespan in fragments.

The Great Salt Lake is often likened to a ‘dead sea’, but after spending months talking with scientists who love the Lake – its white pelicans, its black tar seeps, its bright orange microbial halophiles – my perception has shifted to see this ‘dead sea’ as deeply alive, integrally connected with the snowpack and water cycle of the American West and all those who depend on it: over 250 bird species, coyotes, jackrabbits, brine shrimp, more. I no longer view Great Salt Lake through human eyes only, but now attempt to see it through pelican eyes and try to understand why a brine shrimp or halophile (literally ‘salt-loving’) might find those salty waters an ideal home. The process is like trying to ‘see a garden through butterfly eyes’, restructuring human priorities by attempting to empathise with nonhuman, organic perspectives. William McDonough, an architect who specialises in sustainable design, encourages seeing that ‘carbon is not the enemy’ and that we have to redesign our relationship with carbon, which may help us to reimagine and literally redesign ‘buildings like trees’ and ‘cities like forests’.³

What happens when we change a singular narrative and its correlated metaphors, multiplying its possibilities, starting by acknowledging *life* in deathly tar seeps, enough to make connections and ask: *what else are we not perceiving, here and elsewhere?*

*

Against incontrovertible proof of climate change, narrative responses fossilise around apocalypse, prophecy, elegy and tug-of-warring tropes of progress and loss. Shapes of stories recur to mark the edges of our fears, so our tellings fall into predictable patterns and separate us from the animals that we are. Humans are slow to see our contributions to ecological destruction that can’t be neatly predicted, veering increasingly from past patterns into new uncertainties. Visual literacy in the digital age makes us less dependent on multisensory, embodied knowledges, which otherwise help us to interact with the world beyond words. Data tries to convince our brains yet paradoxically numbs emotions. Even as we face abounding facts, collective denial has grown to frame humans as passive victims rather than active agents. Most stories arise from fear of death rather than awe of life – its aliveness, volatility, mortality – more aptly navigated through indigenous tribalographies, trickster narratives, aboriginal songlines and timeworn performative forms that indivisibly interconnect people with landscape⁴⁻⁷. Rather than adapt

teleological narratives to accommodate the unexpected, we often fall back on human-centred stories that want for control and reinforce tropes (the individual over the communal, the human over the nonhuman) and thus cannot cope with metamorphosis – especially when natural forces raise their voices and howl.

*

The second time I visit the tar seeps it is early summer. Hot and stinky, the sky fills with pelicans, gulls and brine flies. The lake glows orange from halophiles. Near the largest seep, a gull flies toward our group setting up camera traps. Wildlife cameras chronicle the process of natural entrapment, frame by frame, capturing fossils in the making. As I watch the gull fly over warm tar and land near the seep, I want to scare it away. I don't want *this* bird to be the one that triggers the camera, right before our eyes. Nor do I want a researcher to watch, months from now, as *this* bird dies in slow motion. A *not-here* bird feels less real.

I take a step forward. The gull eyes me, steps back. It walks faster as I follow.

Closer, away. Closer, away.

The gull flies, landing again near the seep.

Again, we tango.

I realise that I am interfering. I leave to follow our group.

The gull flies away.

Down the sandflats, we find the tar seep with the barn owls. The black star has melted, browning around yellowed bones. I step toward the seep to take a photo. The sand beneath me sinks. Quickly, I lift my legs. Black gum stretches from my soles. I step back, leaving the outline of my footprints.

Later, when I scroll through photos, the day replays: orange halophiles, tar seeps, camera traps, feathers and bones, melted star, my footprints edged in tar. Hours distil to a few moments. Shot by shot the gull rises over the sticky pile of bones, then lands. Through the camera, we eye our fusing future.

*

Like a gull getting stuck in a tar seep, we can get stuck in one way of perceiving the world. We may be lucky enough to avoid a stinky death trap – because it forces us to immediately react or else die – but we may not notice ourselves getting stuck in a mode of thought, in a single frame of reference, in a single narrative.

A bird may be the closest thing we have to looking into the eye of time. As near descendants of dinosaurs, birds follow migration patterns that have evolved over generations with intricate songs like languages. LeAnne Howe (Choctaw) describes her grandmother as a hawk and birds as ancestors that carry the stories of forebears. 'Even if worse comes to the worst', she writes, 'and our people forget where we left our stories, the birds will remember and bring them back to us⁴.'

'Listening as the Chickadee listens' is how Plenty Coups, the last traditional chief of the Apsáalooke (Crow) nation, advised his people to survive after all the buffalo were killed and 'nothing happened'⁸. Philosopher Jonathan Lear interprets that 'nothing happened' cannot be analogised simply: going to a restaurant, ordering a buffalo burger, and being told that no buffalo remain. Instead it is as if the very cultural institution of the restaurant no longer exists, negating not only 'ordering' and 'buffalo' but also the narratives by which we relate to each other in the world.

This leads me to wonder about your very act of reading this essay and even my writing it. Both practices indicate that we find meaning in narratives. *To rethink narratives, how can we rethink our place in the world?* What more may emerge from more listening: to one bird, to another and each other?

To hear a pelican⁹: https://www.allaboutbirds.org/guide/American_White_Pelican/

To hear a barn owl¹⁰: https://www.allaboutbirds.org/guide/Barn_Owl

To hear a gull¹¹: https://www.allaboutbirds.org/guide/California_Gull

To hear a hawk¹²: https://www.allaboutbirds.org/guide/Red-tailed_Hawk

To hear a chickadee¹³: https://www.allaboutbirds.org/guide/Black-capped_Chickadee

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Biodiversity and the biosphere: can we rebuild a coherent system?

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We invented the 'biodiversity' construct a few decades ago and have had significant success in using it as a tool to measure trends, characterise a crisis, and monitor how the natural world is getting along over time (it is declining alarmingly). Despite generating a notable presence in the scientific community, we have had much less success in mobilising society to take real action to address the emerging crisis.

There have been global responses, notably the Aichi Targets delivered by the biodiversity convention, but these don't seem to have boosted global action. Biodiversity conservation has achieved important local successes, but they do not yet add up sufficiently to halt or reverse overall trends. Scaling up existing efforts would clearly be desirable, but this, in itself, presents enormous challenges. For a start, it would require a much stronger global consensus on the nature of the problem and its significance than we have managed so far.

While biodiversity has clearly struggled to get traction, it is tempting to suggest that the climate agenda has done significantly better – even though it too emerged from the Rio Earth Summit in 1992. In fact, funding patterns for international conventions provide one window into the prioritisation of climate challenges over biodiversity: in 2015, the budget for the operations of the climate change convention was US\$28 million while that of the biodiversity convention was less than half that – US\$12 million, of which US\$4 million actually remained unpaid. Additional evidence can be found in the fact that Google searches for keywords show that “climate change” and “biodiversity” had a roughly equal profile for their first decade after Rio, but by 2016 searches associated with climate change were eight times higher¹!

However, it appears that biodiversity's fortunes may be changing. There suddenly seems to be a zeitgeist delivering much needed oxygen to the global biodiversity agenda. This has been delivered, in large part, from the coincidence of the recent global assessment launched by the IPBES, the campaigning *Our Planet* series from Netflix with its associated 'David Attenborough effect', and the rise of grassroots movements like *Extinction Rebellion* and the campaign for a *New Deal for Nature and People* led by WWF and the World Economic Forum.

The new excitement about nature – in some European countries, at least – is palpable. I find myself wondering if an invisible rampart that has hitherto hindered the socialisation of biodiversity has suddenly been breached?

Realistically, however, we have to recognise that while there is a lot of buoyancy around the biodiversity agenda at the moment, it is still too early to say with any confidence whether it will stay afloat or sink back

below the waves. It would be great if biodiversity continued to trend and joined climate change as a global environmental priority: there are lots of reasons why the biodiversity and climate agendas can and should be mutually supportive – they are after all intertwined within one fundamental Earth system. Much more has to be done to make this important case.

On the other hand, we need to consider the dangers of focusing the global environmental agenda *primarily* on climate change. There is a real danger that radical climate action might, in reality, involve a rush to solutions that are anything but biodiversity friendly. A renewed drive for biofuels, perhaps, or for more indiscriminate hydropower, or an escalation in forest restoration based on fast-growing, non-native species? In anticipation of this likelihood, we need to develop science, policy *and* advocacy responses right now!

A stronger focus on implementation to support the biodiversity agenda is critical. Let's be honest and confront the fact that biodiversity is a science-designed concept that is, for the most part, functionally illiterate about political economy, agency and power. It turns out that such concepts are critical to our understanding of biodiversity loss and the implementation of remedial action.

Conservation professionals commonly have a similar background to my own. While we appreciate that there are strong and inseparable links between biodiversity loss and powerful economic interests, we still tend to underestimate just how deeply the future of biodiversity is entwined with the social and political systems that characterise human development. By way of an example, we consistently overlook the highly political nature of issues such as land ownership and rights and access to natural resources. The result is our biodiversity maps and plans that sketch out sweeping agendas for land use change may unwittingly contain the seeds of their own failure.

The conservation community is slowly waking up to the complexities of socio-political systems and the influence they have on conservation outcomes. However, at this time, there is a growing unease about how best to justify conservation and secure meaningful outcomes at the interface with human needs. We are also likely to see strong and increasingly divergent views and, most likely, contradiction and even conflict.

To help address both of these challenges, I would like to suggest two achievable and important courses of action – based on my own experiences, opinions, and of course biases and prejudices.

First, we have to encourage society to develop a coherent 'systems approach' to the biosphere – linking climate, the oceans, biodiversity, deforestation, and land degradation, at a minimum. This will require a root and branch reform of many of our national and international institutions. But this has to start with a better understanding of what it takes to change institutions at all levels of society, as well as the development of a research and action agenda that crosses disciplines and involves different expertise and types of knowledge.

The second course of action might seem rather parochial, but I am strongly of the view that all of us who are concerned with delivering a systems approach must invest in one or more trusted partners to help us

coordinate actions towards a common goal. These organisations need to have the mandate, capability, and inclination to convene both our own community and society more broadly – mediating around trade-offs and contradictions in agendas to help build convergence and consensus.

There are a few existing players striving to convene different parties – but they really need to raise their game. And soon!

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Systemic ‘biodiversity’ governing

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Biodiversity loss and social purpose

The challenge of the Anthropocene is not to save the Earth per se but to take responsibility for human co-evolution with the biosphere, including other species. Within this dynamic, biodiversity can never be saved in and of itself. Since the arrival of humans, history shows that the quality of what is framed as ‘biodiversity’ arises from the interaction between human social systems and the biosphere¹. Marketisation, commodification, loss of commoning² and place-based sensibilities to name but a few, are vectors of relationship breakdown with the biosphere. The decline and neoliberal elimination of ‘social purpose’ – no longer adequately negotiated by the state and our modes of governance – underlies the crisis in biodiversity. Having a sense of purpose is a common thread across the Blue Zone communities.¹ The Okinawans call it *‘Ikigai’* and the Nicoyans call it *‘plan de vida’*; for both, it translates to ‘why I wake up in the morning’. ‘Knowing your sense of purpose is worth up to seven years of extra life expectancy’^{2,3}. To pursue social purpose requires an understanding of what it means to be social – the reciprocal experience of other humans, species and the biosphere arising as legitimate others in our living.

Contemporary governance systems are inadequate

The principles on which much governance is founded were developed around 200 years ago⁴. Since then new demands have arisen but governance has stayed still. Almost all the elements of contemporary governance predate awareness of, and design for, the Anthropocene and human-induced climate change, extinction rates, water cycle breakdown, etc. In addition, the expansion of the technosphere, the development of hugely powerful corporations and the disruption of civil society dynamics through urbanisation and mass migration, all represent huge extensions in the governance remit, for which existing systems of governing are not equipped.

Nation states have become the focal point of governance, often limiting or preventing local initiative and action. The **global governance** that exists is better than nothing but resembles a rambling superstructure of poor visibility and accountability and without the democratic legitimacy to wield power on the scale now necessary.

Powerful forces have worked out how to manipulate governments for their own ends. The once occasional, but now ubiquitous practice of **preferential lobbying**, whereby business and other large bodies are able to secure their interests at the expense of citizens and biodiversity, has been a key enabler of the domination of the economic system, and a purveyor of inequality. The demise of the biosphere is a quite an

¹ Blue Zones is the description given to a handful of regions of the world where communities have very long life-expectancies, with a high proportion of people who live to 100+.

extraordinary testament to the lack of vision of **most economists**, who have promoted subject exceptionalism such that the 'environment' is treated as an 'externality'. That externality is kicking off in a big way at its human marginalisation. Future history will put all conventional economists in the dock.

Despite intense expressions of concern about the fractured relationship between humans and the biophysical world for over 70 years, governance has failed to deal effectively with the biosphere. Two choices were particularly unhelpful. The first centred on the dualism – a self-negating pair – of **humans and nature placed in opposition**. The second was the 'triple-bottom-line' – **social, economic and ecological pillars** of sustainable development discourses. Both need to be abandoned.

These unhelpful choices arose from systemic failure – common in governance: for example, pollution occurs and is usually only identified after a long delay and then some years later a **regulation**, which may or may not work, is introduced to stop it. Environmental protection agencies and others usually have sufficient powers but if the current political and governing system takes exception, then regulations can be abandoned or bent, compliant regulators appointed and budgets cut.

Take Australia⁵, where **biodiversity enters the governance system** via commitments to an international treaty (The Convention on Biological Diversity) agreed by the federal government and administered through one ministry. The language and mandated actions of the treaty are that of international science and particular disciplinary cliques. It is not the language of local actors who have to effect on-the-ground change. In this case, local actors in Melbourne spoke of improving human-nature relations, not biodiversity conservation. In a federal governance system like Australia, a demand from government always runs the risk of becoming a tick box exercise. It was implemented with undue focus on species and rural habitats (not urban where the bulk of the population resides) with top-down, command and control practices – despite an emerging discourse about the necessity of co-design. Co-design, with local actors, is unlikely to flourish in governance systems that are structure-determined to deliver command and control⁶.

What does the model of nation-state governance look like today? It comprises the state, the law, the private sector including the media and civil society. Each of these elements and the relations between them, are no longer fit for purpose. The institutions that make up the current governance system, plus the understandings and practices on which they are based and enacted, contribute to the systemic failures being experienced not just by the biosphere but in everyday lives⁷. The governance systems we have are the systems we have constructed – in part human invention, happenstance and the product of the cultural norms of a society.

A new model for governance

What is missing from current conceptions of governance to create a system fit for the Anthropocene? We propose the **addition of three new elements** (Figure 1), which would create the means for discovery based on practical experience – a heuristic model which is able to influence contemporary discourse. It would realise new systemic relationships with the potential for a very different dynamic in the way governance is practiced. The new model is a profound change in organisation. The biosphere and

technosphere cannot speak for themselves and for systemic governing practice to emerge, new institutions and practices have to be invented and institutionalised (through constitutional reforms). In addition, the old will need ‘killing-off’, because social purpose requires institutions to begin with ‘not knowing’, and progress in situations of unfolding uncertainty.

Most analyses of governance failure are partial rather than systemic and stop at first-order change (improving the current system) rather than **radical second-order change (transforming the current system)**. There is a need to liberate thinking and practice from the debilitating shackles of historical governance and institutions that foster only first-order change. Commitments to first-order change are among the systemic reasons why biodiversity ‘is not a compelling object’⁹.

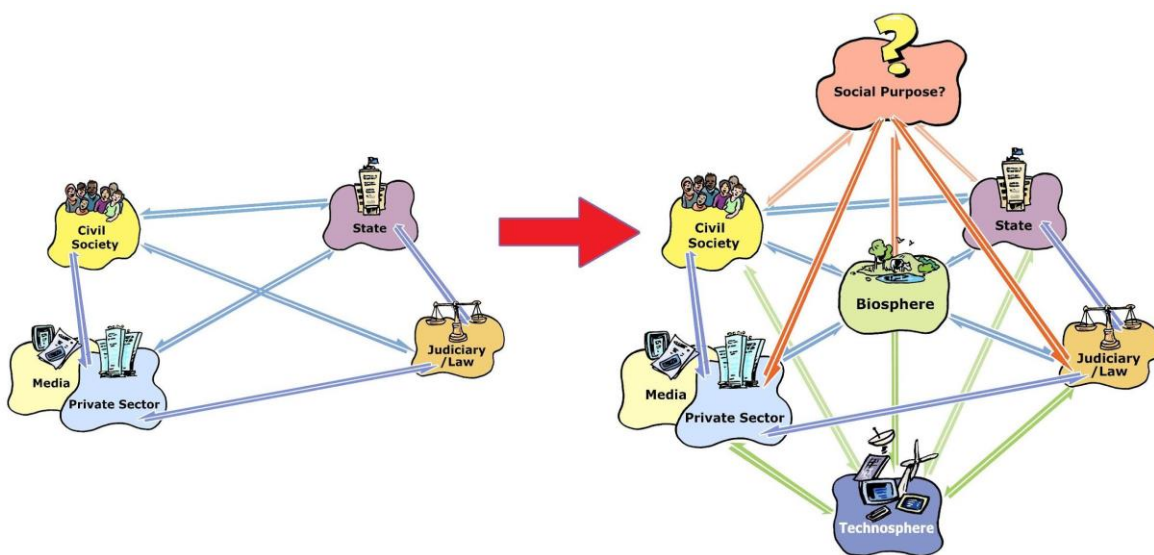


Figure 1 A key challenge – how to transform for governing in the Anthropocene: from a failing governance system (left) to a new ‘governance diamond’ (right) with the biosphere as central, the technosphere and social purpose as additions, adapted from Ison et al.⁸

Effective Anthropocene-governing responses mean making a **framing choice** that places two intrinsically interrelated systems (social and biophysical) into a new joint trajectory based on a clear understanding about what is to be governed and how governing functions. Framing is the social construction of a social phenomenon – by mass media, political or social movements, leaders, or other actors and organisations. An economist will see government in a different frame from a sociologist. Reframing facilitates a fresh perspective and new answers. When an Italian sociologist was asked about his country’s approach to road safety, he reframed the situation by replying ‘*Build better hospitals*’.

De-framing and reframing are the first critical steps of a sequence needed for thinking differently and heading towards second-order change:

1. Take responsibility for *framing choices* applied to situations of concern and explore what those choices could mean in practice;

2. Invite different actors, so that a starting conversation is populated with *multiple partial perspectives*;
3. Explore and design for *purpose*. Revisit articulations of purpose regularly, and know that purpose is what a system does.

Designed human activity systems to carry out these steps will come in many forms to affect the praxis (or theory-informed practice) necessary for a shift to second-order change. The new institutions for social purpose would use principally deliberative and participative forms of democracy such as **citizens' assemblies** run as systemic co-inquiries, which can address effectively situations of uncertainty and complexity that centralised administrations cannot¹⁰. Independent and **cybernetic feedback** on the results or outcomes – in their many forms – of government actions and policies would be institutionalised through an additional component that operated alongside legislature, executive and judiciary powers. As we have found, the world cannot run on lies¹¹.

The global forces of the status quo are not 'natural laws', the only way, tablets of stone or any other platitude for extraordinary degrees of biosphere-human and intra-human inequality. The governing, political, social and economic systems we have are all human inventions, which can and must be reinvented so as to alter the trajectory of on-going human co-evolution with the biosphere, including other species.

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Biodiversity Revisited: bridging aspirations and conservation in research and practice

Winner of early-career essay competition

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New grounds for inspiration

The world's ecosystems and wildlife populations are in crisis despite several decades' worth of efforts as multiple 'sticks and carrots' for biodiversity conservation. The IPBES Global Assessment Report¹ – which highlighted that more than one million plant and animal species are on the verge of extinction – only confirmed our long-lived fears as to the extent of this emergency and its alarming implications for human survival. If existing conservation instruments and well-documented effects cannot bring about the positive change required in biodiversity research and practice, what can? In this essay, I propose a shift in thinking towards a conceptual approach that is centred on 'aspirations' – more than objectives, our collective hopes and desires – as a new place from which to find inspiration in our quest to protect the world's biological diversity.

Biodiversity research and practice: the state-of-the-art

Historically, much attention has centred on the production of scientific knowledge around the world's natural resources. From the works of Alexander Von-Humboldt to Charles Darwin and beyond, we have inherited an extensive body of information on the ecology and origins of the world's biological diversity – from spatial distribution and abundance to the interactions between and within species and environments – increasingly repackaged in terms of 'ecosystem services' and a language of economic valuation². However, experience shows that knowledge of biodiversity loss does not necessarily lead to effective and timely action to halt it. Many people know that cattle emit methane – a potent greenhouse gas – and, although arguably fewer understand how livestock production is a major driver of tropical deforestation and subsequent biodiversity loss, the consumption of beef remains high. Farmers who convert tropical forests to agricultural land and pastures know that they do so at the risk of losing thousands of species, yet high rates of deforestation prevail in many tropical regions.

If knowledge is insufficient to drive the major positive changes required for biodiversity conservation, what other options exist? One is coercion. In fact, the backbone of the 'conservationist' movement during the 20th century – and one that still dominates conservation practice today – was based on the establishment of protected areas and other 'command-and-control' policies and regulations designed to limit the influence of human activity on nature³. Another option is to improve people's socio-economic conditions and to

displace environmentally damaging productive activities away from the natural ecosystems that harbour wildlife. The rise of Integrated Conservation and Development projects (ICDPs) during the 1990s was based on a 'win-win' logic where biodiversity and people could benefit from ambitious interventions that promoted poverty alleviation and 'conservation by distraction'⁴. Yet another option – and one that has come to the fore since the 2000s – is to provide direct incentives for biodiversity protection. Market-based conservation instruments, including payments for ecosystem services (PES) and 'biodiversity offsets', are based on a logic where direct payments and the creation of markets for ecosystem services help align incentives to protect biodiversity⁵.

The widespread implementation of these aforementioned 'sticks and carrots' has made important progress in protecting biodiversity in some contexts. For instance, nationwide research in Mexico shows that protected areas and PES programmes have been highly effective in preventing forest loss⁶. Nonetheless, the conservation agenda has been severely limited in two ways. Firstly, the emphasis has mostly centred on addressing the short-term causes of biodiversity loss such as changes in land use and timber overharvesting through 'nudges', both voluntary (incentives) and involuntary (coercion). Little attention has been paid to understanding the drivers that lead people to engage in biodiversity-damaging activities in the first place. Biodiversity research and practice have remained theoretically weak in terms of understanding human behaviour and few efforts have been successful in acquiring a deeper, broader understanding of behavioural change and decision-making processes. Models of human choice and decision-making have been extremely narrow in scope and depth, with local populations often represented as mythical caricatures of 'noble savages', 'irrational predators', and 'population time bombs'⁷.

These two frequent drawbacks of a traditional 'stick and carrot' approach for biodiversity protection – short-term in scope and superficial in understanding how behaviour underpins choices – have constrained our ability to understand and address the long-term, fundamental processes that lay at the core of biodiversity loss. Consequently, biodiversity interventions are ill-suited to cope with specificity, complexity and changing conditions, and so often backfire or become ineffective over the long-term.

Recasting the biodiversity agenda: aspirations

I propose here a focus on 'aspirations' – broadly defined as hopes or ambitions of achieving something⁸ – may offer a novel lens to move biodiversity research and practice forward. There remains a strong need to engage the decision-making input of local populations who are directly affected by biodiversity availability and loss, including agricultural activities, legal and illegal resource extraction. These inputs can be reconceptualised within a wider set of hopes and ambitions to uncover the dynamic interplay around the complex processes that determine human choices and to expose the synergies and contradictions at the human-nature interface.

Integrating aspirations and biodiversity in research and practice is not about overloading the conservation agenda with 'other noble causes', such as poverty alleviation, Indigenous People, and human rights⁹. After all, the experience of environmental policy shows that 'win-win' outcomes for biodiversity and people are rare⁴. The view that I am putting forward here is about placing human ambition at the centre of biodiversity

analysis, thinking more profoundly about what drives people's choices and asking different questions on how to influence behavioural change. If biodiversity loss is at its essence driven by human ambition – as reflected by pervasive overproduction and overconsumption patterns from local to global scales – then the first place to look for answers and solutions is deep within the human mind. This requires looking at how people respond to economic incentives and coercion but also many other deeper motivations – philosophical, cultural, ethical – that together drive the local actions affecting biodiversity. If narrow, short-term decisions influence biodiversity but those decisions result from a much deeper, broader and longer-term suite of hopes and ambitions, then what is needed is to examine how such behavioural foundations are formed and indeed evolve and change. In other words, to recast biodiversity research and practice in terms of aspirations.

The notion of linking aspirations with biodiversity raises more questions than answers. I present two avenues for enquiry and highlight some thoughts for research and practice. One potential theme revolves around 'intrinsic' motivations for conservation. Whether monetary incentives 'crowd-out' or 'crowd-in', intrinsic motivations have attracted significant scholarly debates in the field of market-based conservation instruments¹⁰ and remains an open empirical question. Yet, when local populations are confronted with various incentives simultaneously, it is highly likely that trade-offs emerge because some incentives crowd-in motivations whilst others crowd them out. For instance, agricultural subsidies may crowd-out motivations to protect biodiversity because they crowd-in interests in becoming ranchers or peasants. Similarly, illegal markets may crowd-in motivations for poaching or wildlife trafficking. As such, from an 'aspirations perspective' it makes more sense to think beyond piecemeal effects from individual incentives and instead focus on how multiple factors – cultural, economic, political, institutional – can combine to motivate biodiversity protection.

Another relevant theme is land-use policy. Biodiversity conservation interventions often operate in contexts where people manage multiple land uses simultaneously – as in an 'agricultural matrix'¹¹ – and local involvement in the present and future decision-making processes will depend on how conservation instruments coevolve with other land-use trajectories and livelihood choices. Research on PES programmes in Selva Lacandona (Chiapas, Mexico) has shown that people think about their livelihoods in broader spatiotemporal scales as opposed to short-term, individual conservation interventions, which allows them to exert some control over the various 'policy mixes' they encounter¹². When framed through an 'aspirations lens' the core issues transcend why people engage in individual land-use interventions and begin illustrating how such interventions may fit or conflict with the multiple components found in broader land-use and livelihood contexts.

Specific themes aside, a focus on aspirations has general implications for biodiversity research and practice. Examining the complex processes through which aspirations operate and their resulting effects requires multi, inter, and transdisciplinary approaches bridging the natural and social sciences – from ecology and biology to economics and anthropology and data collection methods – from geospatial analysis and biodiversity monitoring to surveys and qualitative research. Furthermore, that aspirations are

implicitly bound to be highly diverse, dynamic, multi-scalar and cut across multiple dimensions of human life suggests the need to embrace context-specific, adaptive and reflexive components as explicit features of biodiversity intervention design and implementation.

Conclusion: the way forward

The notion of bridging aspirations and biodiversity conservation in research and practice brings much complexity to the table. If the history of conservation policy has taught us something it is that interventions based on oversimplifications of reality are prone to failure. The challenge is to develop frameworks, theories and models that can capture the complexity of aspirations yet provide clear insights on how to design effective and resilient conservation interventions. Overall, this essay hopes to shed some light on what has failed in biodiversity conservation approaches thus far and how we might do things differently – moving forwards. As the clock is ticking on the world's biodiversity, my hope is that this provocative idea – linking aspirations with biodiversity research and practice – may aide in moving towards a path of improved and sustained change.

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When is growth good enough? Asking nature when to cut consumption

Winner of early-career essay competition

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What is good enough for us?

'Good enough' has acquired a negative connotation – a second best, a consolation prize or a lack of effort. But what if society encouraged 'good enough'? What if 'good enough' sat at the precipice between 'something good' and 'too much of something good'? What if we applauded the effort it takes to say 'enough' to something good and stop before reaching too much?

Our ever-increasing material consumption is destroying habitats and biodiversity at unprecedented rates¹, our unending CO₂ emissions are pushing our climate to extreme change², and our rising pollution levels are strangling our oceans³. In short, our world is in an environmental crisis because, as a society, we assume that more is better and don't know when or how to say 'enough'.

Rather than changing our laws, behaviour, economic system, or societal values, we ask questions like 'what constitutes a dangerous degree of biodiversity loss, CO₂ emissions, or plastic pollution?' and toe this self-proclaimed and vague line^{2,1}. We add the tag line 'sustainability' and continue in business-as-usual fashion, pursuing exponential growth and development, albeit with added efficiencies^{4,3}.

Efficiency is not enough

Efficiencies promise us more for less. More products, progress, wealth, happiness, growth, development for less resources, cost, effort, hardship. But, in a crisis of extinctions, finite resources and cumulative pollution, efficiencies do not stop the crisis; efficiencies merely slow down the rate of environmental destruction³. Incremental changes don't work. Biodiversity loss is irreversible. With complex and often unknown ecological interactions, any rate may be catastrophic¹. Even if we slow our consumption, unless old-growth deforestation is reduced to rates of regeneration, each day the world has less old-growth forest than the day before. Without reaching carbon neutral or negative, energy efficient production, plants and vehicles still emit additional carbon into the atmosphere and global climate change continues². Despite being at the core of current sustainability rhetoric, efficiency can save time, money, and energy, but not the planet^{4,3}.

Rather than 'more for less' we just need 'less'. We need a socioeconomic system that understands – even with efficiencies – that infinite and exponential growth isn't possible within a world of finite space and resources³. We need individuals, corporations and countries to understand that making our destruction of

Nature more efficient is not 'good enough'. Slowly destroying Nature is still destruction and will not lead to sustainable environments, societies, or economies. Thomas Princen calls this the "logic of sufficiency", where instead of efficiency, he proposes thrift, frugality, and moderation to avoid ecological overshoot⁵. Structures that restrain our natural resource consumption to levels that are in balance with Nature's regeneration create 'good enough' or sufficient.

Whilst an individual may be able to understand and exercise restraint to consume only what is needed, scaling the logic of sufficiency up to companies, corporations, and the global economy is much more difficult, particularly when profits come into play. It is logically impossible to separately maximise both corporate environmental responsibility and quarterly performance⁶. Controversial free-market economist Milton Friedman's provocative essay resonates in this contemporary context, recognising that "the great virtue of private competitive enterprise is that they can do good – but only at their own expense," whilst in the realm of public companies 'social responsibility' over profit maximisation appears to be a "fundamentally subversive doctrine⁷."

A large and growing movement suggests 'degrowth' as a strategy to achieve sustainability⁸, however this means asking corporations to willingly say 'good enough' to their growth in the absence of necessary structures or incentives to do this. Within the context of a capitalist economy of unending growth – of 'more is better' – voluntary and equitable downscaling of natural resource consumption, asset value creation, production and profits make no sense to business. Upheaving our global economy, undoing the hardwired capitalist values of our society and halting the innovation that comes with competition is difficult and unnecessary; not to mention – with our current environmental crisis – a check on growth needs to happen faster than we can reinvent our economy.

Our contemporary economy is already dependent on the natural environment, including a stable climate and healthy ecosystems³. The hazard of encountering physical disruption, regulatory costs, brand reputation risks, and devalued assets, when made explicit and visible, motivates corporations to recognise when natural resource consumption reaches a state of 'good enough' and then halt or pay for excess. Our current system fails by hiding these environmental costs of growth and development and we subsequently fail to pay our debts where they are due – back to Nature. Because it is logically impossible to separately maximise both corporate environmental responsibility and profitability, organisations require a system that simultaneously incentivises environmental responsibility and total firm value growth⁶. We need structures that showcase the natural environment as a primary stakeholder in our economy – because Nature's "stake encompasses the most fundamental elements required by organisations without which organisations would not be sustained⁹." Unfortunately, Nature is a silent and undemanding stakeholder.

Nature needs a voice. Nature needs to scream when destruction reaches 'good enough' and demand its debts be paid in full. In essence, Nature must be given rights.

Trees should have standing

Our rights as humans, citizens, consumers, neighbours, employees, and stockholders are uncontested. We can voice our grievances when something negatively impacts us and act in our own best interest. Nature – with neither the capability to speak nor act in defence of its own best interest – has no rights. Yet the corporation – also unable to speak or act – has the same rights as a human and is given a spokesperson to voice grievances and take action on its behalf. As Christopher Stone says, “until the rightless thing receives its rights, we cannot see it as anything but a thing for the use of ‘us’ – those of us who are holding rights at the time¹⁰.” Without rights, Nature, along with its biodiversity and ecosystem services, becomes a resource. Rather than having the intrinsic right to exist unharmed, Nature as a natural resource exists solely for personal use by us, the rights-holding individuals and corporations, to generate wealth, profit and GDP at the expense of the planet and future generations¹⁰.

As with corporations, giving Nature rights is possible. In the 40 years since Stone’s article, Ecuador, New Zealand, India have been leaders passing ‘Right of Nature laws’ for all or part of their natural environment. Yet Philippe Sands replies that the changes have not been enough and the call for “growth now, the protection of Nature tomorrow” is even louder¹¹. Whilst corporate environmental responsibility has become a common phrase, a key reason current attempts at sustainability are failing is due to the lack of objectivity in corporate environmental management strategies. Rather than give Nature its own rights by trying to act in its best interest, we – the current rights-holding individuals – inadvertently take on the role of natural environment spokesperson. By deciding what constitutes dangerous biodiversity loss, natural resource extraction best practices, or permissible pollution levels, our personal objectives and morals consciously or unconsciously decide Nature’s ‘best interest’^{7,10}.

This is not to say the current structure leaves Nature’s interests ‘wholly unprotected’ but rather protection is not ‘at its behest’, not all ‘injury to it’ is taken into account and relief does not run to the ‘benefit of it’¹⁰. In other words, environmental degradation impacting a ‘non-rights-holder’ goes unnoticed and the only way to challenge poor stewardship of the natural environment is through the social or financial costs placed upon another entity with rights: another company, government, or individual. If a rights holder protests negative impact to the natural environment, the cost of damage is reimbursed to the human or corporate protester rather than remedied by “making [Nature] whole” again¹⁰. This lack of direct reconciliation negatively affects ecological system functioning, exacerbates global climate change, and conflicts with principles of environmental responsibility and sustainability.

Nature needs a voice

If Nature were given rights and considered a stakeholder in decisions surrounding its use, all impacts would be identified and remediated directly back to the natural environment through reduced degradation or increased regeneration to a point of balance. Shifting the frame from ‘resource asset’ to ‘stakeholder with rights’ would legally incentivise corporations when to say ‘good enough’ and those whom extended into the realm of ‘too much’ would pay a debt directly back to Nature. Bearing in mind short-term profit maximisation – at the expense of long-term value maximisation – destroys total firm value, Nature as a

stakeholder with rights “tells firms to spend an additional dollar of resources to satisfy the desires of each constituency (stakeholder) as long as that constituency values the result at more than a dollar” where “value is simply the long-term market value of this expected stream of benefits⁶.” Rather than trying to assess the monetary cost of environmental degradation, corporations could assess and remedy their impacts on Nature directly through regeneration¹⁰ to the benefit of large-scale ecological function, future generations and in a positive feedback loop, fundamental asset value maximisation and long-term economic sustainability. The question that remains is, *who* is Nature’s best spokesperson?

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Rethinking biodiversity before the law

Winner of early-career essay competition

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The challenge

The current populist political moment is challenging scientific institutions and environmental advocacy. Populist rhetoric is frequently insidious, questioning the basis of data that disagrees with the populist agenda. For example, in May 2019, in the lead-up to the European Union's Parliamentary elections, the Speaker of the Hungarian Assembly stated that Germans who held climate change to be the greatest issue to face humanity had been "brainwashed" by a "partisan media". In the absence of this media, "migration, not climate, would clearly be of utmost concern to Europeans." Once in power, populist leaders challenge progressive legal and environmental gains as they slash government funding, as per President Trump's to the US Environmental Protection Agency, or turn to increasingly authoritarian governance methods.

We all suffer as post-truth populism shores up power to those who speak it, marginalises alternative views, and delays environmental action. At this moment in time it becomes all the more urgent for conservation to better engage with politics and the law, and to counter conservation's own narratives around its neutrality and nature-only focus. 'Revisiting' how we do biodiversity conservation demands active political engagement with questions of political economy to develop pluralistic rights of nature in public law. This essay examines why conservation's pursuit of project-based interventions replicate environmental and social injustices and goes on to suggest that developments in rights-based environmental law provide a potential framework through which conservation may achieve the 'effective broad-based action' it seeks.

Looking inwards: conservation as a silo

The inability of biodiversity conservation to become 'mainstream' is not only due to the contradictions between the conservation agenda and the extractive growth-centred requirements of our economic systems. It also arises from the conservation sector's own reluctance to 'do politics' and engage with the political consequences of its projects, particularly where conservation is realised through seemingly apolitical and technical interventions that aim to 'save' individual species.

Scientific objectivity and the maintenance of political disengagement are criteria by which biodiversity research is funded: major research opportunities and expert committees expressly skirt 'policy prescriptiveness' with their scientific findings (a contemporary example being IPBES). In addition to conservation scientists striving for neutrality, conservation organisations increasingly cooperate and coordinate with market environmentalism to align the environment with the needs of capital. In this way,

conservation not only makes new spaces of nature available for capital investment, but further replicates the dynamics that disconnect and isolate environmental issues and marginalised voices from the processes that bring about environmental degradation. In effect, conservation then exists in parallel to our dominant extractive political economy, feeding off the issues it creates without fundamentally changing the system.

This is well demonstrated by a quick examination of a few of the most popular ideas in conservation today. E.O Wilson's *Half Earth* project, the 'Ecological Manifesto', or conservation researchers' land sparing/land sharing debates each potentially re-concretise divides between nature and people through sharply delineating – isolating, territorialising – humanity's sphere of place and influence from areas that are to be reserved for 'wilderness'. In practice, these projects advocate for the spatial segregation of intensive land uses from areas that are to be conserved as pristine. The *Half Earth* project explicitly states on its new website that its 'audacious plan begins with species' and 'cutting-edge science, analytics and technology' will map its focus. Local people are only mentioned as responsible for 'encroachment'¹. These approaches risk not only further alienating people from the environment, but also replicate the power relations and social justice issues that have plagued conservation since its inception.

For these reasons it is time to change how conservation identifies as a separate sector, to take seriously what 'mainstreaming' could look like, and to move away from conservation 'projects' to a conservation-infused legal and political system. To date, legal systems have typically been entirely complicit in the marginalisation of people and environments, particularly as they legitimated the (usually colonial) power relations of the ruling elite. To echo the late environmental lawyer Polly Higgins, the "fundamental rules of the game must be changed²."

The promise and development of public environmental law

Legal rights to an environment usually refer to "the access of individuals to unspoiled services required for human survival³:" they are human-centric, where the environment is part of a broader right to life. Social justice calls for recognition of human needs as rights with legal foundations. Environmental justice applies a similar call but girds it within an access framework, calling for people to be able to mitigate the environmental burdens and trade-offs associated with development. However, the ways in which these frameworks have been realised to date are largely reactive: environmental law responds to concrete cases of environmental pollution or degradation, which face the typical legal access challenges of time and money that makes the legal system inaccessible to many. Pursued environmental cases may give rise to payments for damages that do not adequately deter polluters, or injunctions that are too late to prevent environmental degradation. In effect, environmental law has faced similar challenges to conservation around its lack of meaningful integration into overarching legal systems, existing somewhat as an add-on or in parallel to broader regulation of economic activities.

In response to this, some initiatives have been launched to re-balance the chances of the environment against overexploitation and to generate fundamentally new legal frameworks to regulate nature-people relations. These go under various names, such as the concept of an "ecological civilisation"⁴, the

introduction of a law of “ecocide”⁵ or a “rule of law for nature”⁶. These grant rights, legal standing and representation to the environment through extending the principles of a rule of law – that laws are standardised, transparent and apply to everyone and accountable in process and application – as they apply equally to every person in a democracy to also apply to people’s use of nature⁷. Ecocide proposes that crimes against the environment appear on criminal law statutes, so that people bear a legal duty of care towards the environment. This would drastically shift the balance around the considerations that must come into play as extractive industries and large corporations go about ‘their’ business.

An ecological civilisation or the concept of ‘rights to nature’ grants that tackling biodiversity loss and climate change is simultaneously a social, political, economic and environmental task that requires the systemic representation of environmental values in society. The fact that trees or rivers have no voice is in itself not a barrier to legal representation – as Christopher Stone developed in his seminal essay on why trees should have legal standing, “the world of the lawyer is peopled with inanimate rights-holders: trusts, corporations, joint ventures, municipalities, nation states...⁸.”

Moves towards legal incorporation of the environment are best known through the examples of the *Buen Vivir* movement in Bolivia and Ecuador, where both countries have recognised ‘Mother Earth’ in their constitutions. This is not to say that the adoption of ecological rights into constitutions is to unravel the complex globalised systems of which we are today a part, that drive land use change and habitat loss: these legal articulations are only a start.

A common research agenda for biodiversity conservation and the law

The ‘politicisation’ of conservation and of biodiversity research requires the acknowledgement that current passive manufacture of ecological knowledge and individualised, context-specific conservation projects have not halted the continued decline and elimination of biodiversity. In the face of populist and revisionist politics, conservation’s continued focus on scientific outputs and arguments hold ever-less sway. In a similar way, environmentally focused law has established systems for environmental assessment and due process that remain reactive and at the fringes of our broader political economy. Yet the ‘broad-based actions’ required to stem the biodiversity crisis run deep and need to fundamentally transition and re-align our patterns of consumption through modern capitalism. This is not work for the conservation sector alone.

Whilst conservationists are ‘informed citizens’ with specialist skills and knowledge to partake in public advocacy⁹, the Earth jurisprudence movement calls for the rejection of both Western anthropomorphism and Eurocentric constitutionalism to develop governance systems that respect place and the ‘natural laws’ and limits set by ecological systems. The development of such systems are clearly not a matter for paper lawyers nor data scientists alone, but require a broad coalition of interdisciplinary researchers who are the ‘glue’ between systems of thinking, ways of living, and the formal and informal effects of ‘rules’. Legal systems also have an ecology which is as strong as its legitimacy, acceptance and enforcement grants. And it is only through combined political engagement, strategy and work into the development of alternative socio-legal possibilities that today’s environmental challenges may be met.

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From elite wildlife-ism and ecosystem service jugglery to an inclusive environmentalism

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What and why: from wildlife to biodiversity

The term 'biodiversity conservation' is of recent vintage. 'Wildlife conservation' is what inspired most modern-day conservationists, including my college friends and I. Inspired by documentaries like "Serengeti Shall Not Die", we went on field trips to wildlife hotspots. If you had asked us *why* we loved megafauna or birds, our answer would have been "because they are beautiful." It is this aesthetic and spiritual value that arguably drives most conservation action worldwide, a value derived from a subset of nature, viz., megafauna, not bacteria.

Another prominent strand in conservation is 'animal rights'. But this makes a case not only for wildlife, but also stray dogs in cities, whereas several 'wildlifers' would recommend culling strays to prevent them spreading infectious diseases. Similarly, the animal rights perspective differs that of the 'Deep Ecologists' who talk of the 'intrinsic value of nature' and therefore focus on 'wilderness'. They are unlikely to endorse saving stray dogs in cities either. And possibly none of these groups will uphold the rights of mosquitoes, cockroaches or cholera germs.

Conservationists also value natural forests, but for mixed reasons: their intrinsic beauty, their role in harbouring wildlife, and because they bring rain. Aesthetic/spiritual and instrumental values converge. With individual trees – typically in an urban context – the instrumental argument becomes stronger – trees as shade-givers and air cleansers – even though many urban trees are exotics introduced for their beautiful flowers.

Thus, the answer to 'why conserve (biotic¹) nature?' is a mixture of aesthetic, intrinsic value, rights-based, and instrumental arguments, each leading to a somewhat different 'what to conserve' goal (megafauna, all animals, or only useful biota). They may overlap operationally in some cases – natural forests may deliver megafauna, pristineness, animal rights and rainfall – but not in others.

Building common ground can be achieved by using terms that encompass multiple values, such as 'nature' instead of 'wildlife'. Or by demonstrating operational convergence, such as the argument that biodiversity ensures resilience of agriculture against future shocks. Both are legitimate and necessary coalition-building strategies. Where the conservation movement has failed, however, is in indulging in scientific jugglery to claim operational convergence of all conservation with instrumental values, whilst ignoring a wider set of values towards nature and society that exist globally.

The jugglery of ecosystem services¹

Having championed various versions of conservation that appealed to non-material values for decades, some conservationists felt the need to get greater 'traction' with policymakers who seemed obsessed with economic growth and the conservationists came up with the 'ecosystem services' argument: biodiversity = ecosystem services = human wellbeing.

This edifice of ecosystem services turned out to be a house of cards for several reasons. Firstly, pristineness (a cultural service) and sustainable use (a provisioning service) have significant non-overlap. Some diversity is relevant for sustainable use, but use values can be maximised and sustained under 'far from pristine' conditions. Similarly, wild nature may yield pollination, pest control, or hydrological regulation services, but much of treasured wild nature – elephants, tigers and lions – does not provide material benefits².

Secondly, wild nature can also be harmful, i.e. produce 'dis-services' such as pathogens, or damage and death from pests and wildlife. Thirdly, human development indices (HDIs) are increasing as biodiversity is declining – the "environmentalists' paradox³." Resolving this requires acknowledging that human development is increasingly reliant upon 'abiotic' resources – petroleum, iron ore, bauxite, etc. – and the biotic contribution is now largely from agriculture, not forests or prairies.

Ironically, modern-day interest in wildlife or wilderness is also premised upon solving the material challenge of living comfortably, i.e. unnaturally. "For most Americans [read urban wildlife lovers] it is perfectly consistent to drive a thousand miles to spend a holiday in a national park⁴," or to fly to Tanzania, stay in five-star hotels, and travel in air-conditioned safaris to watch lions hunting wildebeest in the Serengeti.

Thus, although the ecosystem services literature generated useful pieces of research on indirect services, it involves too much conceptual jugglery and produces bad science – where the answer to the questions are already known. It is better to re-engage with traditional, 'honest' conservation and its critiques.

The elitism of conservation

At a panel discussion in a recent conference, the anchor asked "What is your vision for a desirable future for this planet?" Eric Dinerstein from Global Deal for Nature replied: "A future in which half the planet is set aside for nature." Tania Lee, a renowned anthropologist, replied: "A future in which all human beings live a dignified life." This captures the essence of the problem. Conservationists' vision of a 'good society' is one-dimensional: a world in which landscapes are kept pristine. Completely missing are other values or concerns that societies legitimately hold and which, in fact, underpin the lives and work of conservationists themselves.

First, is the concern for material wellbeing – how many professional conservationists live a \$1/day lifestyle or live without laptops, refrigerators and cars? Modern-day conservation is full-stomach environmentalism. This does not make it illegitimate, but it demands that basic wellbeing and dignity for all has to be placed on a higher footing than conservation. 'Deep Ecologists' on a moral high horse touting biocentrism as

superior to anthropocentrism are worse than a distraction; they demean the idea of humanity: the capacity to talk about value.

Second, is the concern for equity, justice and fairness. Essentially, if I want a \$100/day lifestyle I must allow it for others. Moreover, if sustainability or conservation require 'cutting back' on the use of nature, who should make this sacrifice? Socially marginalised and colonised forest-dwellers who have lived a subsistence lifestyle for millennia? Or we, the urban elite whose environmental footprint is the cause of climate change, climate-induced biodiversity loss, and the mining, dams and highways that are destroying the wilderness that remains?

Third, is the concern for sustainability. Many conflate this with conservation. But sustaining human wellbeing into the future requires sustainable management of renewable resources, limiting use of non-renewables, and averting the future impacts of current pollutants, foremost among which is CO₂. While conserving biota may mitigate climate change marginally, limiting fossil fuel use is the only way to substantively address the climate challenge. But sustaining wellbeing whilst limiting fossil fuel use will involve more intensive use of biological resources. A climate-sustainable economy may be 'greener' than today's economy, but will be far from pristine.

Finally, if multiple values cannot be simultaneously maximised, we need a 'procedural ethic' as to how trade-offs or tensions may be best resolved. Democracy in its deepest sense seems to be the only reasonable procedural ethic for this and most modern-day conservationists live in and benefit from it. Functioning democracies ensures that our houses in Bengaluru, New York or Cambridge are not flattened overnight, without due process, in the name of a 'greater good' such as a public park. But conservationists forget this when they hob-nob with dictators elsewhere to pursue conservation⁵, or compromise on due diligence process when lobbying to create National Parks in lands historically occupied by forest-dwellers.

Re-engaging with an open-ended inclusive environmentalism

The criticism about elitism is simply a reminder of all the values that conservationists tend to take for granted in their own lives but ignore when they pursue conservation outside their homes, particularly in the Global South. The criticism about the *Half Earth* proposal is that it is narrowly focused on only one value (conservation), and so does not ask 'which half?', 'who decides?', and, importantly, 'what is the vision for humanity in both halves?'. It instead hides behind fake scientism, claiming that setting aside half the earth is the "only defensible target" from a "strictly scientific [sic] point of view^{6,7}." Rejecting this scientism and asking those awkward questions means moving from narrow conservationism to a broad-based environmentalism⁸. It means acknowledging multiple legitimate societal goals including the right to a dignified life for all, acknowledging that trade-offs and synergies between these goals cannot be fully understood beforehand and are essentially value-loaded, and therefore requiring a commitment to a democratic process. We cannot say we 'scientifically know' how much biodiversity – whether wildlife, wilderness or pristineness – has to be saved and should stop pretending that we do.

Rather, it is time to engage with the larger environmental challenge of achieving reasonable material and non-material wellbeing for all nine billion people in a just and sustainable manner, through democratic decision-making. If this means in practice that most elite urban, Western conservationists should focus on reducing their own environmental footprints and of their fellow citizens before they demand conservation from others, then so be it – it may lead to lesser conservation in the short run, but will yield greater overall personal satisfaction and social acceptability in the long run. In other words, conservationists need to not just “think like a mountain” as Aldo Leopold suggested, or strategically co-opt community organisations to achieve narrow conservation goals in half the world but work towards a broader eco-social vision for the whole world.

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Going probiotic: securing life in the Anthropocene

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Antibiotic blowback and the rise of probiotic alternatives

The recent confirmation of the Anthropocene as the current planetary epoch brings to a head longstanding anxiety about human impacts on our planetary systems. We can understand the Anthropocene as the outcome of an *antibiotic* approach to managing life, in which a relatively small number of people have systematically rationalised and controlled living systems to increase food supply, prevent disease, and deliver economic growth. Intensive agriculture, sanitation, river management and antimicrobial chemicals – to give but a few examples – have driven real, material improvements to people's lives. But they have come at a cost. There is a growing sense, across a range of policy domains that such antibiotic approaches have gone too far and that they are causing a new set of pathologies. This antibiotic 'blowback' is manifest across scales – from planetary concerns with climate tipping points, to the loss of landscape ecosystem functions, to the emergence of drug resistant infections in human and animal bodies¹.

Conservationists were in the vanguard in diagnosing the impacts of antibiotic approaches and in seeking means to mitigate their blowback. 'Biodiversity conservation' came to the fore in the 1990s as one such approach, aiming to tackle the extinction crisis by securing the futures of rare and endangered species and habitats. Copious lists have been drawn up to audit these losses and large areas of land and sea have been designated to slow their progression. But there is a growing sense that this response is not sufficient to secure ecological functionality and to adapt living systems to the new realities of a hotter world. Critics suggest such approaches create a fragmented biogeography of protected land of marginal agricultural value are overly focused on rarity and – at least in Europe – have prioritised low-intensity agricultural systems that are increasingly anachronistic in the face of accelerated globalisation and the land use and ecological changes predicted for the 21st century^{2,3}.

A different response to antibiotic blowback can be found in the recent interest in the conservation community for rewilding, which forms part of a wider programme of 'nature-based solutions' to tackling both biodiversity loss and global climate change^{4,5}. Examples include the restoration of 'keystone species' – species with a disproportionately large effect on their environment relative to their abundance – like wolves and beavers, alongside the shift toward 'naturalistic' models for managing fire, rivers, diseases and other disturbance regimes. These projects offer *probiotic* alternatives for managing life – focussing on proactive efforts to use life to manage life – and working with rather than against ecological dynamics to secure desired ecosystem services. Such approaches have the ultimate aim of keeping Earth systems within planetary boundaries⁶. Probiotic approaches involve the 'controlled decontrolling of ecological controls' revising rather than rejecting modern antibiotic models⁷. Versions of this probiotic response can

be detected across a wider range of connected policy domains spanning interests in biological control in agriculture, biological remediation in waste management, and new microbial therapeutics for human and animal health (see Table 1).

Probiotic science

There is a lot of variation here, but broadly speaking probiotic approaches are founded on a common embrace of ecological systems thinking across scientific disciplines, as varied as conservation biology and immunology. I would like to highlight four common elements of this probiotic science. The first is an interest in ecological interaction networks and the ‘top-down’ regulatory influence of a relatively small number of highly interactive ‘keystone species’ at the heart of these networks⁸. Species like wolves, beavers, bees and some gut microbes are understood to regulate ecological dynamics across nested ecological scales. The second element is a growing understanding of ecosystems as nonlinear systems, marked by ‘tipping points’, feedback loops and multiple stable states. This thinking moves away from linear and equilibrium models of ecological succession and calls attention to the generative importance of ecological disturbance, as well as highlighting its potential to initiate catastrophic shifts between ecological states⁹. Third, the focus on keystone species is marked by a common interest in ecological systems that are haunted by their absence. We are learning more about the ‘dysbiosis’, or imbalance, caused by absent keystones (from missing microbes to missing megafauna) and the ‘ecological anachronisms’ that they leave behind¹⁰. We are also learning of the transformative resurgence that can be initiated by their return – the most famous example being the wolves in Yellowstone. Fourth, and finally, this science is linked by a common interest in novel Anthropocene ecosystems, by this I mean a commitment to understanding worlds that are fundamentally shaped by human actions, moving away from models of conservation and restoration that are premised on a return to a premodern or prehistorical past.

Table 1 Antibiotic and probiotic responses to different policy domains

Policy domain		Antibiotic model	Blowback	Probiotic alternative
Micro	Health	Antibiotic drugs, Caesarean sections, low rates of breastfeeding.	Loss of microbial diversity. Dysbiosis and epidemics of absence: rise in allergic, inflammatory and auto-immune disease. Antibiotic resistance and new pathogens.	Probiotic and prebiotic supplements, new birthing practices, helminth therapy, faecal microbiota transplant.
	Hygiene	Water purification, urbanisation, antimicrobials, limited contact with animals, smaller families, clean living		Probiotic cleaning products, the promotion of dirt, and contact with domestic animals.
	Diet	Pasteurisation, ultra-processed food, demise of live food.		Raw, live, fermented, and paleo diets and forms of food processing.
Macro	Agriculture and forestry	Use of pesticides and herbicides, artificial fertilisers, antibiotics in livestock, intensive management systems.	Biodiversity loss, invasive species, zoonotic and other diseases, loss of soil fertility, loss of crop diversity, loss of ecosystem services, pesticide resistance, inability to adapt to climate change.	Biological pest control, organic and permaculture systems, bioremediation, animal probiotics.
	Conservation	Preservation of fragmented, marginal lands, rare species and anachronistic cultural landscapes.	Habitat fragmentation, loss of adaptive capacity, trophic downgrading, extinction.	Rewilding, back-breeding, de-domestication, de-extinction, connectivity.
	Environmental management	Rationalisation of environmental processes and disturbance regimes e.g. in rivers, coasts, fire, pest control.	Loss of resilience, increased risks of natural disaster. Extreme events.	Rewetting, managed retreat, naturalistic erosion and fire management.
	Planetary management	Resource use that exceeds planetary boundaries: carbon, nitrogen, water.	Climate change: global warming, extreme weather, sea level rise, positive feedbacks.	Geo-engineering and nature-based climate solutions: ocean seeding, forest planting, rewilding the tundra and other systems.

Probiotic politics

While this science offers new foundations for grounding conservation in the Anthropocene, it does not offer a single route to truth about the nonhuman world or a straightforward political solution to the disagreements that have characterised biodiversity conservation. There are several different ways of going probiotic and these will have different consequences for the human and nonhuman actors they come to govern.

I will illustrate just two dimensions of this politics that are of importance to nature conservation. The first relates to the distributional dynamics and effects of ‘trophic rewilding’: the increasingly popular programmes that reintroduce species like wolves, beavers and large herbivores¹¹. To date, rewilding has largely occurred in temperate regions in the developed world on land of marginal agricultural value. It has happened either as a consequence of land abandonment, the cessation of agriculture and forestry and self-willed return of animals, or through the proactive acquisition of land and deliberate species reintroduction. Large areas of Europe and North America have been reforested in recent decades^{12,13}. But at the same time, local and global demand for meat and other foodstuffs once produced from this land has not declined. Instead their production has been outsourced to other, often tropical regions, through the processes of economic globalisation. It is possible that the local increase in wildlife in the North is being offset by declines in the South, with limited net gains and with significant distributional impacts on who in the world gets to benefit from the ecosystem services provided by probiotic models of ecosystem management. This is an important question in need of further discussion and research as there is a risk that probiotic solutions perpetuate the political economic inequalities that have thwarted biodiversity conservation¹⁴.

Second, we should also consider the impacts on animals of this shift to probiotic approaches to conserving and managing life. Biodiversity conservation tended to focus on charismatic flagship species, capable of attracting public interest and funds. This can lead to the neglect of the obscure and unglamorous¹⁵. In contrast, probiotic models tend to value a subset of ‘hard-working’ species capable of performing ecological functions that might otherwise require costly human labour or technology – classic examples being beavers, bees, or grazing ungulates. In some cases, these animals are let loose to flourish on their own terms, but in other examples they are corralled into labour camps and their futures made conditional on their economic performance. Meanwhile there are significant numbers of species that could be understood as functionally redundant, who might be let go without obvious short-term ecological impact. In this probiotic model the Anthropocene is no place to be lazy and there is little tolerance for unemployed species. There is a risk that probiotic models of conservation targeted at narrow interpretations of the concept of natural capital or ecosystem services will produce rationalised ecologies bereft of ‘useless’ species and those that conflict with human land use priorities¹⁶.

Conclusions

Going probiotic, as a response to antibiotic blowback, offers fresh potential as a narrative for nature conservation. It provides a new way of conceiving how conservation is adapting to the challenges of the

Anthropocene. This story also highlights some of the important political and ecological questions that must be addressed by those creating future visions for life on an increasingly unruly planet.

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Where to next for biodiversity science?

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Introduction

Looking back over the past 25 years – roughly the period that the Convention on Biological Diversity (CBD) has been in place and the term ‘biodiversity’ has been in use – I conclude that it has become a confusing term and not only for science. Is biodiversity a descriptor of a scientific discipline, or a conservation mission? Is it one dimension on which to evaluate the condition of the natural environment? Is the term fit-for-purpose compared to say, climate change, the other great environmental challenge of our time? Commentaries have suggested the word is too technical (compared to ‘nature’ or life on Earth), too obscure (apparently some people think it may be a kind of washing powder), too vague or too specific. Climate change is a simple term that covers a complex system including cause, effect and impacts – and even social, political and economic issues – and it is reasonably clear to everyone what the fundamental science of climate is all about. I’m not sure that the same is true for biodiversity. If we are going to be able to meet the grand challenges to bend the curve of biodiversity loss in coming decades, it will be critical to clarify exactly what the scientific challenges really are and how they interface with policy and socioeconomic issues.

The essence of biodiversity

1. Is it simply all of ‘Life on Earth’?

It is 50 years since the NASA Apollo missions to the moon first captured pictures of the Earth. The famous ‘Earthrise’ photo was taken from Apollo 8 prior to the moon landings. But there are multiple testimonies from astronauts, all awestruck by the spectacular beauty and distinctiveness of Earth from space. Ours is a colourful, living planet. Our planetary home is the only one in this obscure corner of the Universe that has life and it is a diverse, dynamic life that has been developing and diversifying over billions of years. Life really does underpin our liveable planet. Humanity has evolved, developed, created civilisations and thrived on Earth as part of the dynamic diversity of life. It is the defining feature of our planet and underpins our very existence. We certainly cannot hope to thrive into the future if we treat the diversity of life as simply another environmental dimension, or a natural asset that can be offset and traded as a balance in economic accounting. Therefore, I think that we must consider ‘Life on Earth’ as a broader concept than ‘biodiversity’ – it is simply so fundamental that it should not be reduced to the technical term of biodiversity.

2. Is it all to do with counting species?

At the other extreme biodiversity science can become quite reductionist and focussed on describing, defining, measuring and counting certain units of life. Traditionally species have been the fundamental

units embracing genetic diversity. There is a substantial body of scientific work that is focussed on what a species is, how to delineate and differentiate them, how to measure the differences among them, and how differences play out over time and space. This aspect of biodiversity science to do with metrics has been important and influential, but curiously often somewhat disconnected from the global change and sustainability agenda. Important as it is this is, surely it is too narrow a focus for a biodiversity science that will support sustainability.

3. Or something else?

Falling in between these two extremes are a plethora of other approaches that can equate biodiversity simply with 'naturalness' or 'greenness' or some kind of alternative to urbanisation and the built environment. This kind of usage of biodiversity is especially common in policy documents, where it implicitly codifies preservation of more natural areas, or recovery of a degraded habitat. Here, the use is often undefined with different commentators often talking at odds and 'biodiversity' a useful word that can be both vague and unchallenging, but generally perceived to be a 'good thing'. The lack of clarity is a problem in this context. Biodiversity can be bracketed with, for example, green infrastructure, such as green walls and roofs, many of which allow a permissive approach which could have low diversity, naturalness and sustainability.

4. The promise of big data and new technologies

Increasingly, over recent decades – and especially with the emergence of new kinds of observational and analytical tools and technologies – we see efforts to move beyond species and habitat mapping as the basis for biodiversity description. Instead, researchers have started to apply new genomics tools and techniques to summarise differences, use remote and on-the-ground sensors to detect changes at unprecedented scope and scale and use novel computational tools to devise informative and objective methods to describe changes to the living world that are no longer constrained by people's limited capacity for observations. Whilst field ecology has dominated data gathering in the living world for centuries, these new tools offer completely new insights and have radically altered our understanding of evolution, ecological interactions and teleconnections just in recent decades. We have a suite of new tools and techniques at our disposal, but simply layering the new techniques onto the existing confusion would be too limiting. What is it that we really need to know that these new techniques can help us with?

Biodiversity and ecosystem services

Around the turn of the Millennium and coincident with the publication of the Millennium Ecosystem Assessment, biodiversity as a term became strongly linked to – and even synonymous with – ecosystem services. This was an extraordinarily influential step. It suddenly made biodiversity real and significant for mainstream policy. It could be given an economic value and a legitimate place in policy design and development. Biodiversity was no longer limited to the niche world of nature conservation. Ecosystem services gave biodiversity a legitimacy and status beyond nature-watching preferences and species and habitat preservation. The ecosystem services concept has been pervasive, most recently attracting global

headlines with the release of The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Global Assessment.

There are some inconvenient truths here, however, and this conflation will be a slippery path if followed uncritically. Biodiversity and ecosystem services are not the same thing – far from it. The links between ecosystem services and biodiversity are complex. Many ecosystem services do not actually require much diversity, especially over the near term and smaller scales. Yet, IPBES and the CBD have increasingly melded biodiversity and ecosystem services into one storyline that suggests that if we maintain biodiversity (whatever that is), then somehow that will also secure ecosystem services. In effect, we need biodiversity for ecosystem services. While some people have pushed back against this commodification of nature, and reinforced the arguments for nature in its own right, or ‘intrinsic’ values, narratives here are equally complex and difficult to implement into science and into policy.

There are serious inconsistencies. Ecosystem services are by definition anthropocentric. They are only services if people use them or need them. Ecosystems on the other hand, including their biotic and abiotic components are dynamic, physical complexes undertaking production, nutrient cycling, evolution, growth and all kinds of processes, quite regardless of what people want and need. It is the management and manipulation of these processes that allow benefits to flow to people. The current emphasis on ecosystem services for biodiversity is narrow and distorting. It risks losing sight of the importance of maintaining the stock, the source and the novelty of life upon which this pinnacle of currently highly valued services ultimately depends.

What science do we need?

Here I highlight three rather different priority areas. They are inter-related but far from a coherent or comprehensive body of work.

1. The origins and maintenance of living diversity

The most basic science is concerned with understanding how the diversity of life is maintained. This is the diversity that has allowed life on Earth to thrive, to adapt and innovate. What are the processes that lead to more and less diversity? How important are biotic (genes and species and their interactions) compared to abiotic (environmental change) in generating and maintaining diversity? What are the limits to these processes? Whilst fundamental understanding is key, we also need to put these in perspective given the massive changes to Earth’s systems that are being wrought by people and their impacts. Are there some kinds of environmental change, say rapid climate change that will overwhelm the well-documented drivers of change from evolution and adaptation? This topic is about generating a fundamental understanding of processes and systems. It is necessary to improve understanding in order to secure adaptability, resilience, innovation and the dynamics of life in Earth.

2. Where and when is nature critical for people?

Whilst diversity is a key feature of life, our concern about the degradation of nature needs to extend beyond diversity. The many ways that natural systems underpin wellbeing ultimately depend upon some combination of diversity, abundance and composition, and these may play out at very different scales of space and time. As a simple summary I favour the three dimensions of diversity, abundance and composition (see Figure 1).

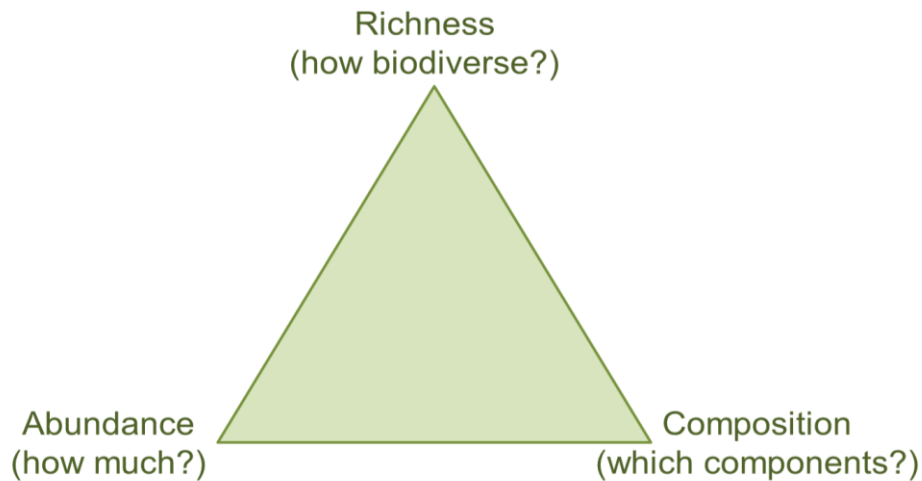


Figure 1 The three key dimensions of biodiversity state

For example, carbon stores in tundra and forests depend on whole biomes over centuries to millennia with low diversity, while the resistance of crops to novel pathogens depends on genetic diversity and may play out at the field scale within generations. Exploring this space, and the way that people's needs and aspirations depend upon different components of state is key. Importantly this set of questions starts with people and society, and not with biodiversity.

3. Deploying new tools and technologies

Researchers in the natural environment have not been slow to adopt and deploy new technologies, but the tendency has been to layer them onto existing, well tried and tested methods. In future we can do better by learning from innovations such as those in engineering that have come from allowing a more open-ended approach. Machine learning, genomics, eDNA, sensor technologies, Bayesian approaches and many other potential applications may transform our ability to both understand nature and to gain a clearer understanding of when and where its loss and degradation is irreversible or damaging – bringing together the two themes above in whatever way is necessary to enhance our understanding.

To conclude, I have argued to separate more clearly between biodiversity science as a research discipline, from conservation and ecosystem services as a policy focus. Ultimately, of course the different strands must come back together, just as is done in other science policy areas from biomedicine to engineering. In this way, we will improve the chances that our knowledge and understanding of the diversity of life can contribute to a better future for people and for all of life on Earth.

The art of living in threatened worlds

Winner of early-career essay competition

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We live in threatened worlds. In conservation and scientific arenas, words like 'biodiversity' and 'threat' usually go hand in hand. In 2018, we heard alarming warnings to "protect the last of the wild: global conservation policy must stop the disappearance of Earth's few intact ecosystems¹" and scientists and writers are currently referring to the "sixth mass extinction"^{2,3} caused by humans. One aspect becomes apparent: doom lurks around the corner and, unless humans can drastically and urgently change their actions, life as we know it will collapse.

These predicaments have led to movements around the globe, such as *Extinction Rebellion* and *School Strike for Climate*, whilst scientists work to devise ways to curb this progression. Edward Wilson devised a concept called *Half Earth*, stating "[...] only by committing half of the planet's surface to nature can we hope to save the immensity of life-forms that compose it⁴." Scientists have also identified places on earth that are still pristine and require being saved from human destruction.

The scientists' and NGOs' worries are warranted. Tax havens⁵, international trade⁶, illegal logging, and complicity between donors and Mozambican elites⁷ have been identified as factors behind forest destruction and exploitation of villagers: i.e., capital accumulation, for which the figure of the generalised "human" does not account.

These cumulative responses exclude one key aspect: the multiplicity of worlds interacting with one another asymmetrically. Scholars like Marisol de la Cadena and Mario Blaser⁸, John Law⁹, and Annemarie Mol¹⁰ have suggested that different practices make different worlds.

During my PhD research, I lived for over a year with villagers from Nangaze in Lugela District, Zambézia Province, in Central Mozambique. These villagers resided near Mount Mabo that was supposedly 'discovered' by scientists from the Royal Botanical Gardens in Kew, London, in 2005 using Google Earth.

Kew scientists found many exotic plants including a rarely observed orchid and wildlife, including pygmy chameleons, Swynnerton's robin and butterflies, such as the small striped swordtail and emperor swallowtail. The team brought back over 500 plant specimens¹¹. After the discovery, the scientists and NGOs started liaising with the Mozambican government to turn the mountain into a protected area, fearing the pernicious effects of 'rapid development' on biodiversity as well as alarming rates of deforestation caused by the villagers. For the scientists and NGOs, Mount Mabo was a 'biodiversity hotspot' needing protection.

During my time living with the villagers, I learned that the mountain was, for them, a living moral entity, endowed with agency and power to shape human life. There was the River Múgue, Mount Muriba and Mount Mabo. These land formations were – according to the villagers – siblings, with Mount Mabo the older brother, the River Múgue the middle sister and Mount Muriba the younger brother. Mount Mabo and Mount Muriba sometimes go to their sister's house to drink water and chat. River Múgue is the mother of all rivers and they all guarantee fertility of the area, which ensures the wellbeing of all living creatures there. The villagers negotiate their predicaments with the Mount Mabo, the River Múgue and Mount Muriba through a traditional ceremony, in which these agents are summoned by their secret names, known only by the *mwene* (local leader). This is a world, where humans and nature constantly engage in social interactions. The villagers and visitors, if they want to visit the mountain and forest, make a ceremony where they ask permission from the mountain, forest, and the spirits. This is a world that has managed to keep the mountain pristine – a Lost Eden! This world is also threatened by extinction due to growing extractivism and conservationism.

The flagship for stopping biodiversity loss has been the establishment of 'Conservation Areas'. Currently, protection in southern Africa is premised on the idea of enforcing separations between people and nature: building fences to stop human activity, which intersects in complex ways with the legacies of colonialism, class and gender violence. Parks and reserves are created in the current landscape to stop biodiversity loss and make profit through tourism. However, what happens to other worlds, like Mount Mabo, in which relations between humans and nonhumans have managed to maintain the biodiversity of the area? What is their future? Is the current path of protecting biodiversity not another form of colonialism? Are the state and market the only options to change the route of human civilisation and earth, which is heading towards collapse?

A new form of relating to life and nonlife requires more than technological fixes and forced separations that only benefit a few. I would argue that it is long overdue to consider wellbeing as a concept to start flourishing within the framework where life belongs only to life, because no one can truly own and commoditise life. It is about building capabilities for life and nonlife to achieve their true potential, not in the name of accumulation. If we continue with the current path of biodiversity conservation, then biodiversity will soon be like art that is of value to some – kept locked away in highly guarded museums, where only the rich can visit. The work of both NGOs and scientists shows that they *care* about their version of nature, in the same fashion that the villagers *care* about their version of nature and the wellbeing of the community at large. Hence, a more convivial relationship between these 'natures' could bring about wellbeing and continuation of life.

We need to move beyond a biopolitical register. For the Nangaze people human life is nothing about another form of life; human motives and agency are nothing but another agency in an ecology of motives and agencies. For them, nonhumans are also alive: they live or die with us, or through us. This brings humans into the biodiversity discussion, not as something we can build fences around.

As the villagers' saying goes 'oeda abili orambanana', meaning to 'walk with someone is trust'. This shows that for them life is comprised of uncertainties and incompleteness – hence the need for embracing humility, trust and care to flourish, where there was only suspicion and violence. Environmental policies should revolve around wellbeing, as opposed to capital accumulation and political gains. This might sound 'unrealistic', however, a century ago, the fact that humans could be a force capable of affecting the course of *terra* into the Anthropocene was also unrealistic.

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The last biocultural frontiers: recognition, engagement and self-determination for the protection of cultural and biological diversity

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The rate of change in nature during the past 50 years is unprecedented in human history. 75% of the land surface is significantly altered, 66% of the ocean area is experiencing cumulative impacts, and over 85% of wetlands have been lost. An average of around 25% of species in assessed animal and plant groups are threatened, indicating that around 1 million species face extinction unless effective action is taken to address the drivers over biodiversity loss. Without such action there will be a further acceleration in the global rate of species extinction, which is already at least tens to hundreds times higher than it has averaged over the past 10 million years¹.

In the face of a such disturbing scenario, it is necessary to recall that cultural groups are not equally responsible for the social-ecological crisis that currently challenges all humans. Although the term 'Anthropocene'² recognised human beings as the major driver of global change, thus characterising this new geological age, biodiversity decline and alterations in the climate, water cycles and various ecosystem dynamics, are mainly caused by the forms and levels of production and consumption in industrial and post-industrial societies rather than all of humanity³. The Great Acceleration and its significant impacts both on economic wealth and the ecological crisis have been largely associated with the demands and activities of a small fraction of the human population, with OECD countries accounting for 74% of global GDP, while representing only 18% of the global population⁴.

Making clear connections between biodiversity and cultural diversity constitutes a key step towards a more holistic understanding of the types of human activities, knowledge, governance systems and values that underpin social-ecological tendencies towards destruction and conservation. Biocultural perspectives highlight these different relationships with nature, as well as the economic, political and epistemic inequalities that lie at the basis of intercultural exchanges and environmental conflicts. For example, the seminal concept of 'biocultural diversity' refers to the interdependence between biological and cultural diversity, indicating how significant ensembles of biological diversity are managed, conserved and created (e.g. agrodiversity) by different cultural groups, many of whom have low environmental impact⁵.

Indigenous Peoples and traditional communities account for only 5% of the global population, yet manage 95% of the world's genetic resources⁶ and act as stewards of approximately 40% of protected areas and ecologically intact systems worldwide⁷. Their culture-based sustainable practices contribute to biodiversity conservation and social-ecological cycles beyond their locality: the health, agriculture and economy of

people around the world are partially or totally dependent on these resources and environments. Furthermore, their stewardship is based on ways of knowing and acting which provide significant options for the future of life on Earth. In spite of such invaluable contributions to the whole of humanity and other life forms, key areas of biocultural diversity are under intense pressure and growing dispute, with a great number of local communities facing challenges of land dispossession and illegal logging, expansion of industrial agriculture and large-scale extractive and energy industry projects⁸. In 2019, Ailton Krenak, an indigenous leader from the Krenak people in Brazil warned that “in this historic moment, when the corporations have major control over the planet, indigenous territories constitute the last frontiers of such domination. We need tools to question the Western logic of development, which is deprecating the basis of life on the planet.”

Important efforts to move beyond the Western logic of development – to halt the advancement of threats to areas with high biological and cultural diversity and bolster sustainable practices – have been made by scientists, local communities, civil society organisations and policymakers. Individual and collective actors from different communities of practice make use of biocultural discourses to counter the homogenising effects of globalisation and assert the need for changes in how wellbeing, development and sustainability are both conceived and driven by official institutions and corporations. However, despite their shared premises and overarching goals, there is limited interaction between scientific, conservation-focused approaches of both policymakers and academics (themselves in a position of power and privilege within the capitalist system), and the overt political focus of indigenous rights movements who struggle for social justice and autonomy over land and biocultural resource use in the face of dominant economic, political and cultural models⁹.

The transformative potential of biocultural perspectives lies, to a great extent, in their ability to understand and effectively deal with power relations at different contexts and scales. Recognition of biocultural diversity, multi-actor engagement, and the full legitimation and exercise of customary governance systems within nation states constitutes some of the means by which biocultural approaches can contribute to changing current power structures. This is briefly discussed below.

Recognise biocultural diversity: Acknowledging and valuing biocultural diversity in academia, practice and policy generates implications for understanding, decision-making and action across different scales. Many biocultural systems are not completely conditioned by hegemonic culture and are particularly important given that despite their historical invisibility, they offer crucial contributions to biodiversity, human wellbeing, and sustainability. Biocultural manifestations in urban contexts and the extension of the biocultural paradigm to non-indigenous groups enlarge the diversity spectrum and leads to novel knowledge and applications. In any case, broader attention to Global South experiences is key to revealing how a greater number of biocultural systems are currently threatened, to denounce the often-illegal advances over such territories and cultures and to engage in actions which defend them¹⁰.

Engage in collaborative processes: Knowledge construction, decision-making and action around biocultural systems should involve the direct participation of indigenous and local community members

through boundary work, action research and other forms of place-based collaborative knowledge-action processes, as well as through advocacy and political institutions. This could lead to greater recognition and protection of biocultural systems as well as influence policies and sustainable practices beyond the local. To enable this potential and allow for real collaboration in the context of power asymmetry, the study of and engagement with diverse biocultural knowledge systems, should take a series of ethico-political and epistemological considerations into account. These might include the use of co-formulated biocultural protocols, dedicated implementation of 'Free Prior and Informed Consent' and support to indigenous-led initiatives and movement¹¹. Such engagement needs to be founded in respect, equity and usefulness for all involved¹².

Defend the right to self-determination: Biocultural perspectives elucidate how local customary governance systems contribute to nature conservation, providing elements for the legitimation at local, national, and international levels of such institutions in Indigenous Peoples' struggles for self-determination¹³. Customary governance systems are part of nation states, and their associated sustainable management practices are more prone to flourishing within national legal frames that recognise the right of people to determine their own forms of economic, social and cultural production. Reaching a peaceful and constructive co-existence of different governance systems within national territories calls, in many cases, for the very reinvention of democracy and the State¹⁴.

In light of the dire social-ecological challenges that we face, it is imperative that those cultural groups not responsible for the global crisis – but whom provide significant contributions to counter it – are recognised and have their rights to land and cultural existence fully respected. Creating knowledge, policy and action in their defence is a significant means by which to promote social justice, protect biodiversity and ensure a more sustainable future for all.

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Corporate Nature

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Governance shapes nature

In this statement, I engage critically with the global governance of biodiversity. I begin with a proposition, now widely accepted in social science, which is that: *how we know* about nature, and therefore *how we govern* nature is constitutive of it in some way. This is what philosopher Bruno Latour explores in his notions of 'compositional nature' and 'socio-nature'¹. Such notions prompt us to reflect upon the kinds of socio-ecological systems or socio-natures²¹ that result from our actions – which for biodiversity may include measurement, diagnosis, protection or intervention – among other things. The point is that environmental governance is generative of socio-nature and is therefore neither neutral nor apolitical.

The practices of biodiversity governance must therefore be understood and scrutinised, while asking the following: do our actions lead to desirable, life-inspiring, diverse, ethical and durable forms of nature – or indeed, socio-natures? This question forces us to consider how the *governance practices* and *knowledge systems* we deploy in relation to biodiversity play a strong role in shaping our world, including our multiple relationships to nature. Herein, I focus on the role of mainstream global conservation.

The significance of global conservation action

In recent decades, Western technocratic and neoliberal ideas have become dominant in environmental governance². This trend is exemplified in the practices of a handful of big international conservation organisations that play a vital role in setting conservation priorities and in defining how we understand biodiversity and govern nature. Their influence is reflected in the funding they attract, with the top three big international non-government organisations (BINGOs) spending around 40% of global conservation funding available for civil society or NGO-led activities². Operating globally, these organisations are positioned to shape or remake nature-society relations in a diverse range of country contexts. We must therefore ask: what kind of socio-nature is being produced? To answer this question, I argue that we must study the practices of global conservation, including the inner workings and knowledge systems of the BINGOs.

By studying how global conservation thinks and acts, we may observe how it is generative of various socio-natures, each with their own ethical and philosophical contours. We know of 'colonial nature'³, 'imperial nature', 'neoliberal nature' and 'eco-modernist nature'⁴. My focus is upon what I call *corporate*

¹ Lorimer refers to this as the 'multi-natural', to account for the multiple possible natures that can result from conservation management.

² Calculated using 2017 figures from Charity Navigator. BINGO spending on 'functional expenses' was US\$1.23 billion. This does not represent all conservation funding, as a large portion is public, domestic spending. BINGOs play a prominent role in global civil society spending, with corresponding influence.

nature – that which emerges from the technocratic, bureaucratic, and power-laden practices of mainstream global conservation.

The contours of corporate nature

Through long-term project ethnography of BINGOs in global conservation, I observe the following features of corporate nature:

- Global conservation may be considered a business of ideas: policy ideas or generic solutions are the chief product. These ideas are generated at the global level, then rolled-out, scaled-up, or replicated in various hotspots around the world. This modus operandi is crucial for fundraising, branding, and for organisational identity and coherence across scales. However, global practice of this kind requires a certain level of ignorance or ‘factoring out’ of local complexities and voices. This is because, among other things, it assumes that generic policy tools can be translated from one site to the next.
- Logics of expertise and control underpin BINGO interventions, so constitute corporate nature. We see this in the rise of quasi-experimental methods that try to test or ‘prove’ the effectiveness of a given conservation tool⁵. Again, the assumption is that policy models look the same everywhere; indicative of an understanding and approach that is blind to the transformative workings of context. This assumption is evident in mainstream technical questions about whether a policy model ‘works’ and in discourses of ecosystem ‘health’ where experts measure nature’s ‘vital signs’ using highly abstracted, quantitative indicators – the latter being a new tyranny in global governance, indicative of a corporate thinking⁶.
- Yet, despite all of the expertise and power possessed by the global conservation movement, its weak grasp on local contextual processes makes BINGO intervention decidedly messy and clumsy. This means, paradoxically, that global conservation is rarely able to know exactly what is going on in ‘the field’ in terms of its project effects, let alone control those effects⁷. Of particular importance are project side-effects – such as the political dimensions of local community organising around conservation activities – which are not necessarily seen or detected with the use of overly narrow or quantitative ‘impact’ measures. The implication of these impact measures is that global conservation suffers from a form of systematic blindness.
- If BINGOs cannot see, or if they ‘un-see’ the complex effects of their interventions, then we must examine the role of ignorance or ‘non-knowledge’⁸ in conservation practice. I argue that the production of ignorance is a necessary aspect of conservation’s global-corporate form: it provides a way to cope with ongoing dissonance between the good intentions that are evident in appealing policy ideas, and local realities that are typically unpredictable or uncomfortable. In other words, conservation projects become successful if they can maintain suitable ‘representations’ of what is happening in the field⁹, in line with the overall policy framework at hand – while everything else is noise.

- The persistent gaps between intentions and outcomes in global conservation largely arise from the organisational demands and knowledge practices of the BINGOs. A core issue here is the competitive funding environment, in which NGO reputations are of vital importance. Unfortunately, this can lead to the suppression of dissent or ‘undisciplined knowledge’ about what is happening in the field or within conservation projects¹⁰. Corporate nature can therefore be characterised by organisational efforts to control knowledge and interpretations of ‘the field’, in the corporate BINGO’s interest. This makes corporate nature inherently undemocratic and not necessarily receptive to diverse forms of knowledge, divergent epistemologies, and critique – a problem that is especially grave for Indigenous Peoples¹¹.

Together, the corporate-style practices of global conservation give rise to a socio-nature that is not necessarily ethical or fair and generally unable to account for diversity in real-world contexts. Corporate nature is homogenous and lacks humility. For this reason, I ask: how can an organisational system that in itself lacks diversity be capable of conserving biodiversity? Radical critics argue that it cannot: that the very modernist thinking which has led us into the current ecological crisis, cannot lead us out of it¹². However, short of dismantling the entire edifice of global conservation, we must at least imagine new kinds of practices and knowledges to prise open corporate nature and produce something else.

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Sex, drugs & biodiversity: embracing intersectionality within conservation

Winner of early-career essay competition

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'Nature conservation' as a field of practice and study has transcended its previous boundaries within the physical sciences and now encompasses social dimensions that govern relationships between people and the natural world. Since the 1990s, mainstream conservation – as embodied by international agreements, conservation organisations, and academic institutions – have acknowledged that effective conservation is only possible if social and economic factors are taken into account when identifying threats and solutions. However, biodiversity loss continues to reach unprecedented rates¹ while global inequality soars regardless of 'economic growth'² emphasising the need for more collaboration to achieve social and ecological justice through transformational change. Social and political movements are leveraging cross-cutting issues linking climate breakdown, biodiversity loss, and socio-economic inequality, highlighting the need for holistic approaches to achieve a more just future. The conservation sector can better nurture effective collaborations and identify common objectives between different social groups by adopting 'intersectionality' as a framework for examining interconnections and interdependencies between a range of social issues and processes³. Taking inspiration from intersectional feminism, I assert that conservation frameworks for transformational change address ecological destruction within many specific contexts pertaining to intersecting sociocultural, political-economic, and historical factors. I will reflect on a number of such intersections, highlighting potential opportunities for synergies and collaborations spanning the fields of sex, drugs, and biodiversity.

Nutrition, sexual health and empowerment

Illegal wildlife trade (IWT) is partly fuelled by demand for the consumption of wild animals – in some cases, species are consumed to assert socio-economic status⁴ or because they are the only reliable source of protein or sustenance for local communities. Wild species are commonly viewed globally as being more nutritious than their farmed equivalents and are preferred for their taste and perceived health benefits⁵. Conservation efforts addressing IWT should better incorporate nutritional security into their strategies, accounting for the growing levels of distrust in the agricultural industry and the quality of its products⁶. Collaborating with organisations such as the UN Food and Agriculture Organisation (FAO) as well as Slow Food International may be useful when developing research and leveraging common goals to address food security, with consideration also to culinary heritage and ecological boundaries.

Wild animals are often consumed for their perceived medicinal properties for the treatment of different ailments and illnesses, which may indicate a lack of access to proper medical care or lack of trust in public healthcare systems. This highlights the potential intersections between conservation and public health. Sexual health in particular is a growing yet understudied force within IWT and the quest for aphrodisiacs is driving demand for some wildlife products. In the Middle East, specific species of migratory songbirds are consumed for their supposed aphrodisiac properties and are often referred to as “natural viagra⁷.” Such perceptions are often dismissed by conservationists as scientifically unfounded local superstitions, in spite of the fact that research has been conducted to indicate the aphrodisiac effects of specific plants and animals on both human and nonhuman subjects⁸. Erectile dysfunction (ED) is predicted to increase globally with the largest projected increases in the developing world⁹. Surveys conducted on the attitudes of men with ED indicate significant psychological implications, including “great sadness” and the willingness to do “nearly anything” to cure ED¹⁰. This may reflect the importance of incorporating the psychological, physiological, and political – economic dimensions of sexual health in assessments around drivers of IWT, with a particular focus on how males perceive and interact with nature in terms of their virility. More collaboration and research is required between practitioners in conservation, nutrition, healthcare, and the social sciences to better harness the intersections between sexual health, gender, and nature conservation.

The demand for wildlife products is not exclusive to male sexual health but extends to fertility in females. The blood of sea turtles was, until recently, consumed by some women on the Mediterranean coast of Egypt in the hope of curing infertility, driving up the demand for endangered green and loggerhead turtles being sold in local fish markets¹¹. Addressing issues such as IWT in light of female fertility requires an interdisciplinary approach also encompassing public health, and gender dynamics.

Population, Health and Environment (PHE) has become a more prominent approach to human development in recent decades – integrating family planning and health with conservation efforts to ensure holistic approaches to the wellbeing of humans and nature – particularly in the Global South. Conservation organisations engaged in PHE need to work closely with local feminist groups attuned to local customs and traditions to avoid oversimplified Eurocentric narratives on empowerment that fixate on growing populations in Africa and Asia, whilst ignoring the ecological and carbon footprint of the Global North – a footprint magnified by the political-economic structures that govern the world and maintain existing privileges, regardless of the vast difference in population numbers between them. An acknowledgment of the structural privileges enjoyed by conservationists in Europe and North America should be a prerequisite to any work involving the development and empowerment of less privileged communities, thus ensuring an intersectional approach that accounts for the historical, sociocultural, and political-economic factors that govern lives particularly in the global south.

Guns, drugs and Sir David Attenborough

Militarising conservation efforts to combat IWT has become increasingly popular to combat poaching. While this could be an indication of increased political will to prevent extinctions, conservationists must

acknowledge that militarised efforts are likely to cause more harm than good if they mirror and recreate past injustices endured by local communities at the hands of their governments or their previous colonisers¹². Social and ecological justice can only be achieved by acknowledging the past and present role of the global military industrial complex in maintaining political-economic power structures in the Global South, dictating how communities, governments and economies interact with nature to produce wealth from it.

'The war on poaching' is increasingly resembling 'the war on drugs'. However, the last decade has seen reforms in the way some countries are addressing the issue of 'drugs', most notably with the mainstreaming of cannabis and psychedelics within American and European public discourse. Aside from growing evidence on partial therapeutic effects in treating depression and anxiety, psychedelic substance use has been associated with promoting changes in personality traits, particularly increasing connectedness with nature alongside pro-environmental behaviour^{13,14}. Similarly, 'getting stoned' and watching nature documentaries narrated by Sir David Attenborough has become a staple in modern pop-culture. "Cannabis enhances both communing with nature and watching videos, so naturally *Planet Earth* and similar programmes appeal to those under the herbal influence," says writer David Bienenstock¹⁵. Perhaps it is time for conservationists to start considering psychedelic movements and 'stoner culture' when developing their communications strategies, leveraging the increasing potential for connectedness with nature and the decreasing trust in the social and political structures that degrade it. On the other hand, the liberalisation of marijuana has in some contexts been correlated with environmental degradation¹⁶, illustrating the need for necessary collaboration – or intersection – to achieve a sustainable outcome between conservation and the growing cannabis industry.

Naked conservation

'Intersectional conservation' – as a theoretical framework to visualise new collaborations and leverage holistic conservation approaches for transformational change – must also acknowledge the danger of resorting to more complex terminology that further alienates conservationists from other groups and their perspectives. Intersectionality requires the incorporation of multiple structures to identify, diagnose and address socio-political and ecological problems. A key challenge for conservation is that it remains sidelined as an independent field of work and its expertise lies within its own organisations, journals and academic networks. Wild habitats and species continue to be studied, protected and ultimately exploited in isolation of people, often masked by alienating labels such as 'biodiversity' and 'ecosystem services'. We frequently discuss what we are conserving but need to focus more on consolidating what we are conserving nature from and who must we support in the process. A paradigm shift is necessary in how we define nature and how we can promote conservation that is stripped naked of its colonial heritage and structural restrictions that continue to frame nature as separate from people. I argue that such a paradigm shift can only be achieved by acknowledging that nature is defined by people, whilst conservation is defined by their actions – all of which exist within wider social, political and economic structures, including the intersecting struggles within and between the social and ecological ecosystems that share the earth.

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Biodiversity conservation, mindfulness and the future of humanity

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The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) media release¹ on 6 May 2019, screams – *Nature’s Dangerous Decline ‘Unprecedented’ – Species Extinction Rates ‘Accelerating’*. The media release provides some bleak highlights from the IPBES Global Assessment Report on Biodiversity and Ecosystem Services, which will be released later this year. Among its most alarming findings are that “1 million species are threatened with extinction”; “nature is declining globally at rates unprecedented in human history”; “that the current global response insufficient”; radical transformative changes are needed from local to global scale to halt this unfolding catastrophe; and given that there is “good progress on components of only four of the 20 Aichi Biodiversity Targets, it is likely that most will be missed by the 2020 deadline.”

On reading the IPBES bombshell media release, several questions came to mind. First, I wondered why, some 26 years after the UN Convention on Biological Diversity (CBD) came into force, the rate of loss of biodiversity on the planet has not slowed down? Second, I wondered why countries that are signatory to the CBD continue to produce National Biodiversity Strategy and Action Plans (NBSAPs) if they are not helping to preserve the Earth’s biodiversity? In the IPBES media release, they state that “transformative change can expect opposition from those with interests vested in the status quo.” This is an overt admission that the problem is due to vested interests in the status quo, which prefers ‘business as usual’ among decision-makers responsible for economic, social, political, and technological policies.

How can transformative change happen in a context where vested interests seek to maintain the status quo? The starting point is to have a proper diagnosis of the problem; to look beyond the symptoms including extinction rates, economic models and lack of political will. The starting point is our mindset, and, in this piece, I will draw attention to our lack of mindfulness as one of the fundamental problems we need to address. Given that we are mindlessly plunging into the biodiversity abyss, mindfulness should bring us back from the precipice. What is mindfulness and how would it save the planet from the present biodiversity crisis?

Mindfulness says Jon Kabat-Zinn “is an awareness that arises through paying attention, on purpose, in the present moment, non-judgmentally².” Kabat-Zinn in his book *Coming to Our Senses: Healing Ourselves and the World Through Mindfulness*³, argues that true awareness results from using and interrogating all of our five senses (sight, sound, smell, taste, and touch) as we make sense of the world. To do this we

must be fully present and not just switch into auto-pilot as we engage with people and the world around us. We have to be intentional about paying attention and intentional in following through on our observations.

Kabat-Zinn’s work on mindfulness, health and survival is arguably a further elaboration of the pioneering work, *Five Minds for the Future*⁴ by Howard Gardner, The John H. and Elisabeth A. Hobbs Research Professor of Cognition and Education at Harvard University⁵. In this book Gardner proposes the five minds (or mindsets) needed if humanity is to continue to thrive on planet Earth. These are the ‘disciplined mind’, the ‘synthesizing mind’, the ‘creating mind’, the ‘respectful mind’, and the ‘ethical mind’. The meanings and relationships between these minds are shown in Figure 1 below.

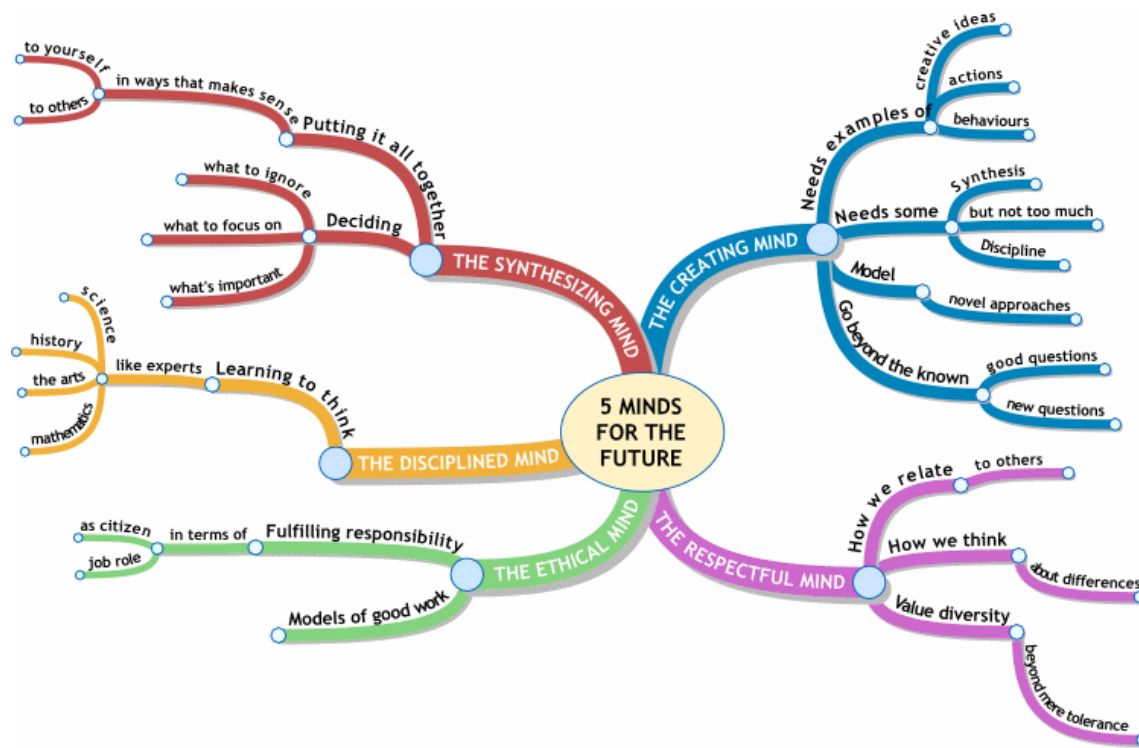


Figure 1. Five minds for the future⁶

To thrive, it is not enough for humanity to be innovative, analytical and diligent; we must be intentionally respectful and ethical. What Kabat-Zinn and Gardner both suggest that we must *wholistically* engage (emphasising entirety) with the present and utilise all of our five senses; *holistically* preparing for the future through interconnected thinking. It is through this ‘wholistic and holistic’⁷ approach that we will intentionally transform the world in a direction that would allow humanity to survive, and beyond that to thrive. If this is the underlying problem behind the loss of biodiversity, what is the way forward?

Bringing mindfulness into biodiversity decision-making processes

When I completed my undergraduate education in Environmental Science two decades ago, I set out to pursue graduate studies in either plant taxonomy, plant systematics or wildlife survey. My first job was as an intern in a major ‘integrated conservation and development project’ (ICDP) with bilateral and some

multilateral funding.¹ I wanted to learn as much as I could to inform my choice of graduate studies from the options foremost in my mind. I joined the Environmental Education (EE) Unit as this provided opportunities to work with both plant and wildlife experts and also social scientists and policy experts.

To my great shock, I discovered that policymakers would not read the full reports produced by plant and wildlife experts nor, in some cases, would they read the executive summaries so carefully crafted for them. In the worst cases, they would not even read the beautiful and costly policy briefs published for policymakers. These policymakers citing the pressures of work, preferred verbal briefings after which they would mouth platitudes.² I observed that whilst policymakers seemed to follow an auto script in responding to experts, they were the decision-makers. I asked myself if I wanted to do gruelling work in the field, only for my report to gather dust? I decided to pursue graduate studies, which focussed on the process of informing, designing and evaluating policy.

This mindless auto-pilot policy processes helps explain why signatories to the CBD continue to produce National Biodiversity Strategy and Action Plans (NBSAPs), even in cases where there is no follow-through adoption framework and the NBSAPs consequently end up being ineffective in halting biodiversity loss. An off-the-counter prescription would be to bring mindfulness into biodiversity decision-making processes. The first thing we must do is to ring the bell really loud; we must pump up the volume to inconveniently loud decibels. The IPBES media release is a great step in this direction, but will it have staying power or lose steam the way the IUCN Red List of Species has also lost some of its oomph?

When the ringing has caught the attention of decision-makers and they have 'woken up' to the biodiversity tragedy unfolding, they must be kept 'awake'. No more auto-pilot, no more mental absence where the eyes are opened but the mind is asleep. There is a role for organisations which are agile⁸ – able to quickly respond to change and changing priorities – and as such be quickly re-tooled to include within their Mission Statements, a role of influencer, vigorous bell-ringer, and biodiversity mindfulness coach, to high level decision-makers around the world. This calls for exercising a creative mind; and brings my concluding thoughts to what the person on the street can do in this regard.

People power and keeping biodiversity decision-makers mindful

In his paper on environmental regulation and societal self-deception, Newig argues that although society demands stronger environmental regulations, society is itself often reluctant to shoulder the cost of stronger regulations⁹. Norwegian people pressed for strong environmental regulations from the 1970s to the 1990s, and Norwegian politicians like Gro Harlem Brundtland advocated for strong environmental regulations. However, eventually Norway had to settle for international environmental activism that was not so disruptive of 'business as usual' in the oil and gas industry, the bedrock of the Norwegian economy¹⁰.

¹ This was the Mount Cameroon Project (MCP), in the South West Region, Cameroon¹³.

² A notable exception during this period was when the Cameroon Minister of Environment agreed without hesitation to reduce harvesting of the bark of *Prunus africana*, a CITES listed endangered medicinal plant from 1,500 to 200 tonnes per annum based on results of *Prunus* inventory presented to him by staff of the Mount Cameroon Project Limbe despite strong opposition by powerful actors¹⁴.

While this may appear as a pragmatic political calculation by the government and people of Norway, they have been accused of environmental hypocrisy in many quarters¹¹.

Considering this observation about society's reluctance to pay for stronger and more effective environmental regulations, how can people power be harnessed to achieve more effective biodiversity conservation outcomes? In my work on reconciling poverty alleviation with biodiversity conservation I have advocated for local biodiversity conservation champions "who would speak for biodiversity because of internalised conservation ethics¹²." My earlier focus was on capacity building through conservation sensitisation in schools, for young people who would grow up to become conservation champions. Now I advocate for the creation of a worldwide network of local biodiversity champions – persons selected based on their proven commitment to biodiversity conservation in their corner of the world.

One such person is Stella Asaha who runs Forests, Resources and People (FOREP) – a reputable NGO based in Limbe, working in the montane forests surrounding Mount Cameroon. Stella has been working in this region and the adjacent Korup National Park and Takamanda forest – home of the critically endangered Cross River gorilla – for more than two decades. She knows the forest, the people and the biodiversity conservation challenges in the region as well as any other expert in the world. Given the right kind of support and mentoring, Stella – and many other local committed conservationists like her around the world – would make great spokespersons advocating for biodiversity conservation in their regions, linking local to global and most importantly, being the bell ringer from below to keep decision-makers mindful.

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Why do we need a more pluralistic approach to valuing biodiversity?

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The diversity of values for biodiversity conservation

The value of biodiversity is often interpreted from an economic perspective, stemming from the application of seemingly neutral valuation methodologies. This view derives from more than two decades where the narrative around natural capital has been dominant in ecological economics and conservation biology¹. For example, building on the Millennium Ecosystem Assessment landmark, The Economics of Ecosystems and Biodiversity (TEEB) fostered the natural capital framework², further assuming that economic valuation is a central policy support tool to recognise and capture the importance of biodiversity conservation for human wellbeing³. While TEEB may still be considered in certain policy circles a gold standard regarding why and how the valuation of biodiversity ought to be undertaken, there is an increased interest in science-policy initiatives to articulate and capture the multiple values of biodiversity from a more pluralistic perspective⁴.

The literature recognises different conceptualisations of values of nature, and uses alternative value categories, such as held, assigned, instrumental, moral, intrinsic, shared, and social values, to name some of those most commonly used. Values may be connected to material and non-material relationships with biodiversity. Likewise, while some categories may resonate with monetary values, others cannot be related to money or other easily identifiable metrics. Intuitively this suggests that valuing biodiversity is not a straightforward endeavour, partly given the complex methodological issues, and partly due to philosophical perspectives related to different notions of value, as well as due to different ontologies about nature.

It may be argued by some policymakers that there is no need to be overly complicated in terms of distinguishing between different conceptions of 'value', as this may appear to be an academic debate, one that distracts from the urgent needs to find pragmatic solution to the biodiversity crisis. For others, what is crucial is that there should be space within policy to take account of what matters to people on their own terms. I think we need a common ground within science-policy where it is possible to delineate different concepts about the value of biodiversity, as this can influence new narratives that may determine how we interpret human-nature relations, and why we care about biodiversity.¹

¹ I use the concept of 'biodiversity' and 'nature' interchangeably noting that both terms are socially constructed underpinned by different and sometimes opposing ontologies.

Broadening the value lens: relational values *of* and *about* nature

Biodiversity science needs to foster deeper understanding of human-nature relationships by drawing and bridging ideas across different academic traditions. There is a tendency to follow up the long-standing dual narrative about the value of biodiversity: either as having worth itself irrespective of humans (intrinsic values) or as being important because it is useful for people (instrumental values). But this is conceptually too narrow to understand how people perceive our relationship with nature. Various initiatives, such as IPBES, are now taking a more pluralistic approach to the values of nature. This is likely to influence discourses about the values associated with biodiversity, for instance by introducing a third value dimension known as “relational value” (RV)⁵.

Relational values can act as a boundary concept between diverse scientific fields and policy. The concept draws on a long tradition in the humanities and the social sciences; it is recognised as a key value category by IPBES^{4,6}. Relational values include the preferences, principles and virtues about human-nature relationships. They are representations of what people find meaningful about nature. For example, they may include responsibility and attachment towards features of nature or solidarity towards a given species. In this sense, one can say that these are values *about*, rather than *of* nature. But relational values can also represent values *of* (or assigned to) nature insofar as nature contributes to achieving a *good life* (for example in terms of living in accordance with moral principles and virtues, such as connecting to the land or maintaining traditions)⁷. Relational values therefore diverges from ecosystem services-related instrumental values (e.g. via pollination services) but in some instances may be viewed instrumentally for instance as the worth of a forest grove to the wellbeing of a community.² Table 1 describes some common concepts about values and how they connect to nature.

Why does integrating and mainstreaming relational values into biodiversity conservation matter? Some relational values connect to universal moral values, such as to rights to a healthy life or human rights to a healthy environment. This connects biodiversity conservation with rights-based approaches. It therefore obliges questioning how biodiversity conservation initiatives should take on board the rights of people to choose how they want to be attached to nature and apply their held values (such as fairness, solidarity, etc.) towards nature. This perspective broadens the traditional instrumental approach of the ecosystem services framing as well as biocentric perspectives on the intrinsic value of biodiversity.

² The subtle difference is that of theoretical substitutability of the natural feature. If the value of a thing is in principle substitutable, and the relationship is merely a means to an end, the thing is valuable instrumentally but not necessarily has a relational value. Relational values are reserved for relationships wherein the feature of biodiversity is not entirely substitutable (e.g. while a tree may provide shade, it can be planted to commemorate a birth or death)⁶.

Table 1. Common concepts about values and their connections with nature

Value type	Explanation	Examples in relation to nature
Instrumental value	The value of nature's entities as means to achieve human ends or satisfy human preferences. Economic values are all instrumental values and in contrast to relational values they are typically substitutable.	The value of a forest in terms of providing tangible or intangible benefits for people (e.g. food or timber)
Intrinsic values	The worth of nature itself. Values inherent to nature, independent of human judgement (it assumes that people can articulate that features of nature have their own interests and needs). Sometimes intrinsic values are interpreted as being equivalent to moral values or associated with the rights of nature.	The inherent value of species living in forests irrespective of their relationship to people. Sometimes, when used as equivalent to moral value, it could for instance connect to the right of a river or to animal rights.
Relational value	The worth of a relationship that takes on its own meaning, beyond a means to an end. Relational values represent the preferences, principles, virtues and attitudes of care and responsibility. They can be positive or negative. They are not substitutable.	Representations of what people find meaningful about some feature of biotic nature, such as a forest, or abiotic feature, such as a landscape or mountain. People may care about any of these features for example in terms of their attachment to a place or the identity it provides to them e.g. via kinship or interdependence.
Moral value	Value that applies universally and typically represents what is right.	The human rights to clean water from a forest, a responsibility to save a forest for future generations, or the rights of Indigenous People to live in a forest in their territory.
Shared social value	The value people share within their own communities, typically addressing a social good. It is likely relational, rather than instrumental. It is created through a social process and is not simply the aggregation of individual values.	Forest land held as common property by a community typically involves shared values about the forest specially when there are strong historical and cultural links between the community and the forest.

Relational values of and about nature are considered explicitly in the IPBES conceptual framework⁷ and in the synthesis of the preliminary IPBES guide on values and valuation⁴. They connect directly with the IPBES framing of 'nature's contributions to people'⁷ and offer space to recognise a diversity of human-nature relations and therefore of the diversity of values^{4,7}. Relational values offer a richer connection between 'nature's contributions to people' and people's good quality of life given the cultural context that gives meaning to the ideas of nature and wellbeing. In addition, the intersection between relational and other value categories such as moral and collectively shared values, puts the concept of the value of biodiversity into a pluralistic (and necessarily normative) perspective, where different values of nature

should be recognised and captured in policy. That is, relational values connect biodiversity with value pluralism, thereby departing from the view that the values of biodiversity can be reduced to one super-value, either in money terms or any other common metric. Valuation should therefore be about recognising and learning how to bridge distinct values of different people for different aspects of biodiversity.

Valuation in biodiversity-related conflicts

Opening up the idea of valuation beyond a purely instrumental ecosystem services-based approach can create a more integrated social-ecological perspective where biodiversity conservation is associated with broader notions of sustainability and justice⁸. Valuation of biodiversity should be seen as a value-laden process, influenced by power relations, and efforts should be placed in social learning and integrating diverse values of biodiversity, especially in contested spaces⁴.

Recently, Muradian and Pascual posit that it is possible to identify and categorise a finite number of human-nature “relational models” underpinned by shared representations of nature in society⁹. In this way, intrinsic, instrumental and relational value categories may derive from different socially constructed cognitive frameworks that shape a given relationship with nature. The ways we perceive and relate to biodiversity and make sense of it are influenced by collectively constructed and socially shared cognitive frameworks. This may explain that whenever there are sufficiently distinct social representations of biodiversity, conflicts around its conservation, use and exploitation may arise. For example, one may identify a ‘problematic species’ such as wolves who tend to be cognitively represented in starkly different ways by conservationists and cattle ranchers. These are typically two distinct social groups whose social representation of a wolf deviate and this implies that irreconcilable positions and social conflicts tend to arise over how to deal with conservation of wolves, e.g. culling vs. compensation mechanisms.

In such situations it may be more productive to enquire about what those cognitive models are and how they are shaped and reproduced, rather than estimating or measuring the value of wolves. Valuation would instead need to focus on ‘re-framing’ of relations towards wolves as a strategy for attempting conflict avoidance, mitigation and transformation. Valuation would first and foremost aim to ascertain in which ways are the social representations about the relations with wolves created, transformed and communicated, as well as to ascertain the power relations among the social groups who hold different cognitive relational models about wolves. This should predate any attempt to estimate the individual and collective shared values in terms of the intrinsic, relational and instrumental worth of wolves – or indeed any other feature of biodiversity that we might for different reasons care about.

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Revisiting conservation through evaluative thinking: towards a more impactful theory of change

Winner of early-career essay competition

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Introduction

'Reasoning is the only ability that makes it possible for humans to rule the earth or ruin it. All other distinctions between us and other forms of life turn out to be illusory'. Scriven, 1976

As human action continues to erode the diversity of life that sustains us at unprecedented rates, it is becoming increasingly clear that global conservation efforts are not delivering the required impact. The critical question is why – despite significant collective knowledge – our conservation efforts have been largely unsuccessful and beset by widespread inaction. To better understand this question and suggest potential answers, this essay turns to the discipline of evaluation – the systemic investigation and reasoning of what works, in what circumstances and for whom². Evaluators systematically collect and analyse data to increase understanding, inform judgements about the performance of interventions and guide decisions about the future³. Here, using tools and concepts from evaluative thinking, I apply the same approach to the problem statement by unpacking the synergies between evaluation and effective conservation, deconstructing the 'theory of change' at the heart of the current conservation failure, and suggesting ways of developing a better theory of change for a new conservation agenda. Throughout this essay, I draw on key evaluation texts and examples from my own experiences as a practising evaluator working in conservation. How can evaluation and evaluative thinking help us improve conservation? Evaluation has a crucial role to play in understanding conservation impact from the programme level up to the broader narratives shaping conservation. Historically, there has been little evaluation of conservation interventions but this is shifting as conservationists become increasingly focused on understanding their impact, improving effectiveness, sharing lessons learnt and demonstrating accountability⁴. Many conservationists are already engaging external evaluators or using open-access evaluation toolkits like PRISM⁵ to evaluate their conservation projects, programmes and strategies. Although scholars like Margoluis and colleagues⁴ have criticised the poor integration of evaluation into conservation design and practice, I have seen many conservationists using programme evaluations in thoughtful and innovative ways. For example, in the conservation of the Great Barrier Reef, I have seen evaluative tools used to build collective understanding amongst diverse stakeholders and empower 'Traditional Owners' to design governance systems that will enable them to care for their Country. If undertaking programme evaluations can help us to better target specific interventions, evaluative thinking provides a reflective approach that

can help us to deepen our understanding of the current narrative that are driving ineffective conservation. Evaluative thinking applies critical inquiry and the evaluation tools to investigate the key assumptions, motivations and biases of oneself and others⁶.

What is our existing theory of change for conservation?

The core assumptions underlying conservation's dominant theory of change has not held. A theory of change represents the general processes by which changes come about for individuals, groups and communities⁷ and through these social changes, in turn, impact the natural world. Theory of change offers a powerful thinking tool that makes explicit the causal linkages between an intervention, its desired outcome and wider impact. The problem statement and the broader premise of *Biodiversity Revisited* allude to an implicit failed theory of change underpinning the current dominant narrative around biodiversity. The core assumption of this theory of change is that high-quality research and sufficient knowledge of biodiversity will influence governments and other decision-makers to take effective action to conserve biodiversity and, in so doing, foster a more biodiverse world. Figure 1 presents a simple visualisation of the conceptual linkages between the invention, outcome and impact outlined in this theory of change.

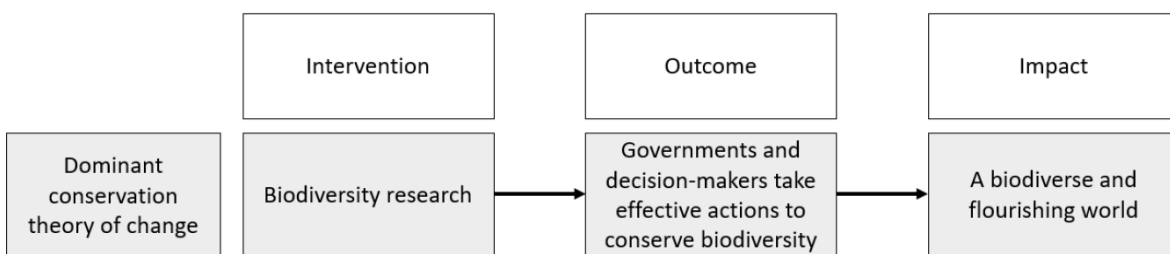


Figure 1. A simplified theory of change for the current model of biodiversity research

However, as the problem statement asserts, despite significant knowledge around the loss of core environmental functions and wild species, effective action has not followed. This disconnect between conservation knowledge and action is well documented⁸. Even though significant efforts have been made to better connect science and policy, effective conservation action has not followed⁹. There is strong evidence that the core assumption underlying this entire change pathway has not held. Yet, conservationists have continued to focus on improving the quality of biophysical research rather than asking if our theory of change accurately reflects how social and policy change for biodiversity might happen.

How might we develop a stronger theory of change for a more biodiverse future?

Firstly, we must consider a broader set of actors than scientists, practitioners and policymakers. The current failures of our existing theory of change does not undermine the important work that conservation biologists do in helping us to understand the complexity of environmental systems. What it does suggest is that biophysical research alone is unlikely to catalyse effective conservation action. This means that we need new narratives – and theories of change that support them – that include a wider diversity of

stakeholders. Conservationists may want to consider more collective impact-type approaches that seek to engage actors across sectors and groups to deliver results in a particular place¹⁰. This approach is already being implemented by some natural resource managers in Queensland who are bringing together community, government, scientists and traditional owners to deliver conservation outcomes for their local marine parks. More broadly, integrated approaches to biodiversity conservation have been practised across a diversity of successful indigenous cultures for thousands of years¹¹ and new initiatives like the *Human Nature Project* are outlining compelling narratives of “nature for the people, by the people, and with the people¹².” Secondly, as with all good theories of change, we as conservationists must be explicit about our normative stance and be prepared to test and revise our core assumptions⁷. The theory of change that currently dominates conservation is not normatively neutral; it reflects a wider stance that science should have a stronger say in environmental decision-making and that all societies will face unnecessary hardship should environmental challenges go unaddressed⁹. In a world where resources for conservation are scarce, if we want to create room for other conservation stakeholders, biodiversity science cannot occupy the same level of focus. This is a normative decision. Similarly, we must recognise that biodiversity loss will impact those who are already marginalised to a greater degree than those in more powerful positions. As an extension of this, if we assume that a people’s movement for biodiversity will save the planet then we must be prepared to test this assumption. One might argue that, in spite of compelling and wide-scale protests for climate action, global climate policy and the action to implement it lag behind. Finally, in developing our new theories of change, we must be prepared to ask the hard questions not just around the overarching narratives of conservation, but how we should be practicing conservation day to day. If conservation work is ineffective, then we should not continue to pour resources into it. Having these conversations threatens the power we place in the existing status quo of conservation research, governance and programming. This asks a bolder choice of all conservationists, not to continue doing what they have always done, but to commit to what will be effective in delivering positive change for biodiversity. I know from experience how difficult these conversations can be, particularly when well-loved programmes and the jobs of conservationists themselves may be at stake. However, as Margoluis et al.⁴ argues, we must not let the urgency of biodiversity loss divert us from what is important – drawing on robust evidence to deliver conservation that is truly impactful.

In conclusion, this essay has illustrated the potential for evaluation and evaluative thinking to redefine how we understand the impact of specific conservation interventions and wider conservation narratives. Specifically, it has articulated that the current theory of change underpinning the dominant conservation narrative – namely, that good biodiversity research will lead to effective conservation and positive impacts for biodiversity conservation – is an assumption that has not held and this theory of change must be revisited.

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Conservation is not working: it is time to radically rethink forest tenure and consent in the tropics

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Conservation cannot succeed where local costs are overlooked

Despite the rapid expansion of protected areas in the tropics, biodiversity loss still persists¹. The prevalent win-win myth that the preservation of nature is a paramount contributor to poverty reduction partly accounts for this ongoing decline. Forest conservation has for too long been dissociated from food production, a prerequisite for development. In biodiversity hotspots in particular, the availability of vast standing forests may not help local communities fight their hunger. Forest conversion to agricultural lands is a means to claim customary tenure as much as a way to maintain subsistence².

Conservation restrictions may come at a local cost and these costs can be significant and felt over many generations³. While the negative social impacts of conservation have long been recognised in conservation policy – the ‘do no harm principle’ – advocacy and conservation practice reveal a lack of awareness of the high price that local people have to pay⁴. Compensations are often incomplete and inadequate or absent altogether. Even when the local costs of conservation are recognised, their legitimacy may be questionable if they involve activities that may be illegal – often due to a lack of recognition for local people’s customary rights. In such contexts, identifying who is eligible for compensation and how much is needed can be extremely difficult.

Community-based forestry has been seen as an approach which delivers conservation and development benefits. Currently 35% of the tropics’ conserved forest areas are managed or co-managed by Indigenous Peoples and local communities⁵. However, these community-managed areas are under increasing pressures⁶, in part because these regimes have failed to compensate local costs, and have not sufficiently built local capacity to enforce protection⁷.

Conservation is extremely complicated where property rights are unclear

Financial mechanisms that reward the provision of ecosystem services have also been proposed to safeguard biodiversity and compensate local costs (also known as payments for ecosystem services, PES). Whilst small-scale land users can be efficient producers of environmental services, insufficient consideration has been given to property rights, which are an important determinant of the effectiveness of such mechanisms. In many tropical countries, governments still have legal ownership of forestlands. Such state tenure is a legacy from colonial regimes, or the product of non-democratic governments and strongly conflicts with customary tenure.

The majority of PES to date have been implemented in countries where the institutional framework is well-defined and where land is individually owned. Designing PES in situations where institutional frameworks are weak is challenging, yet these contexts are dominant features of biodiversity hotspots where threats to ecosystem services are the highest and where conservation actions are viewed as most urgent. For instance, where property rights are not clearly defined or contested, it is challenging to determine who is eligible to benefit and how contracts can be legally enforced. While PES concepts have received considerable attention in the conservation literature for almost two decades, only a few have explicitly tackled the challenging institutional context of forest conservation in least developed countries, where forest users are often not legal landowners⁸.

Securing forest tenure could solve the current conservation crisis

Devolving forest tenure rights to local communities can help tackle many of these problems and should precede any efforts to conserve biodiversity in the tropics. Such private tenure is highly valued by local communities⁹ and would be fundamentally different from decentralised management where local communities are only granted management rights.

When state enforcement capacity is inadequate or unreliable – a common feature of conservation in the tropics – local people are more likely to clear forests faster than they would otherwise do had they secure tenure rights⁶. This is a well-known phenomenon in fisheries, where harvesting is typically higher in open access fisheries and is more sustainable when fishermen are granted individual property rights¹⁰. Emerging evidence suggests that granting local communities legal titles to forests could be similarly effective^{11,12}.

When property rights are explicit and locally perceived as legitimate, conservation can be negotiated directly with forest owners through PES contracts. 'Free Prior Informed Consent', another key principle widely accepted in conservation policy, is impossible without freedom of action; and individuals, choosing freely, are the best judge of the worth of compensatory interventions. Local people would also have the freedom to choose their own livelihood strategies. Violations of contract conditions would imply the stopping of payments. Payments may also account for changing opportunity costs and be renegotiated over time⁸.

Such voluntary conservation contracts are also argued to be more cost-effective than previous indirect support for conservation. When adequate compensations are very difficult to estimate and target¹³, voluntary PES schemes may have lower transaction costs than trying to achieve fair compensation if markets are competitive and property rights enforceable¹⁴. However, formalising individual ownership may be open to elite capture and embed inequalities and any mechanisms aimed at achieving equitable compensations would likely face the same constraints.

Private property rights must explicitly consider different contexts. While giving stable communities common tenure may slow deforestation rates, individual legal tenure may be preferable when the context lacks clearly defined common rights. Individual access rights may also help solve cost-sharing issues prevalent

in common regimes, where a few individuals free-ride off the efforts of others. In some cases, individual rights over forest resources can be used, instead of, or in addition to, payments as a reward for environmental services. Where farmers have recognised individual rights, participating in a PES programme additionally offers a way to strengthen their property rights, for instance by reducing threats of land invasion.

Implementing a drastic forest tenure reform requires concerted actions

Legally recognising local community forest ownership is only a first step in safeguarding the world's remaining forests. Local forest tenure must also be secured by enhancing owners' abilities to enforce and legitimise exclusion rights. While the amount of legislation recognising or strengthening forest ownership, and land access rights of Indigenous Peoples and communities has increased significantly in the tropics since Rio 2012, the bulk of this progress has been made in Latin America and Africa lags behind¹⁵.

Implementing such a drastic legal reform will not be easy and national governments cannot embark upon this journey alone. Concerted actions are critical, governments will need to work with Indigenous People, local communities, conservation organisations, civil society, the private sector and the international community. Various stakeholders will need to make concerted efforts to collect data to ensure that the circumstances of local forest communities and the particular challenges to forest tenure are measured, monitored, and factored into new legislations. Most importantly, experimental pilots and robust assessments of their impacts are urgently needed, especially in Africa where major knowledge gaps undermine progress observed at the global level.

Local communities, who are the most ably positioned to halt the current biodiversity crisis, have yet to be made part of the solution. Secure property rights can build local communities with a real stake in protecting forest resources and in steering their own development agenda.

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Systemic failure and the ‘Iron Triangle’ of conservation practice

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The problem

The effectiveness of conservation practice has long been questioned and has recently come under greater scrutiny^{1,2}. Rarely discussed beyond project teams (Catalano, unpublished data), and even less commonly published², failure in conservation projects is both ubiquitous and unavoidable. *Systemic failure* may even be the norm. A dogma exists that the practice of conservation will become more effective if *more* money could be spent to implement *more* action *more* quickly. However, policy cannot guarantee successful action because it only sets the frame for conservation and science cannot deliver action because it is operationally limited to providing information. In short, the dogma is that more ‘doing’ of the same practices will resolve the state of systemic failure. A cause of our current collective ineffectiveness lies partly in an unchallenged imbalance between ‘knowing’ and ‘doing’. Correcting this requires an intimate ‘knowing’ or thinking of the *contexts* in which we work, and also of *ourselves* as conservation professionals. A further cause of ineffective practice is our struggle to grapple with the essential interplay between knowing and doing.

We argue that the adoption and application of systems thinking tools linked to enabling, mainstreaming and implementation activities³ that promote an interplay between knowing and doing should be used to trigger a strategic ‘systemic disruption’ in the conservation sector. A systemic disruption is an action that creatively challenges or breaks entrenched practices in a malignant system. These tools will reduce the incidence of project failures by: 1) promoting an intimate understanding of the social-ecological issues faced by policymakers, researchers and practitioners; 2) elucidating cognitive biases and dogma; and 3) promoting individual and collective thinking and reflection in practice. We present a concept used in social science – the ‘Iron Triangle’ – coupled with systems thinking ideas of boundary critique^{4,5}, to rethink the systemic failure currently embracing the conservation sector.

Systems thinking and the iron triangle: a toolkit for ‘knowing’ conservation practice

A *system* is a collection of entities perceived as interacting together to do something⁶. All systems are explicitly bounded, partial conceptualisations of ‘reality’ as perceived by specific individuals or groups. As

these conceptualisations are partial, their boundaries circumscribe only the elements and interrelationships perceived as being relevant by the individual or group in question. Boundaries thereby serve the needs of some stakeholders better than others⁴. When stakeholder perspectives (and their associated boundaries) become privileged, the knowledge used to make ‘boundary judgements’ and guide the implementation of conservation action will be partial. This can lead to strategies being poorly matched to other stakeholders’ values, or to benefits being captured by elites. In conservation, conceptual tools for understanding situations as systems are therefore essential for effective practice^{6,7}.

Systems thinking in practice involves: 1) understanding interrelationships of a situation as a system; 2) engaging with multiple stakeholder perspectives, including perspectives of being *both* systematic (doing) *and* systemic (knowing); and 3) questioning and being aware of boundary judgements, including boundaries invoked at different system levels – sub-systems (e.g., whilst ‘doing’ action on-the-ground); and supra-systems (when ‘knowing’ the broader context of conservation)⁸.

The ‘Iron Triangle’ is a metaphor borrowed by systems thinkers to understand interrelationships of a professional practice (‘evaluation’ in this case)⁹. Drawing on ideas of systemic triangulation³, the ‘Iron Triangle’ was translated as a system to enable reflection upon self-perpetuating, pernicious confluences of interest that manifest as systemic failure.

The iron triangle of conservation practice

We apply the ‘Iron Triangle’ to conservation projects, building on previous work to identify ways of alleviating the current systemic failure of the conservation sector^{7,9}. The ‘Iron Triangle of Conservation Practice’ (ITCP) allows conservation project participants to critique their performance and evaluate the factors affecting practice. We describe interactions between three groups common to conservation projects: 1) *communities* that projects typically engage; 2) *practitioners* implementing projects; and 3) *donors* who fund projects. The three groups are connected by six flows of influence (arrows and letters **a** – **f** in Figure 1).

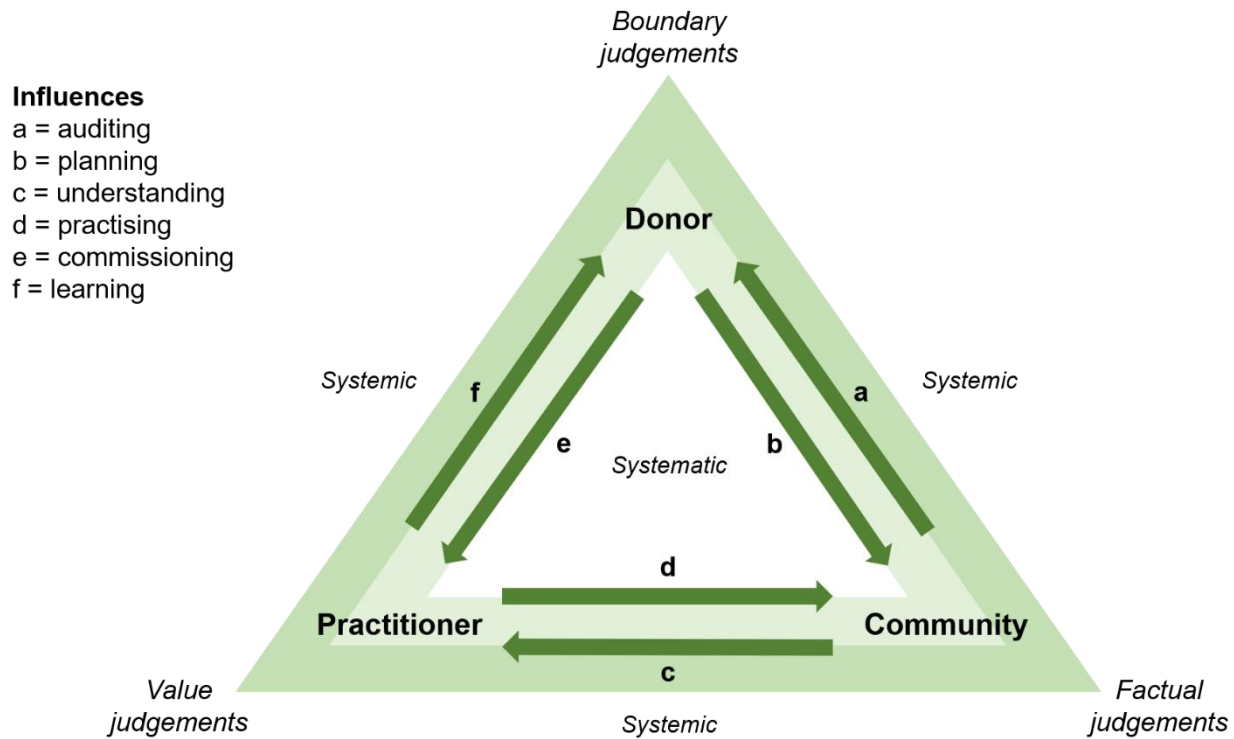


Figure 1. The 'Iron Triangle of Conservation Practice' (ITCP) is a conceptual tool adapted through the union of the 'Iron Triangle' concept used in social sciences and systems thinking ideas of boundary critique. It can be used to provide a holistic understanding of a malign system (i.e., a context in which a conservation project is being implemented with suboptimal outcomes). The tool can be used for envisaging a more benign system driving reflexive behaviour and ultimately greater effectiveness in the practice of conservation. The three parties common to any conservation intervention – communities, practitioners, and donors – correspond with factual judgements, value judgements and boundary judgements, respectively. Arrows (labelled a – f) indicate flows of influence between the three parties.

Donors identify the object of their conservation interest using a systemic audit of the real world, which should be based on judgements of 'fact' (**a**). A good-quality audit enables donors to develop a plan for delivering conservation outcomes (**b**). However, a donor's boundary judgements can negatively influence the outcomes of an audit. For example, donors often focus on species or ecosystems as outcomes, even though human behaviour usually drives the actions that manifest conservation problems and opportunities.

Planning is often based upon donors' idealised systems, meaning effort invested in planning (**b**) inappropriately outweighs auditing (**a**) due to poorly informed boundary judgements. This can result from the 'crisis' mentality of conservation professionals and organisations promoting action ('doing') over understanding ('knowing'); or a drive to ensure audit efficiency to allow investment of greater time and resources in donor-practitioner relationships. Plans often therefore fail to correspond with real-world situations, leading to project failure².

Practitioners (often conservation NGOs) may develop a more accurate understanding of the object of the intervention (**c**) by spending time embedded in the real-world situation. This may allow them to engage with value judgements – for example, the relative importance of ecosystem services versus the intrinsic value of nature – that inform their systematic practice (**d**). Conservation practitioners working in different unfamiliar contexts are prone to making flawed value judgements about context, which produces malign

outcomes. Effective practitioners engage more constructively with communities acknowledging mutual partial understandings, but with the collective intent towards *generating* value.

Donors' value judgements may also be imposed indirectly on a community by their commissioning of practitioners (**e**), who use donors' terms of reference for auditing and planning. This can further marginalise communities when partial donor understandings unintentionally objectify them by imposing technocentric, science-based values. A transdisciplinary approach by donors and practitioners that actively involves communities in the processes of defining conservation problems and implementing practice can help avoid excessive power being vested in "expert" practitioners in their "ivory towers" (a common criticism of Western conservation practice)¹⁰.

Ultimately, effective commissioning must be complemented by a systemic process of learning (**f**). Conservation organisations are typically fixed in single-loop learning; learning to do things 'right' rather than, as with double-loop learning, checking on doing the right thing¹¹. Double-loop learning can inform commissioning and terms of reference that more accurately and precisely reflect the dynamics of changing real-world situations; a more benign systemic triangulation whereby making judgements of 'fact' is acknowledged as being circumscribed by practitioners' value judgements and donors' boundary judgements⁹. However, double-loop learning remains incapable of addressing unequal power relations and questioning the underlying assumptions driving conservation interventions. Triple-loop learning, which ensures power relationships are both understood and made more equitable, should be the ultimate goal of conservation practice^{7,11}.

From practice to praxis: breaking the iron triangle of conservation practice

The six influences in the ITCP (**a – f**) can be mapped onto the four principles of 'praxis for effective conservation'⁷ (theory-informed practice *and* practice-informed theory) to develop strategies for more effectively avoiding both project and systemic failure. Humility (Principle 1) by donors and practitioners underpins effective systemic auditing (**a**), understanding (**c**) and learning (**f**). This can ensure that the partiality of knowledge is recognised, idealised worldviews derived from inappropriate boundary judgements are avoided, and flexibility when commissioning terms of reference is ensured. Engaging with values (Principle 2) requires systemic appreciation of existing values and practices for generating new values to underpin effective systematic planning (**b**), practising (**d**) and commissioning (**e**). Communities' own sets of values must be recognised by practitioners, and donors must recognise practitioners' expertise on this issue.

Whilst Principles 1 and 2 are exercised amongst communities, practitioners and donors (each at a sub-system level), Principles 3 (Systemic learning) and 4 (Exercising wisdom) function at a higher (supra) system level for effective conservation practice, where the six influences are enacted as a 'whole' rather than simply individual 'parts'. Learning about the whole practice of conservation is conducted in the context of other practices, not simply donors learning from practitioners – as with activity (**f**). Wisdom involves enacting this higher order of learning; an action that works *both* systematically (in 'knowing' through learning) and systemically (through the wisdom of 'doing'). Conservation practitioners are invited to explore

how they may support activities (a – f) in transforming the ITCP towards a more benign conservation practice that grapples more effectively with current systemic failures.

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Writing over that which is already written: reconceiving biodiversity conservation in a second world according to the concept of ‘palimpsest’

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Rethinking biodiversity in a previously written world

The concept ‘Anthropocene’ has brought to light the significant global impact of human activities on natural systems on a geological scale¹. Whilst the term initially arose as an academic metaphor within only a few years this concept has influenced an emerging scientific and political agenda, oriented toward documenting and denouncing multiple negative anthropogenic factors which have led to global ecological change. Nevertheless, not all large-scale environmental transformations by human societies have been intrinsically destructive. Many local cultures have existed over time in the Neotropics, the Palearctic, sub-Saharan Africa, North America, Indo Malaya, and Australasia that have radically – though constructively – modified the physical and biotic conditions of the natural systems which they inhabit². This reinterpretation of the idea that human action always degrades the environment may be denominated ‘Antropogenesis’. Rather than consisting of a naïve image of the ‘Good Anthropocene’, this concept seeks to add historic human expressions of environmental construction to the biodiversity debate – components that the conservationist ‘Edenic sciences’ had invisibilised – ‘Anthropo-not-seen’³.

One concept of utmost importance in transcending the ‘pristine syndrome’ of biological conservationism⁴ is expressed by the Greek ‘palimpsest’: a manuscript that conserves traces of previous writings that are difficult to observe because the same surface has been re-written. Archaeology and Historical Ecology have reconceived the concept of palimpsest as a historic landscape that contains successive layers of environmental change in which *Homo sapiens* act as a ‘keystone species’ – one which exerts a disproportionately large effect on its environment – through a variety of cultural expressions. The challenge remains to determine the nature and magnitude of the cumulative effects resulting from such transformations⁵. Research on palimpsests analyses geographies that constitute what the Roman philosopher Cicero denominated a ‘second world’ – environments constructed based on either centuries-old histories (cultural landscapes) or histories developed over millennia (domesticated landscapes), both of which may be historically differentiated from environments resulting from only decades of management (first-nature landscapes)⁶.

Palimpsests are constructed through so-called 'human-mediated disturbances', which are the sum of physical and biotic transformations by local cultures through environmental management practices, which generally take place at the margin of intensive, industrial, and globalised natural resource use⁷. Principle human-mediated disturbances that have been documented around the world include: (a) controlled use of fire in such an intensity, frequency, temporality, and scale; (b) deviation, narrowing, or expansion of rivers, lakes, coastal systems, or wetlands; (c) construction of anthropogenic soils; (d) domestication and diversification of a large quantity of plant and animal species; (e) human-wildlife behavioural co-evolution; (f) introduction, translocation, and changes in species distribution and abundance; (g) moulding of landscapes by managing vegetation succession; and (h) designation and guardianship of sacred spaces^{8,9}.

Human-mediated disturbances may result in counterintuitive effects for biodiversity conservation as understood based on classical ecological theories that conceive ecosystems as balanced closed systems that are inherently destabilised and degrade when disturbed. Most theories related to biodiversity conservation – such as those aimed at explaining species diversity patterns in different geographical contexts, restoring disturbed ecosystems, controlling biological invasions and implementing programmes to reintroduce endangered species – are based on such classical ecological theories. However, cases have been documented in which local cultural group's management practices positively impact biodiversity, given that they develop heterogeneous landscapes in which species find new niches to inhabit, as well as interconnected patches of vegetation through which these species may displace themselves and reproduce. This principally occurs in areas where cultural groups have a long history of environmental occupation and ways of life which directly depend on their immediate environments, due to the fact that they develop conscious processes of mediating between ecological functioning and human utility resulting in anthropogenic landscapes which are highly dependent on local management for their maintenance¹⁰. New explanatory approaches that take into account mutual relationships between ecological and social aspects of landscapes – such as the 'biocultural paradigm'¹¹, 'new ecology'¹², 'nonequilibrium landscapes'¹³, and convergent models of socioecological territorial organisation¹⁴ – are fundamental to understanding the implications of human-mediated disturbances on biodiversity conservation.

Human-mediated disturbances result from – and lead to – cultural expressions of great importance for preserving biodiversity. Cultural manifestations intimately linked to the biological diversity of a landscape include many components: peoples' traditional ecological knowledge, social norms and local institutions, oral traditions, systems of inheritance and cultural transmission including language, metaphorical thoughts and ecological ethos, sacred ecologies and access and use rights, local taxonomic systems, culinary practices, and ethnomedicine, amongst others^{15–17}.

Palimpsests in action for the 21st century

Stemming from the concept of palimpsest, the following eight guidelines are intended to reorient biodiversity conservation research programmes and practice:

- 1) Identifying emblematic cultural and domesticated landscapes around the world upon which local populations depend for their subsistence that are currently being studied by socio-environmental research groups and officially administrated by government agencies or NGOs;
- 2) Developing inter- and transdisciplinary research and biodiversity conservation teams to carry out studies based on a vision of palimpsest that include not only actors who typically participate in such initiatives, but also archaeologists, geologists, historians, geographers, environmental anthropologists and ethnolinguists, with active participation by the inhabitants who manage local natural resources;
- 3) Reconstructing the environmental history of landscapes in order to define baseline ecological conditions and understand past human-mediated physical and biotic transformations carried out during specific cultural periods and determine those changes which have degraded or increased biodiversity;
- 4) Documenting and analysing past and present cultural expressions associated with biodiversity conservation, particularly addressing processes of cultural autonomy as well as socio-political changes that threaten historic landscape-related knowledge;
- 5) Carrying out programmes to restore and revitalise landscapes by recovering their ecological trajectory and capacity for resilience, as well as generating new ecological processes;
- 6) Reconciling NPA management plans, wildlife regulations, ecological land-use planning, and other forms of ecosystem regulation on the one hand, and recent socio-environmental knowledge to develop regional biodiversity conservation strategies with full participation of local populations to reaffirm traditional rights and local livelihoods on the other, so as to minimise unfavourable governance interactions;
- 7) Establishing networks of local inhabitants, researchers, government agencies, and NGOs to exchange generalisable knowledge and practices across different biological conservation initiatives and cultures;
- 8) Participating in national and international biological diversity forums to compare methodologies, achievements, and lessons based on conservation approaches that take into account the concept of palimpsest with mainstream conservation approaches used around the world.

Modern societies tend to assume that the future is ahead of us, and the past behind us. However, for some cultural groups, the past guides future possibilities that approach us from behind. Reconceiving biodiversity conservation according to the concept of palimpsest involves the science and technique of learning to read previously recorded landscapes in order to creatively rewrite over them based on 21st century challenges. Over the 'Capitalocene' canvas covered by ecological footprints that geopolitically point to the Global North, 'ecological handprints' that signal certain geographies of the Global South represent those human legacies that merit space in biodiversity conservation research and practice agendas around the world.

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Should we, could we, adapt to biodiversity loss?

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Discussions around the post-2020 international framework for biodiversity have focused on the targets that should be included and the types of action needed to bring about transformative change. Considerable debate has gone into how much land (or sea) area should be protected with calls for at least 30 if not 50%¹. Others have highlighted how much land could be restored². And yet another group of scientists has suggested attention needs to shift towards targets aimed at retention of existing intact ecosystems³. The focus of all these efforts is on reducing the rate of biodiversity loss – or even halting it. What has not been discussed to date is whether we should begin to plan for adaptation to biodiversity loss.

The equivalent of reducing or halting biodiversity loss in climate change language is mitigation – reducing emissions of greenhouse gases in order to slow the rate of climate change. This is the primary focus of the United Nations Framework Convention on Climate Change (UNFCCC), its ultimate objective being to “achieve ...stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system⁴”. Climate change adaptation is described by the Intergovernmental Panel on Climate Change (IPCC) as “the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities⁵.” Within climate change diplomacy, adaptation was considered almost a taboo subject for many years⁶ on the grounds that it would divert attention away from the priority of mitigation. In 2002 however, developing countries put forward the ‘Delhi Declaration’, calling for greater attention to adaptation on the basis that damaging climate events would occur regardless of efforts to mitigate emissions⁷.

Has that same turning point arrived in biodiversity diplomacy? And if not, should it?

Using the same definition as for climate change, human adaptation to biodiversity loss would imply adjusting to low(er) biodiversity environments and to the effects of that reduction in biodiversity. The impacts of biodiversity loss include (but are not limited to)⁸:

- Reductions in the immediate availability of food, medicine, fuel, fibre to the estimated nearly 3 billion people who depend directly on traditional agriculture, small-scale fisheries, wild foods, and medicines for basic livelihood support. Some groups of people are heavily dependent on only a few species, meaning that even small changes in local biodiversity can present major threats to their livelihoods⁹;
- Reduced primary productivity and hence reduced crop yields, fodder production, fisheries production, leading to reduced food security;
- Less diverse diets leading to reduced nutritional security;
- Reduced availability of keystone species and key functional guilds such as pollinators or seed dispersers;

- Increased disease burden and reduced options for future drug development;
- Reduced protection against pollution;
- Reduced carbon storage and sequestration and hence reduced climate change mitigation;
- Reduced resilience to environmental change and natural disasters;

The reality is of course that we have already adapted to biodiversity loss and continue to do so. Throughout much of human existence humans have altered ecosystems and the biodiversity that these contain in the effort to maximise contributions to livelihoods and culture. The vast majority of the world's land surface has been transformed by humans to some extent. In some cases, this has increased biodiversity, but in the majority of cases it has resulted in large-scale decreases and an increased homogenisation of the most useful food, fuel or industrial ingredient crops. Taking just one sector – food – out of the millions of species and varieties that people have described and recorded, only 30 crops provide 95% of global human food energy needs and just four of them – rice, wheat, maize and potatoes – provide more than 60%¹⁰. But this lack of diversity in our diets seems perfectly normal to the majority of the world's population. Chemical fertilisers and pesticides have, to a large extent, filled the niche of soil biodiversity and natural predators. Beyond food production we can see clear signs of adaptation in the form of engineered flood defences that replace depleted mangroves and manufactured drugs that replace traditional medicines. More experimental approaches include nutritional supplements to improve bee immune systems¹¹, and even experimentation with drones in response to declines in bee populations¹².

Looking further into the future a recent report by the International Union for the Conservation of Nature (IUCN)¹³ highlights the potential of synthetic biology to contribute to adaptation to biodiversity loss. Synthetic biology is described in the IUCN report as “a suite of techniques and technologies that enable humans to read, interpret, modify, design and manufacture DNA in order to rapidly influence the forms and functions of cells and organisms.” In one field of synthetic biology, so-called ‘resurrection biologists’ have explored the potential of ‘de-extinction’ – using ancient DNA to recreate extinct species. But just as climate change adaptation was initially dismissed as a distraction from the mitigation prerogative, so de-extinction has been described as ‘a fascinating but dumb idea’ that would take resources away from saving endangered species and their habitats, and would divert us from the critical work needed to protect the planet¹⁴. The IUCN analysis notes however that synthetic biology could help improve species viability through reintroducing extinct genes – for example from museum specimens – through cloning, and also suggests that it could contribute to the restoration of ecosystem resilience and function – including increasing resilience to climate change.

Adaptation to biodiversity loss – or to some effects of biodiversity loss – is clearly *possible*. A key issue remains as to whether it is *feasible*. The highest rates of biodiversity loss are currently in the tropics. For example, drylands – which are being rapidly degraded – include 20% of the centres of global plant diversity, 30% of important bird areas and 30% of the global human population including nearly half a billion people who are chronically poor⁸. These are the people and the countries who are most dependent on biodiversity and least able to afford substitutes for its loss, or the technology to develop replacements.

The challenge perhaps is not so much whether or how we can adapt to biodiversity loss, but how we can make adaptation approaches available and affordable. We need to urgently reduce the rate of biodiversity loss, which is currently occurring at unprecedented levels¹⁵, but we also need to accept that in some places loss has already happened – or will inevitably happen – the effects of which will need to be addressed. Luckily, nature is remarkably resilient and restoration is a real possibility, unlike the irreversible effects of climate change. But in the meantime, we shouldn't dismiss adaptation.

Adaptation is now mainstream not only in climate change diplomacy but also in national and local level planning. Will adaptation to biodiversity loss be mainstream in the post-2030 biodiversity framework? At least talking about adaptation could increase discussion about the sustainability and equitability of current approaches, and stimulate greater attention to innovative, pro-poor solutions that help both people and nature respond to biodiversity loss.

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From passion to professionalism and back again: the battle for the soul of conservation

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Once upon a time, the conservation movement was filled with radicals brimming with passion, ideas and a willingness to take direct action. They chained themselves to buildings, hugged trees and wrote folk songs. They were noticed by a few students and enlightened politicians in Scandinavia, but they were ignored by the corporations and Western governments that were driving biodiversity loss around the world. Realising that the grassroots approach was not working, some among their number began to call for a new direction, reimagining conservation as a slick and well-organised professional movement that would get the attention of decision-makers.

Conservation organisations gradually adopted this model, developing well-crafted strategies, standard operating procedures and financial safeguards. New ways of framing and communicating conservation were developed, drawing on ideas from the world of business to sell biodiversity as natural capital, with salespeople organised into 'business and biodiversity' teams. And new courses were developed to train conservationists themselves to be more effective, going beyond biology to incorporate other disciplines and the applied skills of management and communication. As a result, conservation began to get a seat at the decision-making table, attending the World Economic Forum, holding gala events in royal palaces, and being followed on Twitter by A-list celebrities. Conservationists congratulated themselves on a job well done.

Time passed. The loss of biodiversity continued... Fossil fuels were burned faster than ever. Forests also burned or were cut down. The oceans warmed, reefs were bleached. Happiness was measured in units of consumption.

A girl refused to go to school on Fridays until meaningful action was taken. She sat down outside her national parliament building with a sign. She spoke with authentic passion and others took note. An accidental movement was born. Elsewhere, a group of activists chose to use direct means to bring about change. They organised on social media, recruited followers and occupied the streets. An intentional movement was born. People noticed. Politicians noticed. Meetings were held with ministers. Crises were declared. Decision-makers promised to take meaningful action.

The professional conservationists were perplexed. They had been talking to the same decision-makers for years but hadn't had much impact. Now change was happening not because of the conservationists' skills, suits and glossy brochures, but because of unprofessional movements of radicals with passion, ideas and a willingness to take direct action. What's more, the professional

conservationists were very tired. They worked long hours in offices filling in funding proposals and timesheets. They wrote press releases about the wellbeing benefits of spending time in nature but rarely had time to do so themselves. They heard the chants of student protestors outside their offices but couldn't join them because they had a meeting to go to.

The conservationists had some choices to make.

Like any fable, this tale is oversimplified and slightly silly, but perhaps contains some kernel of truth. Certainly, elements of it ring true to my own experience. I direct the Cambridge Masters in Conservation Leadership, which aims to equip conservation leaders with the skills they need to be effective agents of change for the natural world. A core part of the teaching programme covers professional skills such as strategic planning, financial management and partnership building. I strongly believe that these are useful and important skills for conservation leaders to acquire and our alumni tell us that they have been highly valuable in the workplace.

At the same time, I see conservation organisations that are more and more 'establishment' in their design and outlook, mirroring the structures and practices of the corporations and political systems that they say they wish to change. Yes, conservation may be more organised and professional, but has this come at the expense of the creativity and passion that enticed many to the conservation world in the first place? And why are so many conservationists completely over-worked and close to burnout, with a work-life balance no better than a trainee in a city bank?

The challenges with the current model of professional conservation have been brought home to me by the recent growth of the *Extinction Rebellion* movement in the UK. This group has burst onto the scene over the last year with a series of mass-participation occupations (bridges and streets in London and elsewhere around the country) and with hundreds of members willing to be arrested to draw attention to their cause. I don't agree with absolutely everything they do or call for, but I am deeply impressed by their commitment, energy, organisation, and willingness to take deep personal risks. Crucially, they have done all this with a strong sense of friendliness and collective support, which is a joy to behold.

So, indeed, conservationists have some choices to make. Should we continue the journey to professionalisation on its present course? Or should we lay down our laptops and instead lie down in the streets with the protestors? Perhaps the answer lies between the two. The world does need organised, skilled and professional conservationists and their organisations. But it also needs them to stay in touch with the authenticity and the energy of mass protest movements, and never to forget that their *raison d'être* is change, not conformity. Finding this balance should not be a passive process. It is easy to say that a plural approach is needed, with different groups playing complementary roles towards the same ends, but this can be a smokescreen used to justify inaction. Rather, the mainstream conservation movement should actively seek to engage with the new wave of direct action movements. This means offering support in terms of knowledge, contacts and even funding. It also means listening and learning, for the new kids on the block have a lot to teach the old guard. This is why I have invited members of *Extinction Rebellion* to teach our Conservation Leadership students next year about the power of direct action.

Inclusive knowledge for biodiversity governance: democratic legitimacy and pluralism at the science- policy-society interface

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Historical overviews of conservation often use the creation of Yellowstone National Park in 1872 as the start of the conservation movement. However, this history can be traced back much earlier to the adoption of forest conservation measures in India by the British Empire to secure timber supply in the 1840s¹, and game laws in 1657 in The Cape by the Dutch Colonisers to secure sufficient hunting opportunities². Science has played an instrumental role in developing and justifying those measures and optimising the production and use of natural resources³⁻⁵. Science has also played an important role in defining biodiversity.

The concept of wilderness resonates well with a dominant way of thinking separating nature (the domain of objects that can be studied and represented by science) from culture (the domain of subjects)⁶.

Biodiversity as wilderness not only promoted a conceptual distinction between nature and culture, but also the idea that it could be conserved by establishing natural parks and excluding local people. The important parallels between the exploitation of natural resources by colonial rulers and the early 20th century concept of wilderness is that conservation was something for the elite – associated with both conceptual and material violence – and that science had been complicit in justifying this violence. It is therefore crucial that biodiversity knowledge-making practices better reflect exactly how they inform conservation practice – whose interests they represent – and the implications thereof for people and nature.

To initiate this reflection, we can consider a most basic scientific activity: counting. Counting requires definitions and classifications and we cannot count if we do not a classification system that defines the categories around which to count things, as this tells us what to look for and how to distinguish and differentiate. These are the differences that *make a difference* and all scientific measurement and monitoring requires a pre-existing classification system that defines real world things. This classification system cannot be verified empirically as we cannot make sense of this reality without the categories and classifications. Facts and values are inextricably entwined in the production of knowledge from the outset.

The concept of biodiversity provides an excellent illustration of the entwinement of facts and values. As the Convention on Biological Diversity explains, biodiversity refers to all life on earth: “biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems⁷.” Whilst such a broad definition is appropriate in

terms of the objective and global scope of the convention, it is also impractical. Before we can define or implement a policy or a research project on biodiversity, we must create an operational definition. Since it cannot include all of biodiversity – there is no such thing – this operational definition is inevitably selective and, as I discuss below, not neutral.

One of the most prominent ways in which biodiversity is defined is by the concept of variation of species. This concept of species shows how humans impose classifications onto the world to such an extent that we forget the cultural nature of classification and start to normalise its categories. Whilst Darwin considered “the term species as one arbitrarily given for the sake of convenience to a set of individuals closely resembling each other”⁸, most scientists will do their research on the working assumption that biodiversity is made up of species. If we have working definitions of species, we can start to gather data about their abundance and distribution and this data can be used to produce information about the relative rarity of species which can inform the policy domain through the IUCN Red List of threatened species.

Concepts of biodiversity also create a space for specific solutions to emerge. A biodiversity focus on species generates both dedicated knowledge around distribution, abundance and rarity and informs policy responses that target specific species, such as protection programmes. A more recent concept of biodiversity relates to the supply of ecosystem goods and services, a concept which emphasises the relationship between people and nature. Unlike concepts such as wilderness or species, it does not necessarily result in outcomes such as natural parks, the eviction of people, or species protection. Rather, this concept highlights the benefits that people derive from and attribute to nature and the interdependencies between producers and users of those services, for example by arranging economic transactions in so-called Payment for Ecosystem Services programmes.

Concepts of biodiversity not only shape research agendas but also policy responses. By defining, conceptualising and measuring, and representing biodiversity in specific and selective ways, science generates knowledge and constitutes objects that are rendered amenable to governance, policy and management⁹. This circular relationship between concepts, knowledge and policy interventions – which I term ‘measurementality’¹⁰ – is how knowledge is political. This refers not only to the ways that actors in policy or society use, abuse or discredit knowledge according to their own interests, but also in the way that facts and values entwine in biodiversity concepts and knowledge-making practices and recognise the political work that knowledge does in defining what should be conserved, governed or managed¹¹.

These political implications of knowledge require critical reflection by those involved in the production and use of this knowledge. Such reflection takes place in a context in which biodiversity conservation continues to face challenges related to effectiveness, equity, and social and environmental justice; where top-down technocratic forms of governance are increasingly criticised and give way to community-based approaches; and where science-policy society relations are changing towards increasing interaction between knowledge producers and users, captured by concepts such as ‘coproduction’¹² on one hand, and increasing criticism and scrutiny of the authority of science on the other¹³. In the midst of these dynamics, institutions of biodiversity governance and expertise are rethinking their identity, role and place

in democratic societies. One crucial question is how to ensure biodiversity knowledge is not just credible and relevant but also inclusive of diverse stake – and knowledge holders to inform fair and inclusive biodiversity conservation.

To address this, I suggest scientists reflect on their role^{14–16}. When interacting with societal actors, as in contract research, science commonly takes on a servicing role, where scientists address the research questions and needs of societal actors. This may appear to be neutral but it is not, as values that inform the research questions, or frame the problem may serve certain interests over others. Another common role is advocating, which many scientists may not easily recognise or admit to. It is important to recognise its existence in curiosity driven or fundamental research where scientists are free to develop their own research questions and follow their own problem framing, values and interests. Thus, what these two modalities have in common is that they accept *one* specific problem framing – either their own or that of a societal actor – which may include underlying values and interests as the basis for research and often without sufficient reflection, justification or accountability. Where problem framings are contested – or not contested because legitimate voices, values and perspectives have been marginalised – these two roles can be problematic. This is why it is important to consider a third diversifying role where knowledge-making is opened up to different values, interests and systems with a focus on producing different knowledge-based options that can inform action and serve the legitimate needs of multiple stakeholders.

Science can apply three democratic norms to enable this diversifying role¹⁴. Firstly, accountability, which requires science to give an account of the decisions, selections and values that inform it. Those with an interest in – or affected by this knowledge – are able to hold science accountable for the political implications. The second norm is contestation, which acknowledges that biodiversity can be known and represented in diverse, legitimate but not necessarily neutral or value-free ways. It also recognises the importance of enabling all knowledge claims (scientific and other) to be voiced and taken seriously, including critical scrutiny and contestation. Thirdly, these two norms can only flourish in a context of humility – where humility is used as the opposite of hubris, referring to modes of knowledge that do not recognise pluralism and aim to present *the* truth or operate by means of consensus. Collectively, these norms mean science is in open and equal dialogue with other ways of ‘knowing biodiversity’ and resists the temptation to create a singular or complete representation.

Despite these challenges I contend that biodiversity requires diversity. Mindful of the pitfalls of technocracy – where one particular set of values has been allowed to dominate how we know and govern biodiversity while excluding other legitimate voices – it is clear to me that effective biodiversity governance requires knowledge that is not just credible but also societally and democratically legitimate. This means that it is inclusive of diverse ways of knowing, valuing and living with biodiversity; that it resists the reduction or taming of diversity through for example principles of consensus or methods of integration; and that it accommodates pluralism and contestation.

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