



Equity and Justice should underpin the discourse on Tipping Points

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Abstract. Radical and quick transformations towards sustainability have winners and losers, with equity and justice embedded to a greater or a lesser extent. According to research, only the wealthiest 1-4% of the global population will radically need to change their consumption, behaviours, societal values and beliefs in order to make space for an equitable and sustainable future for nature and people. However, narratives around many ‘positive’ tipping points, such as the energy transition, do not take
40 into account the entire spectrum of impacts the proposed alternatives could have or still rely on narratives that maintain current



unsustainable behaviours and marginalise many people. One such example is the move from petrol-based to electric vehicles. An energy transition that remains based on natural resource inputs from the Global South must be unpacked with an equity and justice lens to understand the “true cost” of this transition. Another is the role of ‘nature-based solutions’ to address climate resilience, where ‘nature’ in some parts of the world needs to be maintained as an offset for the continued lifestyles of the wealthy, usually in different parts of the world from where this nature is supposed to be maintained. There are two arguments why a critical engagement with these and other similar proposals needs to be made. First, the idea of transitioning through a substitution (e.g., of fuel), whilst maintaining the system structure (e.g., of private vehicles) may not necessarily be conceived as the kind of radical transformation being called for by global scientific or governmental bodies like the IPCC and IPBES. Secondly, and probably more importantly, the question of positive for whom, and positive where must be considered. In this paper, we unpack these narratives in the context of what they mean for the idea of positive tipping points using a critical decolonial view from the South.

1. Introduction

Earth system tipping points, as defined in this special issue, may lead to abrupt, irreversible, and dangerous impacts with serious implications for humanity (Armstrong McKay et al., 2022). Avoiding these thresholds, particularly in addressing climate change and species extinction, requires transformative changes (Rockström et al., 2023). Positive social tipping points can be seen as one type of transformative change, where non-linear social responses to these existential threats alter either system structure, components or feedbacks into more ‘desirable’ states (Adams et al, this issue; Scheffer, 2009). For example, shifts in behaviours that are needed to move away from current unsustainable practices or overconsumption, towards behaviours that will keep global society within a safe operating space (Adams et al, this issue). Positive tipping points can be imagined as an ideal interplay of actors exercising their agency for positive transformations, including the multiple types of actions needed, and the multiple feedback processes necessary to propel and secure changes (Lenton et al., 2022).

However, radical and quick transformations towards sustainability will have winners and losers (Blythe et al., 2018), with implications for equity and justice depending on who is affected and where. For example, recent literature has shown that the wealthiest 1-4% will radically need to change their consumption, behaviours, societal values and beliefs to enable an equitable and sustainable future for nature and people (Hickel et al., 2022; Rammelt et al., 2023). This societal shift could be defined as a positive tipping point, but may not be seen as desirable for those whose consumption and production patterns have to change. Many ‘positive’ tipping points still rely on narratives that maintain current unsustainable and unjust behaviours. These narratives often marginalise many people and exploit many places as mere commodities or stocks and downplay the need for people in consuming regions to alter system structure, components or feedbacks. While the concept of positive tipping points has been useful in outlining what can be done in the global discourse of change, it has not critically engaged with and



75 confronted existing and associated messiness and imbalances in how the current global system is configured in terms of power
(Leach et al., 2018). For instance, the question of positive for whom and positive where and at what cost, has not been
adequately considered when referring to tipping points. This is a critical gap that must be addressed. A tipping point towards
an energy, food or other system transition in the Global North or amongst big consumers that remains based on natural resource
inputs from the Global South must be critically unpacked, not least because these systems are so fundamentally interconnected
80 and interdependent across scales (Downing et al., 2021; Pereira et al., 2021). An environmental justice lens is needed to
research such telecouplings holistically (Boillat et al., 2020; Carmenta et al., 2023).

Many discursive injustices are founded in historical legacies of marginalisation reinforced in current geopolitical agendas and
environmental policies. Ghosh (2022) traces the current planetary crisis showing that the irreversible negative tipping points
85 that we know we need to avoid are rooted in Western colonialism's violent exploitation of human life and the natural
environment. He argues that the dynamics of climate change arise from the geopolitical order that was established by
colonialism centuries ago and continues to play out and reinforce present-day inequities. This argument is supported by (Hickel
et al., 2021) who also extends the driver of our contemporary crises to colonialism, but centres capitalism as the main
perpetrator of the exploitation suffered by many people in places over the past five or so centuries. Data on historical emissions
90 can be helpful in this regard and are available (Jones et al., 2023). The colonial legacy not only impacts on the climate crisis,
but is also intimately linked to the biodiversity crisis (Pörtner, Hans-Otto et al., 2021; Adam, 2014).

All life on Earth, not just people, are affected by this colonial discourse, which shapes actions across regions differently.
Environmental justice as elaborated from Afro-Indigenous worldviews in environmental humanities, involves the rights of all
95 human and nonhuman communities to a healthy environment (Adamson et al., 2002) and the idea of multispecies justice refers
to forms of justice that consider entanglements with the nonhuman worlds (Chao et al., 2022). Gupta et al. (2023) propose an
integrated "Earth system justice framework" to understand how to reduce risks from crossing tipping points, which includes
multiple dimensions of justice including procedural, recognitional and distributive dimensions linked to intragenerational
justice (the relationships between humans right now), intergenerational justice (relationships with people across generations)
100 as well as interspecies justice (generally including the rights of nature and other species to co-existence on Earth).

In this paper, we expand on the argument for including equity and justice in the discussion on tipping points, emphasising the
need for acknowledging tensions and trade-offs and considering a Global South lens. It requires switching the narrative away
from 'silver bullet solutions' and identifying what biophysical and social-ecological trade-offs we are willing to accept in order
105 to prevent negative tipping points. Although win-win social tipping points may exist, everything comes down to asking why a
tipping point is positive, for whom it is positive as claimed, and whether it can really be positive if it maintains the current
inequitable status quo or repeats passing the burden of losses to disadvantaged groups, but in different ways to the status quo.



When the trade-offs occur between two or more social groups, some of whom are already vulnerable or marginalised, this discussion becomes even more pertinent, as it means we have the potential to either reduce, or increase inequality.

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To situate these challenges, we use the following case studies: 1) the solution of protected areas in potentially a) exacerbating ocean inequity, b) increasing human-wildlife conflict and c) excluding indigenous peoples from their land, if not implemented inclusively; 2) the energy transition in developed economies and its implications for exacerbated extractivist behaviour in mineral-rich countries of the South as well as the deep ocean in both national and international waters, and 3) the discourse on nature based solutions as a potential route for making Southern ecosystems mere solutions to the problems created by the rich in distant locations. The implications in all of these cases are that some of the global recommendations for ‘staying within planetary boundaries’, which involve reconfigurations of how society organises itself (from where it gets energy to how it conserves biodiversity), lead to impacts not only on people but also on ecosystems in the Global South. Given the wellbeing of people and places are tightly coupled (Hamann et al., 2018) these cases illustrate how cross-scale interactions between initiatives trying to address sustainability in one part of the world invariably rely on ecosystems in other regions (Downing et al., 2021) leading to potential injustices perpetrated against the people and nature in these ‘other’ zones. We conclude with a set of recommendations for practising more reflexive and ethical approaches to tipping points and sustainability that takes the present inequities into account.

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2. Case studies

Each case in this section references an Earth system tipping point related to either the biosphere or the climate, illustrates how predominant narratives are being framed to tackle existential threats and unpacks the equity and equality implications that this intervention could have, with disproportionate negative impacts in the Global South. We then apply an equity lens from a Global South perspective to reframe alternative options that could have more equitable and just outcomes. We acknowledge that the ‘positive’ impact of such proposed interventions largely rely on how they are implemented without aggravating equity problems both within countries and between the Global South and the Global North. In doing so, we try to shift the narrative away from rehashing ‘solutions’ to recognising that transformation requires the current system to die (creating losers) and be replaced (creating winners) (Hebinck et al., 2022).

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2.1. The solution space of Protected Areas

The integrity of the biosphere is in jeopardy as humanity has overshoot a safe and just earth-supporting system (Rockström et al., 2023). The recently agreed Kunming-Montreal Global Biodiversity Framework (GBF) seeks, in Target 3, to protect 30% of land and ocean by 2030 (30x30) through protected areas (PAs) and other effective area-based conservation measures (OECMs) (CBD, 2022). However, the initiative risks perpetuating historical injustices, colonial legacies, and power

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145 imbalances by imposing Western conservation models in the Global South (Obura et al., 2021). Here we unpack three equity implications to protected areas interventions should they not be implemented with inclusivity and equity as a priority. We argue that the focus on protected areas as the only way to safeguard critical life-support systems is often short-sighted as a solution space and instead offer alternatives from a Global South perspective.

2.1.1. Ocean Equity and the role of Marine Protected Areas

150 A severe regional tipping point includes the die-off of severely threatened marine ecosystems (Armstrong McKay et al., 2022). To halt and reverse marine biodiversity loss, particularly in some Global South biodiversity hotspots such as low-latitude coral reefs, there is a pressing call for transformative governance of ocean biodiversity (IPBES, 2019; O’Leary et al., 2016; Dinerstein et al., 2019). While recent estimates suggest maintaining intact 50–60% of marine ecosystems to avoid further species loss (Rockström et al., 2023), high-level goals like the 30X30 target can have local societal consequences (Sandbrook et al., 2023). We argue that a more nuanced and equitable discourse on positive tipping points in ocean conservation is needed.

155 As both positive and negative social outcomes result from MPAs establishment, it is critical to be aware that MPAs may compromise the social well-being of vulnerable communities via forced removals or displacement from traditional areas, loss or restriction of access rights, or threat to food security, health, and livelihoods (Bennett and Dearden, 2014; Sowman and Sunde, 2018; Oracion et al., 2005). Together with other negative social well-being outcomes related to identity and culture (Ban et al., 2019), research shows that a strong global focus on increasing MPAs as a ‘tipping point’ towards conserving and halting marine biodiversity loss, may fail to carefully and comprehensively address historical impacts and ongoing equity issues experienced by coastal communities in the Global South.

165 The 30x30 target and the revitalization and empowerment of local communities in MPAs may be reconciled by: 1) acknowledging customary, traditional and local practices when protecting coastal areas, which is articulate in target 22 and the core principles (Section C) of the GBF; 2) involving communities from the very beginning to enhance procedural justice, increasing the likelihood of equitable outcomes; 3) balancing both biodiversity and well-being outcomes of local communities and among stakeholders; 4) implementing a balanced portfolio of government and rightsholder-led protected and conserved areas within the 30x30 target (accommodated by the reference to ‘Other Effective Conservation Measures, or OECMs, within the target text), favouring those where small-scale actors and Indigenous peoples are empowered. Overall, MPAs expansion must be part of a broader and more diverse governance portfolio to manage our oceans in a sustainable and equitable manner (O’Leary et al., 2018).

175 A potentially impactful alternative for promoting ocean conservation without overburdening coastal communities, would be closing the high seas to fishing, where fishing is mostly possible because of governmental harmful subsidies, but only provide



180 jobs and significant incomes to relatively few mainly in several Global North countries. This intervention could enable a much more equitable share of the ocean's bounty as the majority of those fishing in the high seas are high-income nations (Sumaila et al., 2015). Closing the high seas could be catch and global food-security neutral (Sumaila et al., 2015; Schiller et al., 2018) while inequality in the distribution of fisheries benefits among the world's maritime countries could be reduced by 50%, contributing to resource sustainability and well-being in some of the poorest and most fish-dependent countries worldwide (Teh et al., 2017). Yet, as a potential social tipping point towards a healthier ocean, this intervention faces barriers in gaining traction outside academia and advocacy groups as the current winners or keystone actors (See Österblom et al., 2015) like the fleets of some wealthier nations, would become the losers.

185 2.1.2. Human Wildlife Conflict, Militarisation and Conservation in Southern Africa

Africa faces rapid biodiversity loss and there are growing threats to wildlife posed by habitat loss, poaching, deforestation, climate change, and human-wildlife conflict (Archer et al., 2020). The ways in which human-wildlife conflict (HWC) such as crop raiding, livestock predation, and even attacks on humans by wildlife, have been addressed further exacerbate inequality in marginalized communities, with substantial negative impact on both livelihoods and wildlife conservation (Nyirenda and Tembo, 2016; Gross et al., 2021; Song, 2023). Such efforts have largely been guided by a model of conservation rooted in colonial legacies that centres needs and perspectives of tourists and external conservation organisations to the detriment of the needs of local communities. This has created a sense of 'us versus them' among the local authorities and the people that coexist with wildlife (Mutanga et al., 2021), aggravating social injustices and violence through forced evictions of marginalised populations (Koot and Büscher, 2019).

Implementing the 30x30 target within current conservation frameworks in Zimbabwe and across southern Africa may worsen the ongoing exploitations of marginalised groups if socially just conservation practices that account for the needs of the local communities are not taken into account. In an effort to mitigate future biodiversity loss, conservation activities have become more militarised (Duffy, 2014; Duffy et al., 2019) leading to a 'green militarisation' in the name of conservation and anti-poaching efforts (Lunstrum, 2014) within a broader shift towards 'green violence' (Mushonga, 2021). The intensity of this militarization in Africa and the Global South is often more pronounced due to factors such as colonial legacies, socio-economic inequality, and political instability (Duffy et al., 2015; Pennaz et al., 2018; Büscher and Fletcher, 2018). The creation and expansion of protected areas often involves the demarcation of borders and the exclusion of local communities, who may have lived and depended on these areas for generations. This can have severe negative impacts on the populations that live alongside wildlife as well as on the wildlife itself as this exclusion can lead to conflicts between conservationists and local communities, who may feel that they are being deprived of their land and livelihoods (Mushonga and Matose, 2020). The militarization of conservation efforts often rely on reactive responses to human-wildlife conflict, such as killing problem animals, rather than addressing the root causes of the conflict, which can escalate conflict and lead to a cycle of retaliation (Ramutsindela et al.,



210 2022). Militarized conservation efforts, such as the use of armed guards, have not been shown to be effective in reducing
poaching or protecting endangered species (Lunstrum, 2015). When conservation is framed as a security issue, it legitimizes
violence, overlooking the wider socio-economic and political contexts and therefore undermining efforts to address the root
causes of environmental degradation, human wildlife conflict and unsustainable resource use (Büscher and Ramutsindela,
2016). While the militarization of conservation efforts may provide short-term benefits, such as increased protection of
215 wildlife, it may not be effective in the long-term and may have negative impacts on local communities. Implementing the
30x30 in this context is likely to have a negative impact on the conservation of biodiversity in the Global South.

A decolonized model of conservation is needed that offers an alternative that can address the equity and justice issues left out
of the 30x30 target. This should include conservation that 1) addresses the underlying causes of environmental problems, such
220 as unsustainable production and consumption patterns, rather than just protecting ecosystems and species; 2) involves
meaningful participation of local communities in decision-making and implementation, fostering accountability, transparency,
and empowerment whilst also respecting traditional knowledge; 3) recognises the customary rights and interests of local
communities over lands and resources and acknowledges that conservation and development are not mutually exclusive; 4)
attempts to jointly develop solutions that are advantageous to people and the environment (Büscher and Fletcher, 2019, 2020;
225 Massarella et al., 2022; Mavhura and Mushure, 2019; Obura et al., 2021, 2023). These benefits are captured in the idea of
convivial conservation, which aims to achieve a just and equitable conservation system with an equal benefit distribution
(Büscher and Fletcher, 2019). However, while the convivial conservation approach may be considered a radical and plausible
alternative, its implementation in the Global South will remain challenging in the face of the existing conservation problems
without a complementary social-ecological justice approach to incorporate the rights and responsibilities of different
230 conservation stakeholders from the perspective of procedural, recognition, distributive, and environmental justice (Kiwango
and Mabele, 2022).

2.1.3. Protection and environmental laws in the Amazon basin

235 The destruction of the Amazon rainforest is approaching a biophysical tipping point, which, if crossed, irreversible phenomena
may unfold with planetary consequences (Boulton et al., 2022). The destruction of the Amazon rainforest leads to biodiversity
and cultural loss as well as reduced carbon storage affecting the global climate. Furthermore, self-reinforcing interactions
between deforestation, climate change and fire are pushing the Amazon biome towards a tipping point with large quantifiable
economic and environmental costs (Banerjee et al., 2022; Lapola et al., 2018). In a similar mode to the 30x30 target, a dominant
240 proposal to avoid the Amazon rainforest reaching a tipping point is to classify it as a protected area (Walker et al., 2009). A
strong narrative underpinning such solutions is that tropical forest basins like the Amazon and the Congo are considered global
public goods and need to be protected for the good of the planet with little consideration or reparations for the people who



have lived within these regions maintaining these ecosystems, what their aspirations might be and how their autonomy might be affected (Navrud and Strand, 2013; Neves et al., 2021; Nobre et al., 2016).

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Here we offer two alternative, legal mechanisms to reframe conservation solutions that include equity and justice in relation to the preservation of the Amazon: 1) recognizing the rights of nature in connection to stewardship forms and ancestral cosmologies of the Afro-Indigenous inhabitants of the Amazon, and 2) including “ecocide” as a punishable crime in legal frameworks to hold accountable those driving the Amazon to a tipping point. Using an equity and justice lens entails accepting the forms of forest stewardship that the Indigenous peoples inhabiting the Amazon have been practising ancestrally, such as recognising that the Amazonian Floresta is a vibrant animated being in ancestral cosmology, a living forest, with its own rights, as a subject of law (Biemann and Tavares, 2014). This Rights of Nature approach is institutionalised in the Ecuadorian Constitution. The potential of a rights to nature approach, rather than just setting aside a protected area that may not in any case work, is becoming an increasingly recognised option that should be taken into consideration (Cano Pecharroman, 2018; Harden-Davies et al., 2020; Putzer et al., 2022).

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The other legal mechanism considers whose interests are actually driving the degradation of the Amazon. By analysing the wave of forest fires that has been affecting the Amazon in 2019, Raftopoulos & Morley reflect on the claims of “ecocide” made by large sectors of civil society in the human rights areas as a legal term that could have a positive impact in stopping the destruction of the Amazon:

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“In recognition of the limitations of current international law to protect the environment, an increasing number of academics, activists and legal scholars have campaigned for the criminalisation of ecocide and the need to ‘recognise human-caused environmental damage and degradation (whether committed during or outside of war-time), as a crime of strict liability” (Raftopoulos and Morley, 2020: 10).

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Including ecocide as a crime could constitute an effective solution that directly addresses the ecological crimes driving the Amazon tipping point: Mega-corporations, governments and powerful groups like cattle raisers in Brazil (Piotrowski, 2019) that should be held accountable if they destroy, damage or contaminate the entangled ecologies of the Amazon rainforest. In fact, for the first time lawsuits have been applied to illegal deforestation by land grabbers that increased carbon emissions (Bragança et al., 2021). Targeting tax havens could go a long way towards holding companies to account, or ensuring their financial liabilities. Galaz et al. (2018) showed that between October 2000 and August 2011, 68% of all investigated foreign capital to nine focal companies in the soy and beef sectors in the Brazilian Amazon was transferred through one, or several, known tax havens, which represents as much as 90–100% of foreign capital for some companies investigated. As a key source of capital for companies, cutting them off from these sources would make it easier to hold them to account for ecocide crimes in the countries within which they operate.

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From a Global South lens, looking at the Amazon tipping point through an equity and justice lens necessarily implies listening to these claims of civil society and local inhabitants to link ecological destruction with social-ecological injustice (Pinho, 2016) through the legal system to produce a real change in the politics leading to destruction of the Amazon. An ecocide law in the International Court of Justice has the potential to address tipping points, not because it will not stop mining or deforestation projects per se, nor because it will reverse the damage to the forest already inflicted, but because it will be a means to enforce responsible practices and hold powerful actors accountable for decisions that cause, or risk causing, mass environmental damage or destruction (Bragança et al., 2021; Roupé and Ragnarsdóttir, 2022). As climate change shows the profound inequalities between social classes and countries, stopping the Amazon tipping point necessarily involves adopting an equity and justice perspective to climate change (IPCC, 2019, 2022). Taking that perspective into action requires attending to the local inhabitants' rights through legislation that recognizes the links between ecocide and ethnocide in the Panamazonian floresta rather than perpetuating a model whereby they remain the losers in the global system.

2.2. The battery industry: extractivism in the South for the benefit of the North

Addressing climate change tipping points has become an existential crisis facing the planet that will only be addressed through a reconfiguration of the global energy and transport systems away from fossil fuels (IPCC 2023). Greater uptake of renewable energy, together with storage improvements, are part of the systemic transition to net zero energy systems that will reduce Greenhouse Gas (GHG) emissions (IPCC, 2023). Electric vehicles (EV) have a “large potential to reduce land-based transport emissions, on a life-cycle basis”, provided they are charged by a low GHG emissions electricity source (IPCC, 2023: C.3.3). This will not be achieved without maximising battery production from cleaner energy and an efficient supply chain of lithium, nickel and graphite (ECOS et al., 2023).

Rapid growth in the EV market has been presented as an imperative to meet global targets for reducing GHG emissions (Harper et al., 2019; Lam and Mercure, 2022). This could arise within the next decade in the leading car markets of the US, EU, China, Japan and South Korea, which could “induce” an EV transition in the rest of the world, bringing self-reinforcing benefits in terms of further cost reduction and product diversity (Lam and Mercure, 2022; Azevedo et al., 2018). The reorganisation and retooling of production lines to manufacture EVs, which signal profit expectations over at least a decade, can be seen as irreversible within the climate policy timescale (Lam and Mercure, 2022). According to the Paris Declaration on Electromobility and Climate Change and Call to Action, the goal is to have more than 100 million Electric Vehicles and 400 million two and three-wheelers by 2030 (PD 2015 in (Ajanovic and Haas, 2018)).

However, whilst EVs may have the potential to reduce GHG emissions and act as a positive tipping point, their batteries currently rely on minerals such as lithium, cobalt and nickel, the extraction of which have considerable and frequently devastating social and environmental impacts in the global South (Ajanovic and Haas, 2018; Harper et al., 2019). Global



310 demand for Lithium-ion (Li-ion) batteries is expected to soar over the next decade, from a demand of around 700 GWh in
2022, to around 4700 GWh in 2030 (Azevedo et al., 2018). The lithium, cobalt and nickel currently required to manufacture
Li-Ion batteries are mined under highly oligopolistic and even monopolistic conditions: in Australia, China and Chile for
lithium (85% of global production) and the Democratic Republic of the Congo (DRC) for cobalt (70% of global production)
(Azevedo et al., 2018; Campbell, 2020).

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In recent decades, soaring demand has intensified cobalt mining in the DRC (Calvão et al., 2021). The pressure to meet an
increasing demand has reinforced integration of wageless artisanal cobalt miners into the corporate chain, with consequences
including emergent exploitative regimes with no regard for securities of artisanal miners, in the so-called formalisation of
informal mines where the knowledge and acceptance of consequences becomes hidden within bureaucracy and structures
(Calvão et al., 2021), health risks, and environmental degradation in the new mining communities (Banza Lubaba Nkulu et al.,
320 2018). As the demand continues to rise, the formalisation strategies of small scale miners in the DRC, imposed by large
corporations, will deepen insecurities and vulnerabilities of local communities (Calvão et al., 2021), reinforcing and locking
artisanal miners in a dependent and complex chain.

325 In Chile's Salar de Atacama, a major centre of lithium production, 65% of the region's water is consumed by mining activities,
affecting farmers who must then import water. The demands on water from the processing of lithium are substantial, with a
ton of lithium requiring 1,900 tons of water (Katwala, 2018). In the Andes, local lithium, salt flats and solar exploitation could
perpetuate green grabbing practices developed by mining and energy stakeholders that reinforce and even extend pre-existing
processes of commodification of nature and accumulation of resources for use outside of local contexts (Forget and Bos, 2022).

330 The increasing demand is now expanding extractive focus to the deep sea, both within and beyond national jurisdictions, where
minerals such as cobalt and nickel occur. Within national jurisdictions, interest has been largely in the Global South, including
the Cook Islands, Namibia, Brazil, and Papua New Guinea, whereas in areas beyond national jurisdictions, thirty exploration
contracts have been granted by the International Seabed Authority (ISA) totalling millions of square kilometres ¹(Levin et al.,
2020).

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Although no deep-sea mining has occurred, there are major sustainability and equity concerns (Jaeckel et al., 2023; Levin et
al., 2020; Wilde et al., 2023). These include intense and irreversible damage to some of the planet's most pristine and poorly
understood habitats across enormous scales, which could have knock-on effects on ecosystem services such as climate
resilience, fisheries production, marine genetic resources, as well as critically important cultural connections between humans
and the deep ocean (Amon et al., 2022b; Jaeckel et al., 2023; Le et al., 2017; Tilot et al., 2021). Negative social and economic
340 effects are also possible from this unproven industry, particularly for developing states e.g., Papua New Guinea saw losses of

¹ <https://www.isa.org.jm/exploration-contracts/exploration-areas/>



over 100 million USD when a partnership with a Global North deep-sea mining entity collapsed (Jaeckel et al., 2023). These risks are compounded by a lack of science to guide effective decision-making and management (Amon et al., 2022a).

345 In areas beyond national jurisdictions, equity concerns are exacerbated by the minerals as “the common heritage of humanity”
narrative (United Nations, 1982). According to this narrative, mineral resources are supposed to be “vested in mankind as a
whole,” and should be managed to ensure that any mining benefits as many people as possible. However, there is not yet a
financial mechanism to accomplish this and little clarity around who benefits and who carries the burden of environmental,
economic and social risk. Specifically, diverse mechanisms were devised to make sure that developing states are able to
350 participate in deep-sea mining and receive an equitable share of the benefits, but most of these measures are yet to be
implemented and the recent trend of partnerships between private deep-sea mining companies and developing states might
jeopardize the original objectives (Willaert, 2022). There are also no governance frameworks, no robust and inclusive
engagement of all those with a stake, nor transparent decision-making processes (Jaeckel et al., 2023; Morgera and Lily, 2022;
Wilde et al., 2023). Ultimately, the reliance on these minerals maintains relationships whereby the lands and ocean in the
355 South and international waters serve only as inputs to maintain lifestyles in the North with severe geopolitical and social
implications (e.g. Carrasco and Madariaga, 2022; Kingsbury, 2022).

While there are many sound suggestions for improving the conditions for specific mining sites and industries (Mancini et al.,
2021; Deberdt, 2021), these suggestions do not address the elephant in the room: the continued expectation of the convenience
360 of private passenger transport in the developed world. Instead of looking at niche innovations like EVs as transition pathways
to alternative mobility structures, without unpacking the equity implications of where these materials come from or who
benefits (See Geels, 2018), perhaps a more transformative approach that limits personal vehicles in favour of large-scale public
transport might be a more just solution (Gössling, 2020; Rionfrancos et al., 2023). This would require a change in mindset and
lifestyle for those responsible for the most consumption, whilst benefiting more people with improved access to transport and
365 less burden on raw materials. Further, that some scientists advance the EV transition as a positive tipping point without
consideration of the systemic implications of increased mineral extraction is startling (e.g. Lam and Mercure, 2022; U.S.
Department of Energy, 2020). This positioning is symptomatic of a continued malaise, a blindness to the material base of
existence and well-being in the developed world and evidence of a continued lack of commitment to circular economy thinking.

370 2.3. Nature Based Solutions in African ecosystems

Rising emissions have generated the push for a global commitment to achieve net zero emissions by the middle of this century.
Achieving this requires a balance between reducing emission sources and enhancing greenhouse gas sinks. In this context,
land-based carbon sequestration has become a popular strategy to offset emissions (Allen et al., 2022), particularly through
375 Nature Based Solutions (NbS). NbS is an umbrella term linking approaches that involve enhancing and working with nature



to solve societal challenges through protecting and managing natural and semi-natural ecosystems. It is underpinned by the idea that healthy ecosystems provide valuable ecosystem services that support human well-being, including carbon storage, flood control, and clean air and water (Seddon, 2022; Sowińska-Świerkosz and García, 2022). Yet in practice, NbS actions often reflect an expanding interest in carbon offsets which has led to a disproportionate focus on climate change mitigation over adaptation and restoration (Seddon et al., 2020). Certainly, NbS can provide immediate opportunities to reduce CO₂ emissions and if applied with care can also offer significant co-benefits (Girardin et al., 2021). Yet evidence exists that suggest that: 1) carbon offset potentials of NbS based actions are often overestimated, and 2) the assumed ecological co-benefits of increasing carbon stocks are often incorrect and could result in biodiversity losses and degradation rather than restoration (Bond et al., 2019; Seddon et al., 2020).

The emphasis on carbon offsetting has led to proposals that aim to enhance aboveground carbon across numerous biomes in the Global South. This comes in many forms from natural forest regeneration, reforestation, tree planting, afforestation, fire abatement and a switch to early burning in tropical grassy ecosystems (Zomer et al., 2008; Russell-Smith et al., 2021; Veldman et al., 2019). However, these options consider only one metric, carbon-as-stored-in-trees, to the detriment of other metrics (biodiversity, livelihoods, health, culture) and biophysical processes like fire regimes. This framing further perpetuates a simple model of allowing people to continue their lifestyles in one place as long as they are rich enough to pay people somewhere else to take the problem away, while not recognising the full costs to the communities of committing extensive land resources to maximising above-ground carbon at the expense of other forms of use that also provide ecological benefits (Dooley et al., 2022). Such NbS risk not only exacerbating current paradigms of where interventions must go, but may not even meet their initial mitigation targets. For instance, (Bastin et al., 2019) suggested tree planting in non-forested landscapes, including extensive areas of Africa's grassy and open ecosystems, could deliver 205 gigatonnes of carbon. However, this has been shown to overestimate the sequestration potential by more than a factor of 5 (Veldman et al., 2019). These proposals also fail to account for additional risks of afforesting seasonal systems that are prone to drought and fire.

Via the Bonn Challenge, through the AFR100 (<https://afr100.org/>), Africa has been identified for providing major opportunities for tree planting at scale with it being proposed to plant at least 1 million km² of trees in Africa by 2030 with the aim of restoring ecosystems and sequestering carbon (Bond et al., 2019). Yet many of these regions are ancient grassy ecosystems that have co-evolved with fire and herbivory, and have a long history of human utilisation in Africa, resulting in plant and animal assemblages that are functionally distinct from forest species (Bastin et al., 2018; Droissart et al., 2018; Torello-Raventos et al., 2013; Veldman et al., 2019). The persistent misclassification of ancient grassy ecosystems can be traced back to the colonial era, when Western exploration shaped the field of ecology as a global discipline. During this time, grassy ecosystems were mistakenly perceived as early successional or deforested landscapes (Fairhead and Leach, 1996) resulting in an extensive and profound misreading of the landscape (Pausas and Bond, 2019). Tree planting in these cases presents multiple social, economic and environmental trade-offs, including historical, traditional and indigenous livelihoods of local people,



410 disruption of ecological systems and the services they provide, especially through the introduction of non-native trees, and
destruction of rich biodiversity over much of the targeted area in Africa (Martin et al., 2021).

Rather than avoiding a climate tipping point through NbS, such tree-planting interventions in the name of carbon offsets and
mitigation could potentially result in another biophysical tipping point- that of ancient grasslands into managed monocultures
415 of forests. The increase in tree cover, above certain thresholds leads to a complete loss of grazing potential (Scholes, 2003;
Anadón et al., 2014), and fundamental changes in biodiversity (Andersen and Steidl, 2019; Blaum et al., 2009) and ecosystem
processes like fire switching from lower intensity grass field fires to high-intensity crown fires (Bowman et al., 2020).
Additionally, evidence suggests that when trees replace grasses in high rainfall ecosystems it results in a reduction in soil
carbon (Mureva et al., 2018) and reduces streamflow (Nänni, 1970; Zhao et al., 2012).

420 Given these concerns, NbS interventions should be viewed with considerable caution before implementation. For African
ecosystems, a one-size-fits all approach and the disproportionate global focus on ‘carbon’, even if well meaning, places
considerable risk to ecosystems, and dismisses the paired social-ecological contextualisation and livelihood interdependencies
of African ecosystems. The current focus of NbS actions on carbon offset is likely to exacerbate the degradation of Africa’s
425 open and grassy ecosystems, perpetuating a system of transforming African ecosystems to meet the carbon sequestration goals
of those financing such interventions, whilst ignoring African equity and justice considerations. Such an approach perpetuates
a legacy of inequity and injustice to the people living in and dependent on these ecosystems. Thus, while NbS actions are
promoted as “win-win” solutions, their focus on carbon offset makes them a poor fit for Africa’s open and grassy ecosystems.

430 We argue that there are rather many other more appropriate interventions to consider than those currently prioritised and
glamorised by the global community that will result in more robust co-benefits for both biodiversity and climate change
adaptation, while still supporting mitigation efforts. For NbS to work, they must address issues of ecosystem conversion,
maintain and/or re-introduce traditional fire- and grazing practices that sustain open-canopies and support a rich herbaceous
ground layer, upon which a variety of life form depends (Smit et al., 2010; Bond and Parr, 2010; Maravalhas and Vasconcelos,
435 2014). Interventions must be context-specific (e.g. biome specific), explicitly designed to increase synergies and reduce trade-
offs. This includes protection, appropriate management and restoration of ecosystems. It is critically important to address the
historical misclassification of African ecosystems, in particular grassy ecosystems and the misrepresentation of utilised
ecosystems as ‘degraded’ by Global North standards. In ecosystems that are utilised for livelihoods, but have reduced woody
cover as result (e.g. wood fuel harvesting, charcoal production), appropriate NbS are vastly different to those that would be
440 appropriate for a degraded forest system. Global datasets that specifically focus on rangelands and grassland ecosystems, i.e.
the Rangelands AtLAS project (www.rangelandsdata.org/atlas/), are important steps in the right direction, but such
‘reclassification’ still is slow to gain the required traction in the policy arena and should be a priority before any finance flows
for NbS take place.



445 3. Discussion: Reframing ‘solutions’ by flipping the colonial paradigm to move towards plural pathways

We argue that it is necessary to provide a more nuanced understanding of what positive tipping points might look like in practice, who gets to define, fund and drive them, who is supposed to implement them, where they take place, who is expected to benefit and who is expected to lose. Here, we situate some of the common themes emerging from the case studies and expand on what this means from a tipping points perspective.

3.1. Giving governance power back: highlighting a perspective from the majority world

Positive tipping points can perpetuate climate colonialism and create green sacrifice zones if blindspots of winners and losers are not addressed. Even well-intentioned policies, such as the EU’s Green New Deal that aims to transition energy systems away from fossil fuels whilst avoiding transferring the costs to workers, have the potential to put severe pressure on lands held by Indigenous and marginalized communities and reshape their ecologies into “green sacrifice zones” by reproducing a form of climate colonialism in the name of just transition (Zografos and Robbins, 2020). Climate colonialism involves “the deepening or expanding of domination of less powerful countries and peoples through initiatives that intensify foreign exploitation of poorer nations’ resources or undermine the sovereignty of native and Indigenous communities in the course of responding to the climate crisis” (Zografos and Robbins, 2020: 543. As shown above, even sectors like conservation could fall into this trap. The agenda underpinning the 30x30 target runs this risk of identifying hotspots for biodiversity investments - thereby inadvertently pushing a narrative whereby these hotspots could become ‘sacrifice zones’ that exclude local people from their lands. This is particularly important as it highlights the unintended consequences or blindspots of positive tipping points, which are largely well intentioned deliberate interventions.

Sacrifice zones are “extractive zones” characterised by the advancement of coordinated forms of capitalism that see those territories and the communities inhabiting them as extractable and commodifiable (Gómez-Barris, 2017). “Green sacrifice zones” are spaces or ecologies, places and populations that will be severely affected by the sourcing, transportation, installation, and operation of solutions for powering low-carbon transitions, as well as end-of-life treatment of related material waste (Zografos and Robbins, 2020: 543. Sacrifice zones are carefully chosen within a colonial paradigm that marks out regions of high biodiversity to reduce them to resources for conversion (Gómez-Barris, 2017). This extractive view from corporations and governments can meet resistance in the ways in which the local humans and nonhumans that inhabit those territories perceive life as entangled, where the destruction of one parcel affects the rest of the entities and breaks the spiritual heritage in a region (Gómez-Barris, 2017). The violence that Capitalism inflicts on places designated as sacrifice zones can be immediate, but it can also be slow and imperceptible. Such “slow violence” can happen slowly in marginalized communities, under a long period of time and which are almost imperceptible (Nixon, 2013: 6).



A language that acknowledges the need for dismantling the current global system based on extraction, expropriation, expulsion that is driving converging social-ecological crises and institutionalised inequality is required (Escobar, 2021). The concept of the Anthropocene- the period in which humans have become the dominant force of change on the planet- has been criticised by many as it focuses on a singular notion of mankind and does not acknowledge the differential responsibilities and impacts between the world's richest and poorest (Balcarce, 2021; Habersang, 2022; Cunha, 2015; Arora and Stirling, 2015). Some alternatives framings include the Plantationocene referencing the histories of colonialism and race in the development of plantations (Barua, 2023) and linked to this, the Eurocene after drivers of change emerging largely from Europe (Grove, 2017; Juárez, 2021), the Capitalocene referencing capital's role in the planetary crisis (Moore, 2017), the Plastocene as plastic is now in the sedimentary record (Skinner, 2019), a feminist critique referring to the importance of gender in the Manocene (Ally and Boria, 2023: 279, and then the Chluthlucene as coined by (Haraway, 2015, 2016) that talks to the need for messier multi-species assemblages in this new epoch. Indigenous and feminist movements from Chile and Argentina have proposed the term "Terricide" (Buitrago Arévalo, 2022; Millán and Rosemberg, 2021) as a complement to the idea of the Anthropocene. Terricide, instead, names the layers of violence and inequity lived by indigenous and other marginalized groups when corporations and governments destroy the material ecosystems and spiritual sacred realms of the web of life for profit (Millán and Rosemberg, 2021). As it involves a crime, it demands justice and accountability for the designation, exploitation, and destruction of life in these so-called sacrifice zones. This connects to the legal solutions offered from a Global South perspective in the case studies.

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3.2. Dismantling debt and situating sustainability for surfacing burdens and benefits

Similarly, discussions of tipping points need to be aware of the technologies of governance (such as race-making and the processes for labelling countries as indebted or LDCs) that enable access to and appropriation of stocks for capitalist resource conversion (Leifsen et al., 2017). For example, the reason companies are willing to invest in carbon offsets is because it is cheaper to pay other countries to store carbon than it is to reduce their own emissions. This equation only works when there are disenfranchised countries with low GDP and high debt willing to sell their carbon-fixing abilities at low prices, i.e. the entire carbon-offset and biodiversity-offset market depends on global inequality to function.

If the questions we ask are aimed at transformation, these cannot neglect how neo-capital paradigms contribute to inequalities and environmental degradation (Sze, 2018). Further, the financialisation of loss arising from crossing biophysical tipping points reinforces these dynamics by trying to attribute a monetary value to existential loss. Most accounts about lived experiences with harm are from rich, not poor, countries and so the epistemological injustices under-represent the intangible harm among the poorest people (Tschakert et al., 2019). There is an important and ethical role of research at the science-policy interface that needs to bring these aspects to light, giving policy-makers an urgent wake-up call.

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3.2. Foregrounding ethics in science

The role of science in advocating for certain changes or identifying places where changes can or should occur has ethical implications. Ocean conservation planning exercises place a significant fraction of priority areas (e.g. Coral Triangle, Southwest Indian Ocean, Caribbean Sea) within Global South countries (e.g. French Polynesia, The Bahamas, Philippines, Colombia, Indonesia) (Jenkins and Van Houtan, 2016; Selig et al., 2014; Zhao et al., 2020). While important, these scientific exercises hardly discuss the ethical and governance considerations of their results, and local socio-economics needs are either conceptualized as an extra layer in maps (in competition with conservation) or something to be addressed by others in future analyses or by decision-makers at local levels. A related ethical debate on how to identify global priority areas for ecological restoration was sparked by Fleischman et al. (2022) in response to a paper by Strassburg et al. (2022) that identified global priority areas for conservation. As reviewed above, defining these priority areas could be seen as a potential positive tipping point for biodiversity conservation, aiming to fulfil the Kunming-Montreal Global Biodiversity Framework 30x30 target. The critique highlighted the importance of understanding local context, and in particular the viewpoints and values of the peoples in these areas, before designating these areas as appropriate for conservation, especially as “most of the priority areas fell in the Global South, where there is a long history of holding rural and indigenous peoples responsible for environmental degradation, while misinterpreting traditional ecosystem management as ‘unsustainable’ and ignoring the political and social processes that make people vulnerable... (and where) previous efforts to compensate people displaced by conservation projects have often failed and are associated with large-scale human-rights violations” (Fleischman et al., 2022: E5). In their response, Strassburg et al (2022) acknowledge this point but argue that “global spatial-prioritization analyses can adequately incorporate only scale-independent variables, such as those for which the values are less affected by finer scale contexts”, and that they never intended for their maps to be used as final products for on-the-ground implementation, putting the onus back on fine-scale participatory work to sort out all the complex, messy details.

This is not a singular incident within the ecological sciences. Another study quantifying the potential to mitigate climate change by planting trees Bastin et al. (2018) was challenged for producing global maps of “forest restoration potential” that were at odds with the local ecology and social needs. Bastin et al. (2018) responded by saying “our analysis does not ever address whether any actions ‘should’ or ‘should not’ take place, our analysis simply estimated the biophysical limits of global forest growth by highlighting where trees “can exist”. This response leaves the onus on local authorities to decide whether it is a good idea, with the authors effectively washing their hands of the ethical consequences of producing a map that can be used by some for financial gain at the cost of others. Tear et al (2021) similarly quantified the money that could be made by changing fire regimes in all conservation areas in Africa, and stated that this would have only positive consequences. When challenged on this, again they replied that it was up to the individual conservation managers to decide on their fire management goals, and that they were just presenting options. (It is important to note that the rebuttal to this paper authored by ~20 African land



545 managers and conservation scientists was rejected). Again, this shows a lack of understanding of the power dynamics at play
when outside players with money for particular land management goals enter a local complex social-ecological system.

Policy interventions backed by international finance regimes to set aside conservation areas based on disembodied mapping
exercises that meet scientific targets could address biosphere tipping points, whilst at the same time unleashing problematic
550 tipping points of land exclusion and marginalisation. The power of science-based maps, irrespective of how the authors
describe them to be used and the caveats included in the associated written material, become powerful objects stimulating
action (e.g., finance for carbon markets- another potential tipping point) with little contextual work being undertaken. The
gaze that these disembodied and decontextualised spatial-mapping exercises enable is related to systems that enable investors
abroad to bid for exploitation rights to nature, without any understanding of the local dynamics. These dynamics allow for
555 colonial land and conservation ideologies and narratives to persist and thereby perpetuate Indigenous injustices at the expense
of the environment, local traditions and culture (Domínguez and Luoma, 2020). To counter this, an improved capacity for self-
determination that allows for a better understanding of the diverse conceptions of what ‘positive’ or ‘preferable’ states is
needed.

560 3.4. Unpacking what ‘positive’ tipping means requires an improved capacity for self-determination

The voices and tones of developments and transformations in the South are often predetermined (Leach et al., 2015) and leave
no space for surfacing creativities, authenticities and capacities inherent in these often self-growing systems. The capacity of
the South to self-determine has been undermined in diverse ways. First, under the guise of sustainability (green
565 transformations) argued by (Lyon and Maxwell, 2011) as a greenwash-which theoretically promises to uplift ‘vulnerable’
communities and create ‘positive’ impacts in the Global South, the development frameworks and models that seek to bring
positive changes (e.g. payment for ecosystem services initiatives (Bottazzi et al., 2018), carbon trading, renewable energy
initiatives) are designed to reduce and disregard local structures, ultimately creating new forms of structures and feedback that
largely benefit developers. For instance, in recent years, an important literature on the contested effect of Payment for
570 Environmental Services (PES) has flourished, showing controversial effects on local communities’ participants (Bottazzi et
al., 2018). While in some cases farmers may be willing to be compensated for their nature conservation efforts in PES
programmes (Geussens et al., 2019), such payments are often too little to cover the social and economic opportunity costs for
local land users (Hayes et al., 2019; Vedeld et al., 2016). The aftermath is usually a created system that welcomes new forms
of valuing (often monetary at the expense of meaningful values), exacerbates existing inequalities and injustices, and cultivates
575 division among communities.

Secondly, there is a tendency for change-advocates from the Global North to ‘piggy-back’ on existing structures which are
easy-to-work-with, and which require minimal or no reflection of people’s actual needs. Such weakening techniques have



580 maintained a status quo that is constantly prioritising external forces because of associated benefits, while repositioning meaningful community values, efforts and ideas as secondary. For instance, infrastructural developments in the Global South often leave the countries in crippling debts, with impossible alternatives for recovery, which then forces these countries to keep needing external aid. Leaving no options for recovery, by continuous exploitation of fault lines, is a state of capture and a systemic colonialism that underpin the contested north-south dynamics (Calvão et al., 2021). Countries end up spending huge amounts of their GDP serving debt, instead of using this to develop their citizens.

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The protected areas approach discussed in the case studies emphasises this further. This is not to say that protection for these critical ecosystems is inherently problematic, but it is in who does the protecting and how that matters. In 2022, the Confederation of Indigenous Organisations of the Amazon Basin (COICA) proposed the goal of protecting 80% of the Amazon by 2025 -approved by the International Union for the Conservation of Nature (IUCN)- and joined by 30 countries and 288 civil society organisations. The aim is to stop deforestation and land-use change, and therefore prevent the point of no return- or a negative tipping point (Gaia Amazonas, 2022). From the COICA and an Amazonian perspective, the challenge for the Global Biodiversity Framework agreements is to recognize the role of indigenous peoples as key actors in safeguarding the biological and cultural diversity of the Amazon, as these communities are seldom included as active actors in conservation goals. Rather, there is the risk of perpetuating the ‘fences and fines’ model of colonial conservation in Africa that removed people from the land to set up parks where European elites could hunt (Adams, 2008). Instead of hunting, these protected areas would be for the ‘greater good’, but would negate the rights of people to their land and ignore their role as custodians of these places for generations, potentially continuing the negative outcomes such as militarisation and increased human-wildlife conflict in the southern Africa case. Indigenous peoples and local communities have co-existed with the forest and land and achieved equal or better conservation results at much lower cost than conventional conservation programs (ICCA Consortium, 2021). However, in Africa, Asia, and Latin America, governments and NGOs are setting aside vast areas of indigenous and land for conservation and the good of the planet (Dawson et al., 2023). From an equity and justice perspective, it is clear that conservation projects in regions as the Amazon and the Congo Basin cannot take the form of strict protection as there have always been human communities living in this area; indigenous peoples that have cohabited with other lifeforms (Barlow et al., 2012; Hecht, 2003).

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Creating a more decolonial future in the positive transformation landscape would mean allowing local voices, tones and capacities to surface in and by themselves (Leach et al., 2015), to determine and design the changes, as they see and need them (Shear, 2014). Resources provided in their support must then be informed by locally identified needs and framings, without stringent, unrealistic and locally exploitative terms conditions and indicators of change. It is important to note that ‘resources’ come for various reasons ranging from development aid, through to paying for historic damage (e.g. historical emissions in the climate change negotiations) and then paying for what "everyone" cares about, e.g. investment in conservation. Development aid would be classified as support, whereas the latter two are not necessarily in direct support of countries with

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biodiversity/sequestration potential, but rather are investing in a specific agenda for the planetary good- i.e. to avoid negative tipping points. However, this cannot be undertaken at the expense of local needs without any commensurate change in the behaviours of wealthy countries whose development has largely led us to this crisis. As recommended by Obura et al., (2023), any positive changes in the human-nature discourse must uphold and respect local rights and voices, as such bear self-propelling agencies for needed changes.

4. Conclusion: Recommendations for a more transgressive practice

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We conclude with a set of recommendations that should be considered not only when discussing positive tipping points, but in all considerations of environmental interventions.

4.1. Acknowledge the blindspot of winners and losers

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Denying that there are winners and losers in interventions to avert climate disaster limits our solution space to the point of impossibility as we seek to achieve win-win situations. The kind of hard decisions around implementing transformations that are required to stay within a safe and just operating space no longer allow for this kind of thinking. Within this framing, be very clear about who has the capacity to lose whilst maintaining their dignity due to their current privilege and power versus those who are already so marginalised that they have no space to lose anymore. It is important to bear in mind that discussions about how to compensate the losers will by definition maintain the status quo of the winners and so we should instead be shifting a narrative towards how the current winners will repay their debt to society and the planet, thereby expanding the range of positive tipping points available.

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4.2. No more sacrifice zones in the quest to address biophysical tipping points.

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It is unconscionable that parts of the world and certain people remain sidelined without equal rights to self-determination, but exist merely to fulfil the needs of others. Such considerations when proposing solutions, of who is going to lose and whether this perpetuates historical injustices, needs to be at the heart of any discussion about enabling positive tipping points. Further, the exclusion of non-human voices from decision-making further perpetuates an injustice. Interspecies justice as a core component of earth system justice means we need to do a better job at thinking beyond just human needs and drawing more on knowledge systems that see an indivisibility between humans and non-human species as having the right to live and thrive on this planet.

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4.3. Engage with what positive tipping points are desirable and from whose perspective.

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There needs to be a deep engagement in what information, knowledge and interventions can lead to sustainability transformations that are truly equitable and that spread the burden of change to those that have benefited most from the current system, rather than further marginalising the most vulnerable. Companies and scientists producing decision tools and solutions



need to explicitly recognise the risks and trade-offs associated with their solutions: i.e. together with maps of where trees can be planted, or biodiversity conserved, there should be information on the consequences and contact information for people working in these locations who can help to assess whether the interventions are ultimately beneficial to the people living there.

650 The power dynamics of, for example, a global model (e.g. of carbon sequestration areas) that delineates impacts on local people and places necessitates a deep engagement with justice in thinking through the ethics of generating information that could lead to potential ‘positive’ tipping points (e.g. a finance scramble to fund tree-planting). There is a critical need for researchers working on tipping points (both positive societal and negative biophysical) to reflect on how their findings can be used by other actors to drive either reformist (improve and thereby more deeply entrench a system) or non-reformist agendas (reforms

655 that dismantle a system) (Engler and Engler, 2021).

4.4. Decolonise the solution space of what is needed to address tipping points.

Allow space for alternatives that do not come from a Western-dominated perspective. Let animism and entanglement be an alternative to dichotomies between people and nature and sectoral approaches that relegate the environment as lesser than the

660 economy. Be open to alternative economic models based on regeneration beyond growth, not on extractivism. Identify models where private property is not seen as the only possible solution to the tragedy of the commons, and employ real alternatives such as collective ownership that have been in place for generations in many parts of the world.

4.5. Mainstream equity and justice into governance of social tipping points.

665 Ensure that the six equity dimensions (Bennett, 2022) sit at the heart of social tipping points discourse. To do so biodiversity protection and governance need to acknowledge rights, values, visions, knowledge, and needs of local communities in policies (i.e. recognitional equity) as well as to ensure an inclusive and participatory decision-making process (i.e. procedural equity). Biodiversity and well-being outcomes (as well as potential harms) should be balanced (i.e. distributional equity), safeguarding the interests of disadvantaged or marginalized groups, including nonhuman species and ecosystems (i.e. environmental equity).

670 Leadership and participatory skills within local communities should be fostered and improved to allow local engagement in management activities (i.e. management equity). Emphasis should be also placed on qualitative factors such as equity and justice of protected areas (i.e. contextual equity)(Pickering et al., 2022) to move beyond over-simplistic quantitative indicators (e.g. how much area is protected and where). Failing to address any of these dimensions may result in reproducing historical injustices and simply ‘kicks the tipping point down the road’. Resistance movements such as “Blue Justice”, a grass-root

675 initiative to safeguard a secure and viable space for small-scale fisheries in the Blue Economy, (Blythe et al., 2023) are what is needed to ensure that the fundamental structures of unsustainability are dismantled.

Author contribution



680 LP conceptualised the paper and prepared the initial draft together with IG, TA, DA, SArch, SA_r, AC, KC, TPC, TLF, NSi,
Nst, OS and SV. T MA, DMK, IJA, AG, DO, PP, FRC, JR and URS edited and reviewed the draft.

Competing interests

The authors declare that they have no conflict of interest.

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