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Towards Oblique Engagements With 'Tipping Points': A Critical Geography for Redirecting Debates

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ABSTRACT

This intervention brings debates about tipping points into conversation with critical geographical thinking to suggest a more 'oblique' engagement with the concept. Such an approach is vital for rethinking the normative discourses and established imaginaries that dominate in the application of 'tipping' to understandings of environmental change. The use of the term 'tipping point' has grown exponentially over the last two decades within environmental sciences to describe accelerated, self-amplifying and often irreversible changes to environmental systems. It has also garnered significant momentum in policy debates. Yet it is far from a universally lauded concept, with widespread concerns in the sciences about the validity and usefulness of defining such catastrophic points of no return and within the social sciences and humanities about the politics and ethics of tipping points. This intervention argues that human geography has a key role to play in this complex landscape in furthering critical engagements with tipping points as the concept continues to unfold and take hold. It calls for an unfixing of dominant understandings and framings through key geographical ideas: space and scale, time and temporalities and a/effect. These geographical ideas permit a redirection in current debates, especially around governance. Much is at stake in such a critique where tipping points may be productively questioned, imagined as something otherwise, or even outright refused as a guiding concept of our times. More equitable enquiries may emerge as a result.

1 | Introduction

> Earth on verge of five catastrophic climate tipping points, scientists warn
>
> (Niranjan 2023, The Guardian)

> Planet's first catastrophic climate tipping point reached, report says, with coral reefs facing widespread dieback
>
> (Readfearn 2025, The Guardian)

Over the past decades, the use of the term 'tipping point'[1] has grown significantly (van Nes et al. 2016 to Smith et al. 2025). In climate science, environmental sciences and ecology, terms 'once considered too alarmist for proper scientific circles' have 'entered the climate change mainstream' (Kerr 2008, 153), with the term 'tipping' and affiliated concepts of 'thresholds', 'safe operating spaces', 'regime shifts', 'critical transitions', part of the current lexicon, not least in application to policy approaches (Hillebrand et al. 2020, 1502; Munson et al. 2018). For Russill and Nyssa (2009, 343) tipping points 'express anxiety over the possibility that climate change could pose problems incapable of human solution' and

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that time may be 'slipping away' to address these crises (Asayama et al. 2019, 570). In scientific terms, there is no uniform definition of a tipping point. Broadly, it refers to the accelerated (or nonlinear), self-amplifying and often irreversible change process of a system (Milkoreit 2022); or in other words 'when minor changes in the driver (e.g., environmental change) leads to changes in the state of the system (e.g., an ecosystem)' (Hillebrand et al. 2023, 2). Such discourses, though, are produced almost exclusively by dominant, western ways of knowing, constructing universalising narratives of environmental change and of possible futures (Pereira et al. 2025). Accordingly, tipping points have the potential to abstract 'climate change from past inequities and local contexts' (Pereira et al. 2025, 1268, Pereira et al. 2024), and to project singular ideas of future desires based on visions of the West. As a framework, then, 'tipping' carries a significant risk of dismissing the complex colonial and capitalist underpinnings of environmental change (Pereira et al. 2025; Peters and Satizábal 2026; Sultana 2022).

In spite of the term 'tipping point' originating from social science scholarship (Nuttall 2012), there is little sustained engagement within human geography regarding tipping points. This intervention argues that human geography, and its conceptual apparatus, has much to contribute to critiquing how tipping points are brought into being, understood, mobilised and *enacted*. Geographical ideas offer an opportunity for a more 'oblique' engagement with 'tipping' that has the potential to redirect discussion from dominant debates, opening possibilities for more critical—and just—considerations of its application. Building on recent arguments advocating for scholarship that advances more critical climate geographies (Parsons et al. 2025; Sultana 2022; Yusoff 2018), we argue that an oblique approach to tipping points made possible through human geography offers both geographers and wider 'tipping point' scholars fresh avenues to complicate and critique representations of environmental change and to respond to such change. Such a lens may allow tipping points to be questioned, to be imagined as something otherwise, or even outright refused as a guiding concept of our times. More equitable enquiries may emerge as a result.

This intervention does not seek to prove or disprove the accuracy or validity of any given tipping point,[2] or to suggest alternatives (see Asayama et al. 2019 on benchmarks). Instead, it interrogates what 'tipping' implies and how geographical approaches may be usefully mobilised in critique of it. We first provide a starting point for understanding the genealogy of tipping points, locating its trajectory of use. In doing so, we open space to show how and why geographical analysis matters. We then engage with the geographical lenses of (1) space and scale; (2) time and temporality; and (3) a/effect in order to offer an oblique perspective, unfixed from the singular and totalising worldview of the tipping point concept. This intervention concludes by reflecting on how geographers may think about, and engage ecological sciences, to unsettle existing ways of knowing. Doing so opens a door for further critical interventions in understanding human-nature relations as environmental change continues.

2 | Start Points for Tipping Points

Often elided in contemporary policy usages of the concept, the origins of 'tipping points' are not unproblematic or apolitical. 'Tipping' was first coined in the social sciences in research on racial segregation. Political scientist Grodzins (1957) qualified a 'tip point' as the percentage of black residents moving into a white neighbourhood that would precipitate all white residents leaving. This early racialised use of the term sparked scientific discussions regarding whether there could be any single *threshold* for such urban shifts (Wolf 1963; in economics, see also Schelling 1971). The term later took hold in Malcolm Gladwell's book, *The Tipping Point*, which describes a number of social phenomenon (from crime rates to fashion trends) 'where small initial changes led to a runaway process, causing big transitions' (van Nes et al. 2016, 902, see Russill and Lavin 2012, for a critique of Gladwell). From these initial uses across social sciences, the term was applied to a multiplicity of processes in a loose analytical fashion.

Indeed, Walker (in Russill and Nyssa 2009, 338) observed that the idea began to spread like a 'contagion' in climate change discourse. The first climate-related reference to a tipping point appeared in the 'US media in 2003 and the UK media in 2002' (Russill and Nyssa 2009, 338–339). From 2003, the use of the term accelerated in both the United Kingdom and the United States, with NASA scientist James Hansen warning in 2005 that the world was on a 'precipice of climate system tipping points beyond which there is no redemption' (cited in van der Hel et al. 2018, 610–611). For Russill and Nyssa (2009), this was a key moment in drawing tipping point ideas into conversation with climate change as a metaphor to communicate urgency (without necessarily, a clear scientific basis on the tipping mechanism itself, see below). Around the same time, 'the editors of Nature (2006) began to encourage the "application" of tipping points to the social dimensions of climate change' (Russill and Nyssa 2009, 338), given the idea was easily graspable and capable of 'motivating action' (ibid., 343). In other words, it became a useful policy/management directive. Indeed, this use of the term for 'positive' social changes relating to climate change is visible in the writings of climate scientists for policy makers (Lenton et al. 2025) and the wider public (Lenton 2025b, 2025a). Yet in some cases, these applications of the concept have lacked due critical consideration (i.e., 'positive' for whom, and who can and should 'act', and in whose interests, and to what end). This is troubling given the also troubling genealogy of the term, which—if duly recognised—might spark more careful deployment of the term into new arenas of use. This is where geography could play a vital role.

Nonetheless, increasingly, tipping points have become mobilised as a framework for environmental governance. Carrington (2025), for example, reports on 'an ambitious attempt to develop an early warning system for climate tipping points' by the UK's Advanced Research and Invention Agency. They awarded £81 million to 27 teams in 2025 with the aim of finding 'signals that forewarn of the greatest climate catastrophes the climate crisis could trigger'—particularly tipping points that could lead to 'unstoppable changes in the climate system' (Carrington 2025). In 2025, Exeter, UK, hosted a 'Global Tipping Points'[3] conference with the aim of 'accelerating action to ensure a socially just transformation' and to galvanise the research community, policymakers and business to 'raise awareness' of the importance of tipping points (Climate Adapt 2025). Bringing together scientific institutions and private partners (including a

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number of foundations, i.e., Bezos Earth Fund, Global Challenges Foundation, Quadrature Climate Foundation), this epistemic community produces policy-oriented reports (Lenton et al. 2025) and interventions at high-level international events such as climate Conferences of the Parties (COPs). More might be said about what constitutes a 'socially just' transformation, and about the role of philanthropies in climate 'solutions' given the deep connection between capital(isms) and climate change (Gruby et al. 2023; Sultana 2022). Articulations about tipping, then, 'shapes and is shaped by the living world' (Jones 2024, 28) as ideas circulate, get funded, gain momentum and spurn action in particular circles. This interplay between science and society is key in understanding how and why scientific activities change, shift and accelerate (Jones 2024) and how imaginaries of environmental governance are shaped by actors beyond the state (Chhetri et al. 2023).

Yet whilst 'tipping points' have gained significant traction and investment discursively and as concepts helpful for management, they are far from universally lauded in understanding environmental change. Various sciences are critical regarding the concept in ecological terms, debating whether—and to what extent—the processes that are studied fall within the mathematically/analytically narrow scope of 'tipping'. In ecology, for example, whilst Hillebrand et al. (2020, 1502) do not rule out the existence of tipping points, they underline the lack of 'systematic quantitative evidence' in identifying tipping points in empirical data. This leads them to question 'the utility of threshold-based concepts in management and policy' (Hillebrand et al. 2020, 1502; see also Kerr 2008). In addition, social scientists challenge the indiscriminate use of the term to explain social processes and human life (Nuttall 2012; Milkoreit 2022; Russill 2026). Moreover, definitions of tipping are often made on a very narrow subset of values, ignoring those that are bound to future generations or local, place-based, valuing systems (Hillebrand et al. 2023, 3). As Castree (2015, 3) notes, we might understand such ascriptions as strategic attempts by European scientists 'to exert political influence'. Tipping points are not, then, value neutral. The effects of a tipping point 'breach' may take centuries, or much longer, to be realised,[4] meaning there is no tangible 'point' at which change occurs or is experienced. Moreover, as Hillebrand et al. (2020, 1505) argue, the current fixation on tipping points marginalises other important, complex and nonlinear dynamics that exist under global climate change. For Wang (2023, n.p.), tipping points feed a 'weakness for spectacle' and a need for certainty about mitigating potentially catastrophic climate futures, where no such 'cathartic moment of clarity' may exist.

Critically underpinning each of these critiques are pressing concerns about the whiteness of tipping point discourse—*who* has, and is, producing it, and *where* it is being produced from. The racialised dimensions of climate discourse are well examined in critical decolonial literature (see Davis and Todd 2017, for example), and Pereira et al. (2025, 1268) extend this in a rare piece to tipping points, noting how they lack equity and diversity both in their inception within academic and scientific spaces, but also in their potential consequences in the world. There is a risk that tipping points 'distract attention from the deep structural imbalances of capital and the asymmetric power' that drive the effects of tipping points for people at the forefront of climate change whilst also increasing vulnerability to such impacts (Pereira et al. 2025, 1268). Pereira et al. (2025, 1271) go on to argue that tipping points may galvanise efforts toward 'speculative interventions', such as geoengineering (which can have unforeseen and unintended consequences), rather than focusing on the systemic colonial histories that have led to, and which continue to shape, the present moment (Sultana 2022; Yusoff 2018, 2024). Within these complex dynamics, (human) geographical ideas have the further potential to offer an oblique engagement with the concept—to unsettle and to stall, or at least question, momentum around 'tipping' before the concept itself reaches a point of no return within climate change discourse. It is to this challenge we now turn.

3 | Theorising Tipping Point Geographies

As Kumar et al. (2025, 3) assert, 'geographers, who are experts in Earth-Writing' are well placed to think through and respond to climate challenges with 'new stories of/for "the Earth"'. Thinking about 'tipping' is arguably part of this effort. As Castree (2015, 3) writes, to label a phenomenon (like a tipping point) is to discharge 'an awesome responsibility'. It carries significant consequences and involves 'obligations and risks' that remain relatively under-scrutinised. 'What other domain of academic inquiry', asks Castree (2015, 3) 'permits practitioners to make claims about the world that stand to become claims upon all those inhabiting that world?'. Likewise, Gabrys and Yusoff (2012, 6) describe thresholds as a 'more-than-scientific reference, since they circulate as political and cultural metaphors, describing speculative futures that may emerge through irrevocable changes of state'. Garrard (2020, 1) has also explored how '"tipping point" rhetoric' is mobilised to convey 'increased urgency' and to 'shame the present day' whilst pointing to the need to 'represent past, present and future in terms of unknowability, frailty' and limited agency (see also Edensor et al. 2020, 256).

Whilst geographers are thinking with/about tipping points, Pereira et al. (2025, 1275) argue for considering the humanities and social sciences in 'the intention, design, implementation, and evaluation of interventions' of tipping points to help mitigate and 'avoid harms' and to 'achieve positive social and ecological impacts on people'. This requires more oblique engagements that critically *redirect* lines of enquiry in understanding the very conception of tipping framings and their work in governance approaches. Human geography and its concepts offer key tools for such an effort. We now turn to, and draw on, key interlocking geographical ideas of space and scale, temporality, and a/effect to explore these potentials.

3.1 | Unfixing Global Spatialities

Geography can offer attention to the spatial and scalar dynamics of tipping points across multiple fronts, natural and social. Tipping frameworks, for example, often rely on identifying system change within 'distinct' natural systems. But *where*, spatially, do such systems begin and end? Moreover, how do such frameworks (dis)regard the human dimensions of these systems, including what is driving them to change in the first

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place? Additionally, tipping points, as with all scientific knowledge, emerge from *somewhere*. They are situated, discussed and debated in laboratories, conferences, offices and corridors. These spaces matter. They are spaces of knowledge production, circulation and crucially, *reproduction* where tipping point narratives may gain life or momentum, or lose it. 'Place – and context-specific information are often lacking' in understandings of tipping points, with most research 'concentrated in high income countries' (Pereira et al. 2025, 1275), abstracted from their sites of production. Grounding tipping points in the locales and everyday scales from which the ideas emerge offers an important opportunity to critically examine the conditions of their production, reproduction and circulation. Crucially, this also sheds light on *who* is enabled, and disabled, from participating in such discussions and the research underpinning such designations. Alongside this, in global tipping epistemology, the *local* geophysical contexts where a natural system is threatened to collapse are situated as part of a wider, *global*, system. This scale is expected to link local tipping points as part of a domino effect (Ong 2024), providing a prominent discursive strategy to call for *international* action. Critical questioning is necessary to unpack the discursive effect of these scalar framings: how do they relate to political action and to the specific drivers of environmental change, which are far from being global?

3.2 | Looking Beyond the Linearity of Time and the Line

Geographical phenomena take place in time, and temporal dynamics shape geographies. Whilst time has been important in a range of climate change discourse (see Edensor et al. 2020 and associated special issue), particularly around the ways that times of crisis often squeeze 'out time for justice' (Kumar et al. 2025, 5), the specific temporalities of tipping points warrant further scrutiny (see also Garrard 2020). Tipping points are by their essence temporal constructs, speaking (sometimes problematically) to speed and acceleration along a linear line (either towards catastrophe or accelerating efforts to prevent it), whilst simultaneously leading to calls to 'stall' their trajectory, to slow down to prevent a precipice being reached.

As such, *expressions* of time deployed by geographers (including deep, intensive and geological time) are crucial to explore in greater depth. As Colás and Campling (2023, 5) argue in the context of the ocean's varied bio-physicality, 'sometimes contradictory temporal dynamics [are] radically transforming the global ocean and our sense of historical time'. How we make sense of human-nature relations is all too often focused on *our lifetime*. Examining how time is *framed* would create the space to think more carefully about meaningful restitching of 'pasts, presents and futures' (Bulkeley in Kumar et al. 2025, 24). Moreover, as noted by Russill and Lavin (2012, 143, emphasis added) tipping point concepts have 'entered public discourse with *astonishing speed*', their 'sudden' uptake including their 'wide use to reorganise how we perceive and respond to *urgent* events'. This has also worked to define what is widely accepted as 'urgent' in the first place. There is a fundamental temporal disconnect here between justice-oriented approaches and tipping point discourse. As Whyte (2020, 2) argues, relationships are critical and urgent for 'justice orientated' action, yet relationships premised on consent, trust, accountability and reciprocity inherently take time to develop—they are slow and cannot be established urgently. Geographical ideas about time have the potential to shift tipping point discussions towards more oblique engagements centred not on the normative calls for urgency but on a stalling, slowing, or even pausing of unchecked pace and momentum to allow for relational complexities to emerge.

3.3 | Foregrounding Diverse Affects and Effects

As noted, tipping points are associated with catastrophe and a sense of impending doom. Over the past decades, geographers have developed theories of 'affect' which help to make sense of how tipping is intended to mobilise action and resources. Indeed, tipping discourse gives rise to affects, they give the future presence (Anderson 2010, 778) and a sense that 'disaster is incubating' in the here and now (Anderson 2010, 780). In turn, Lenton et al. write (2022, 1), albeit without using the word, that tipping can be *affective*—'[a]ll of us can play a part in triggering positive tipping points' (see also Lenton 2025b, 2025a). Russill (2026) has described 'positive' tipping points as an affective action to counterbalance the 'doom and apocalypse' of climate tipping.

Yet as Pereira et al. write (2025, 1267, emphasis added), there is a need to unpack 'who is being asked to change and where and by whom the impacts of change will be *felt*'. Who is tipping affecting, and affectual for? (and who is it not?). Within this, there is an urgent need for 'more diverse perspectives' on tipping points, with a particular emphasis on 'the inclusion of marginalised voices in offering solutions' (Pereira et al. 2025, 1267). There is scope to expand understandings of normative framings of the tipping concept by unpacking the affective registers of despair and hope, refusal and repair, and to diversify understandings of associated actions and responses beyond any simple binary. This comes through a grounding in the everyday lived experiences and realities of climate change. For Wakefield (2019, 390), outside of white, wealthy contexts, the 'Anthropocene and its possibilities look very different....as the structures of the Anthropocene's ascendant phase splinter, matter and energies are released, opening to new potentials' (Wakefield 2019, 390). These potentials involve resistance and experimentation. The everyday routines and rhythms, the 'less heralded, more mundane responses' to climate change, warrant further attention and foregrounding (Edensor et al. 2020, 256). Diversifying accounts of tipping points, and their widespread affects and *effects*, offers an important corrective to current models and stark representations depicting an ever-rising singular line before the catastrophic drop off. Crucial questions remain about who feels the a/effects of tipping point ascriptions, and who *is* enabled, or prevented from imagining and shaping the futures they represent. Crucially, geography's attention to diverse and plural ontologies raises key questions about who's worlds have *already* tipped (in ways people themselves may describe), who's futures have already been closed, or opened, in different ways by the violence of climate change (see Whyte 2020; Osborne 2019).

4 | Conclusion

The vocabulary of 'tipping points' has become a means to narrate current times, shaping 'how crisis is perceived and understood' (Russill and Lavin 2012, 142), and pointing toward uncertain and

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potentially catastrophic futures. Tipping has garnered special attention in management and policy domains, a comprehensible framework to legitimise environmental governance. Yet, as we have explored, analytical debates on 'tipping' from natural and social sciences vary in their understanding of the irreversibility of such change (Buhr et al. 2025), and in questioning the adequacy of the concept to depict most empirically observed ecological shifts (Norberg et al. 2022) and social changes (Milkoreit 2022). Much of the scientific-political traction around 'tipping' as a way to understand environmental changes comes from the epistemological framing of Earth System Sciences (Lenton et al. 2008; Armstrong McKay et al. 2022). These scientific analyses increasingly push for a kind of 'climate deadline-ism' (Asayama et al. 2019, 570), notably captured by the global target of limiting temperature rise to 1.5 degrees set by the 2015 Paris Climate Agreement.

As we have explored, tipping points are far from being universally accepted, but the ideas, imaginaries and resources that they conjure, matter in the actions and resources it galvanises, not least for governance. A tipping point, despite its simplicity, is 'not a single, complex, planet-wide socio-physical hybrid existing "out there"; nor does it act back upon humans as an objectively knowable set of processes and effects' (Castree 2015, 2). For Russill and Lavin (2012, 144), the presentation of tipping points as scientific fact, has hindered ethical and political debate over their conceptualisation and mobilisation. Moreover, global governance measures emerge from such a particular epistemological scientific framing of the world, shaping dominant discourses of climate change and climate response in management and policy. There is a risk, therefore, that the normative discourses and established imaginaries related to tipping cement further the very coloniality of climate change 'solutions'.

Studies across social sciences have begun to address this through analyses of the discursive work of 'tipping' that have built on each other in time (i.e., Nuttall 2012; van der Hel et al. 2018; Hansson et al. 2025). Yet, as we contend, the analytical apparatus of human geography has an important place in questioning how 'imaginations come to take hold, endure and shape lives' and crucially, how we might also 'detach' or unfix from them (Hawkins 2025, 3). Here an oblique engagement has been highlighted, one that looks from different directions, as well as redirects, debates about tipping. It is an approach that refuses to take tipping at face value, rather adopting a slanted view that is open to seeing tipping otherwise. Geographical thinking allows this obliqueness. Space, scale, time, temporality and a/effect permit a possibility to bring about a more equitable and more problematised deployment of the term.

This is, of course, a challenge for a discipline that is overwhelmingly white (Desai 2017; Esson et al. 2017). We reflect too on our positions as scholars situated within the discipline's dominant whiteness, and as researchers from privileged Global North institutions, and the limits that hence also arise in our intervention from this positionality. We take care to read with critical and decolonial scholarship to further support claims of how 'tipping' can mask the 'diverse dynamics' (Kopp et al. 2025, 29) of both natural and human systems. Drawing from more careful scholarship, we have foregrounded the ways human geography can critically intervene on and question the ways tipping points are formulated and mobilised, often reproducing inequitable narratives of environmental change.

Our intervention invites pause: a pause needed to rupture the momentum and linear trajectories of tipping points and to enable a wider and sustained opening for deeper thinking, and critical questioning. Methodologically, our paper also posits that critical climate change geographies are poised to intervene through institutional ethnographic approaches (i.e., Collaborative Event Ethnography (CEE), see Campbell et al. 2014) to trace the epistemic processes of science that constructs and shapes the world. Practically, such work matters. Tipping points, as political constructs, have consequences on multiple spatial, temporal and a/effective scales that are currently shaping and making new geographies, and ways of being, knowing and understanding the world. Indeed, some people are not allowed to 'describe their worlds freely' in the first place (Schmidt 2022, 942) or their stories and narratives are sidelined in favour of normative descriptions. This intervention therefore calls for further geographical work—theoretical, methodological and practical—centred on critical analysis against a foreground of solution-orientated approaches that collapse subjectivity, and difference, into objective, totalising and ahistorical frameworks.

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Data Availability Statement

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

Endnotes

[1] 'Tipping', 'threshold', 'critical transition' and other associated terminologies are often used interchangeably in the science literature. We focus on 'tipping' here because of its widespread mobilisation in policy and the media.

[2] In the past 20 years, research has been identifying 'increasing numbers of Earth system components … which could possibly exhibit tipping behaviour' (Deutloff et al. 2025, 566). Framed as 'tipping elements', at least 16 features of the Earth system have been identified, each thought to trigger potentially catastrophic change when tipped (see Bradley and Hewitt 2024). As Russill and Nyssa (2009, 340) show, in the early 2000s, such contexts included the Arctic and coral reefs which were understood to be driven 'toward the tipping point of functional collapse' (Hoegh-Guldberg et al. 2007, 737 in Russil and Nyssa 2009, 341). Most recently scientists have noted that the melting of the West Antarctic ice sheet 'may have already passed a tipping point' with 'potential early warning signals of the Greenland ice sheet', and other contexts may be on a similar path (Armstrong McKay et al. 2022, 1).

[3] See https://global-tipping-points.org/ for details of the conference and wider work.

[4] Kopp et al. (2016) use the term 'tipping elements' for this reason.

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