BloEx - Journal
Britain International of
EXACT Sciences Journal
Publish: | January - May - September |
E-ISSN: 2686-1208
P-ISSN: 2686-1216
http://biarjournal.com/index.php/bioex

Carbon, Capital, and Concepts: A Review of New Social Science Vocabularies in the Globalisation–Climate Change Debate

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Abstract:

Climate change represents a fundamental challenge to the conceptual apparatus of the social sciences. The phenomena of global warming carbon flows that ignore borders, supply chains that span continents and vulnerabilities that are unequally distributed – cannot be adequately captured by traditional vocabularies centered on the nation state, international cooperation, or technical mitigation. This review article synthesises the new conceptual vocabulary that has emerged in social science scholarship since the early 2000s, focusing on concepts that explicitly reframe climate change as a problem of globalisation, power, and justice. I identify five thematic clusters: (1) spatial re imaginings (planetary boundaries, anthroposphere, transnational governance); (2) power and historical inequality (carbon democracy, climate colonialism, ecological unequal exchange); (3) justice beyond distribution (loss and damage, just transition, slow violence); (4) critiques of market based solutions (carbon offsets, green growth/degrowth); and (5) temporal and geo social frames (Anthropocene vs. Capitalocene). The review argues that these concepts collectively perform three critical functions: they expose the spatial asymmetries embedded in globalisation, challenge methodological nationalism, and open normative debates about climate justice and transformation. The article concludes by identifying gaps notably the under theorisation of climate finance instruments and the marginalisation of non Western conceptual traditions and proposes a research agenda for the next generation of critical climate social science..

Keywords:
climate change, globalisation, social science, conceptual vocabulary, carbon democracy, climate colonialism, ecological unequal exchange, loss and damage, Anthropocene, just transition

I. Introduction

1.1 The paradox at the heart of climate change

Climate change presents the social sciences with a profound paradox. The causes of global warming are thoroughly globalised: fossil fueled industrialisation, international trade, transnational supply chains, and the relentless expansion of capital have produced a planetary atmospheric transformation. Yet the impacts of climate change are starkly uneven, disproportionately falling on the world's poorest populations and regions that have contributed least to cumulative emissions. The vulnerabilities, adaptations, and political responses to climate change remain stubbornly local, shaped by histories of colonialism, contemporary geopolitical inequalities, and entrenched patterns of marginalisation.

This paradox cannot be adequately addressed with the conceptual tools that have long dominated social science analysis of environmental problems. Traditional vocabularies 'international cooperation', 'emissions reduction', 'resilience', 'carbon neutrality', 'burden sharing' tend to frame climate change as a technical or managerial problem solvable through market mechanisms or interstate agreements. These terms frequently obscure the power

asymmetries, historical responsibilities, and structural drivers that lie at the heart of the climate crisis.

1.2 Purpose and scope of the review

Over the past two decades, a growing body of critical social science scholarship has developed a new conceptual vocabulary to grapple with the climate globalisation nexus. Drawing on political economy, postcolonial studies, political ecology, world systems theory, and feminist geography, scholars have introduced terms that do more than describe: they re politicise climate change, exposing the unequal relations of power, space, and history that shape both causes and responses.

This review article systematically maps this emerging vocabulary. It asks: what new concepts have social scientists introduced since approximately 2000 to understand climate change as a globalisation problem? What intellectual work does each concept perform? What debates and controversies surround these terms? And how do they collectively change our understanding of climate change and its possible remedies?

1.3 Structure of the article

The article proceeds as follows. Section 2 outlines the methodology used to identify and select the concepts reviewed. Section 3 provides brief historical context, tracing the limits of earlier vocabularies. Section 4 presents the core of the review, organising the new vocabulary into five thematic clusters. Section 5 synthesises the key debates and controversies that have emerged around these concepts. Section 6 reflects on what this vocabulary collectively achieves and what it leaves undone – before concluding with a research agenda for future work.

II. Research Method

This review is based on a systematic but not exhaustive search of peer-reviewed social science literature published between 2000 and 2025. Search terms included combinations of 'climate change', 'globalisation/globalization', and keywords such as 'concept', 'vocabulary', 'framework', 'theory', 'justice', 'political economy', 'colonialism', 'governance', and 'Anthropocene'. Databases consulted included Scopus, Web of Science, Google Scholar, and JSTOR.

Inclusion criteria required that a concept met three conditions: (i) it was introduced or significantly theorised in social science scholarship on climate change; (ii) it explicitly addressed the relationship between globalisation and climate change; and (iii) it had gained traction through multiple publications or had sparked substantive debate. The review prioritises concepts that *repoliticise* climate change – that is, that foreground power, inequality, historical responsibility, or structural transformation – over purely technical or managerial terms.

The concepts identified were organised inductively into five thematic clusters, presented below. For each concept, the review provides a definition, identifies key authors and texts, summarises the central argument, notes illustrative debates, and offers a critical assessment.

2.1 Historical Context: From International Relations to Global Political Economy

a. The dominance of methodological nationalism

Much of the early social science literature on climate change operated within the framework of methodological nationalism – the assumption that the nation-state is the natural unit of analysis and that society, territory, and politics neatly coincide (Beck, 2010). The United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol embodied this logic, allocating carbon budgets and reduction targets to states, measuring emissions by national inventories, and constructing a 'common but differentiated responsibilities' framework that, while acknowledging inequality, remained anchored in the state system.

Ulrich Beck (2010) argued forcefully that methodological nationalism is built into the basic concepts of modern sociology and political science, as well as into routines of data collection and analysis. He proposed instead methodological cosmopolitanism an approach that treats the nation as turning around a 'world at risk' rather than the other way around. Climate change, Beck argued, requires a cosmopolitan metamorphosis of the social sciences themselves.

2.2 Limits of the international regimes vocabulary

The language of 'international regimes', 'treaty compliance', 'burden-sharing', and 'capacity building' has been invaluable for certain kinds of policy analysis. But critical scholars have pointed to several limits. First, this vocabulary tends to obscure the role of non-state actors – corporations, cities, Indigenous peoples, social movements whose actions may be as consequential as those of states (Bulkeley & Newell, 2015). Second, it often assumes that the problem is one of coordination among already-constituted states, rather than recognising that the state system itself is a product of uneven globalisation and colonial history (Whyte, 2018). Third, it struggles to account for carbon flows that traverse national boundaries: the emissions embodied in global supply chains, the transboundary impacts of climate-induced migration, and the planetary scale of the Earth system itself.

It is from this dissatisfaction that the new conceptual vocabulary examined in this review has emerged.

2.3. The New Conceptual Vocabulary: Five Thematic Clusters

Cluster A: Re-imagining Spatial Scale

a. Planetary boundaries

The planetary boundaries framework, introduced by Rockström and colleagues (2009), identifies nine Earth system processes – including climate change, biodiversity loss, and nitrogen cycling – each with a scientifically estimated boundary beyond which there is a risk of abrupt or irreversible environmental change. The area within these boundaries is described as a 'safe operating space for humanity' (Rockström et al., 2009, p. 472).

For social scientists, the planetary boundaries framework has been both generative and controversial. On the one hand, it provides a stark biophysical grounding for arguments that globalisation has pushed the Earth system out of Holocene stability. On the other hand, critics argue that the framework is technocratic and depoliticised, treating the boundaries as objective scientific facts rather than as contested social constructs that reflect particular configurations of power and knowledge (Kubiszewski & Costanza, 2013). Moreover, the framework's emphasis on a single 'humanity' can obscure the vastly unequal contributions to crossing those boundaries (Figure 1).

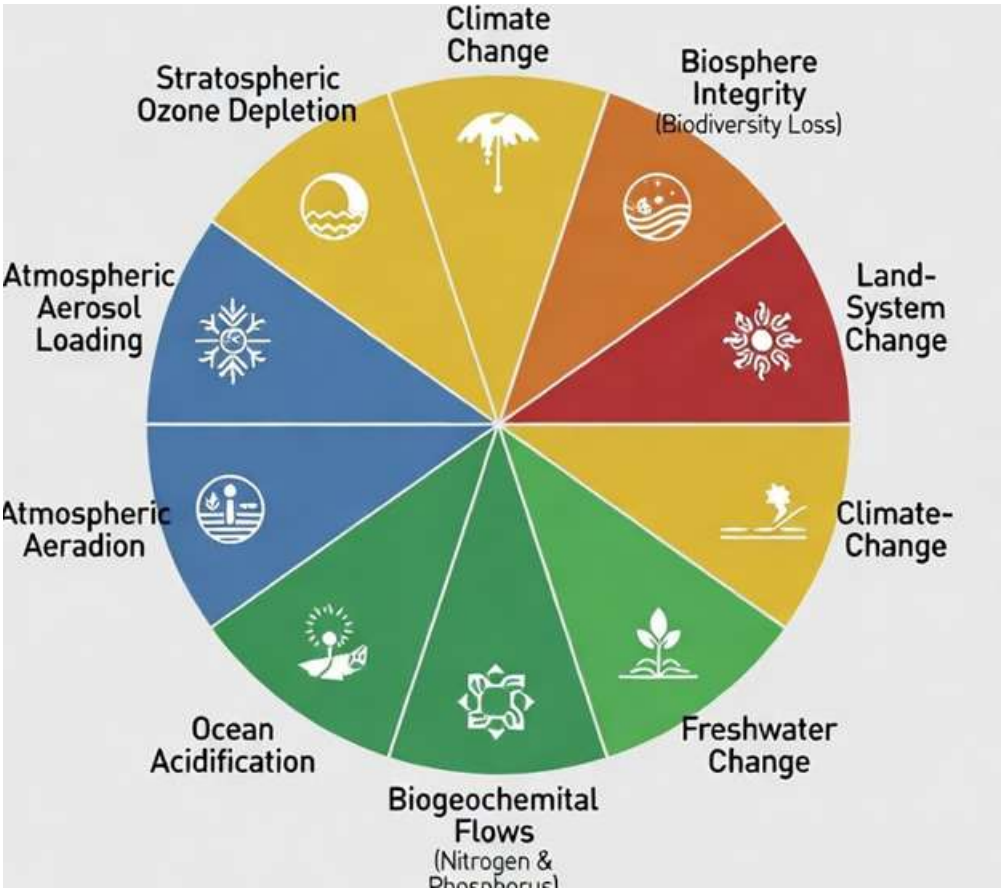

Figure 4. The Planetary Boundaries framework showing the safe operating space for humanity.

b. Anthroposphere and Earth system governance

The concept of the anthroposphere – the human sphere of the Earth system has been developed to emphasise that social and natural processes are not separate but deeply entangled. This framing challenges the nature-society dualism that has long structured Western social thought. It also supports the emergence of Earth system governance as a field of study, one that examines how societies govern the planetary environment (Biermann, 2014).

2.4 Polycentric governance

Influenced by the work of Nobel laureate Elinor Ostrom, the concept of polycentric governance has gained traction as an alternative to state-centric international negotiations. Polycentric systems involve multiple governing authorities at different scales local, regional, national, global – that interact with each other. Ostrom (2010) argued that such systems are more likely to generate effective climate action than a single top-down regime, because they allow for experimentation, learning, and adaptation.

Critical scholars have noted that polycentricity can be a descriptive concept rather than a normative one: a polycentric system is not necessarily just, and can perpetuate inequalities if lower-level authorities are captured by powerful interests (Jordan et al., 2018).

Cluster B: Power and Historical Inequality

2.5 Carbon democracy

Timothy Mitchell's (2011) concept of carbon democracy represents one of the most influential interventions in the political economy of climate change (Figure 2). Mitchell argues that the particular forms of democratic politics that emerged in Western societies in the

nineteenth and twentieth centuries were made possible by the material properties of coal, and later oil. Coal was concentrated and difficult for small numbers of workers to block, which enabled the growth of large-scale labour movements and, eventually, electoral politics; oil, by contrast, flowed through pipelines that could be easily disrupted, producing a different political geometry.

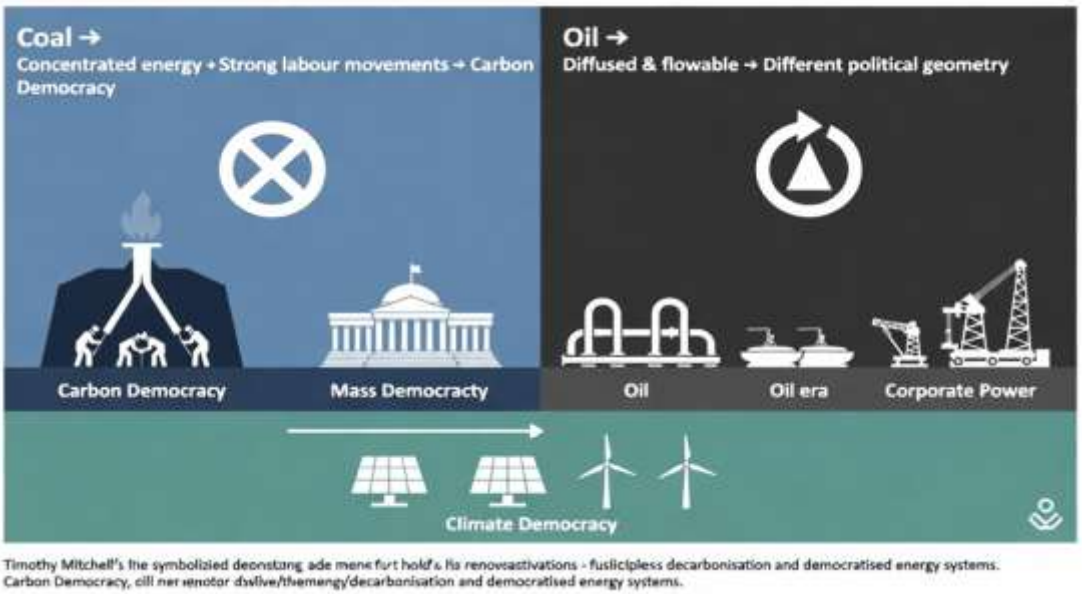

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Figure 2. Carbon democracy: How the material properties of coal and oil shaped democratic politics (Mitchell, 2011).

The concept of carbon democracy has been extended to argue that decarbonisation – the necessary transition away from fossil fuels will fundamentally restructure political possibilities. Some scholars speak of climate democracy as a horizon that requires democratising the energy system itself, not merely adjusting within the existing carbon-based political order (Goodman, 2024). As one commentator notes, three decades of climate policy have affirmed the controlling influence of fossil fuel interests, and achieving global energy transformation at the needed scale requires a democratic transformation to overcome that stranglehold (Goodman, 2024).

2.6 Climate colonialism

The concept of climate colonialism operates at two levels. Historically, it refers to the fact that the industrial revolution and the carbon emissions that have caused climate change – was enabled by colonial extraction of resources, labour, and land from the Global South. Contemporary climate colonialism denotes the ways in which climate mitigation policies replicate colonial logics: land grabs for large-scale solar farms in North Africa to supply European energy; carbon offset projects that displace Indigenous peoples; and the extraction of minerals critical for renewable technologies from the Global South in ways that reproduce unequal power relations (Whyte, 2018; Sultana, 2022).

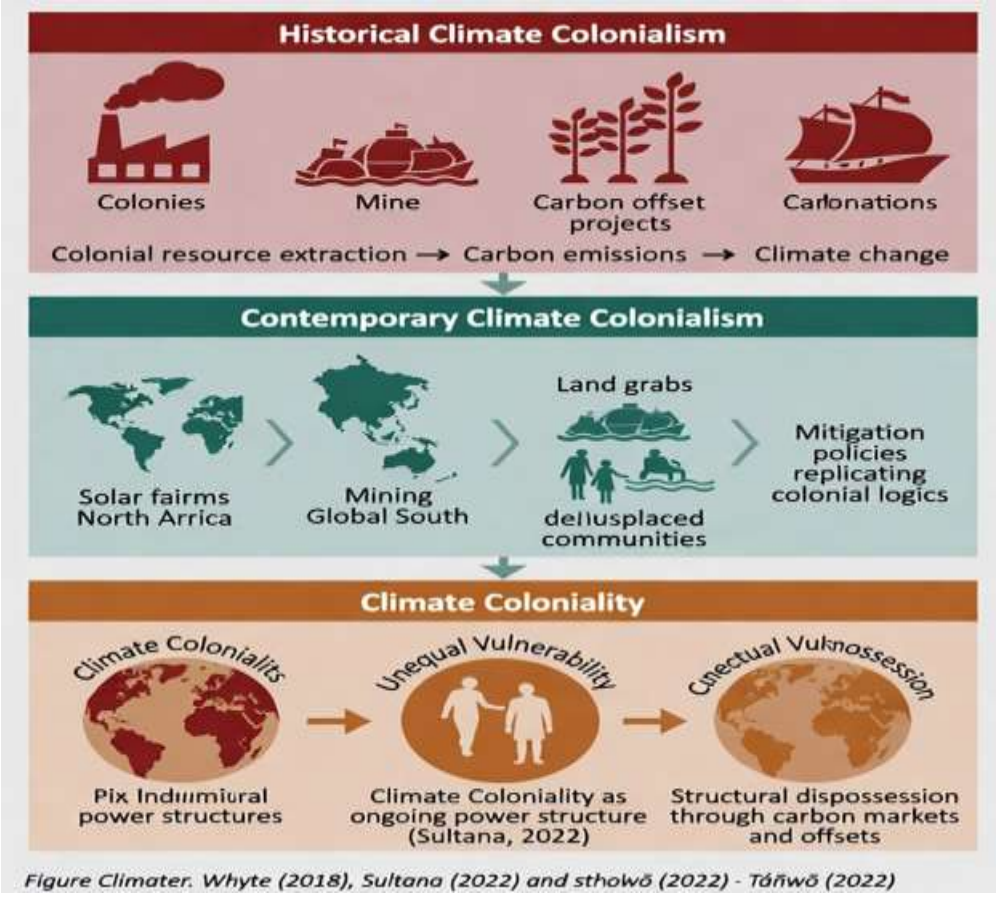

Figure 3. Climate colonialism and climate coloniality: Historical extraction and contemporary power structures.

Farhana Sultana (2022) has recently elaborated the analytic of climate coloniality, arguing that colonialism is not merely a historical antecedent but an ongoing structure of power that shapes vulnerability, adaptation, and policy responses in the present (Figure 3). The coloniality of climate seeps through everyday life across space and time, weighing down and curtailing opportunities and possibilities through global political-economic structures.
Olúfẹ́mi Táíwò (2022) has offered a particularly systematic account of how climate justice demands not merely distribution but structural transformation, arguing that contemporary carbon markets and offset schemes amount to a new form of enclosure that continues the colonial project of dispossession.

2.7 Ecological unequal exchange

Drawing on world-systems theory and Marxist political economy, the concept of ecological unequal exchange holds that global trade is not a mutually beneficial flow of goods and services but a systematic transfer of net resources including energy and materials from the Global South to the Global North (Hornborg, 2013). Rich countries externalise the environmental costs of their consumption to poorer countries, which bear the burden of resource extraction, pollution, and ecosystem degradation (Figure 4).

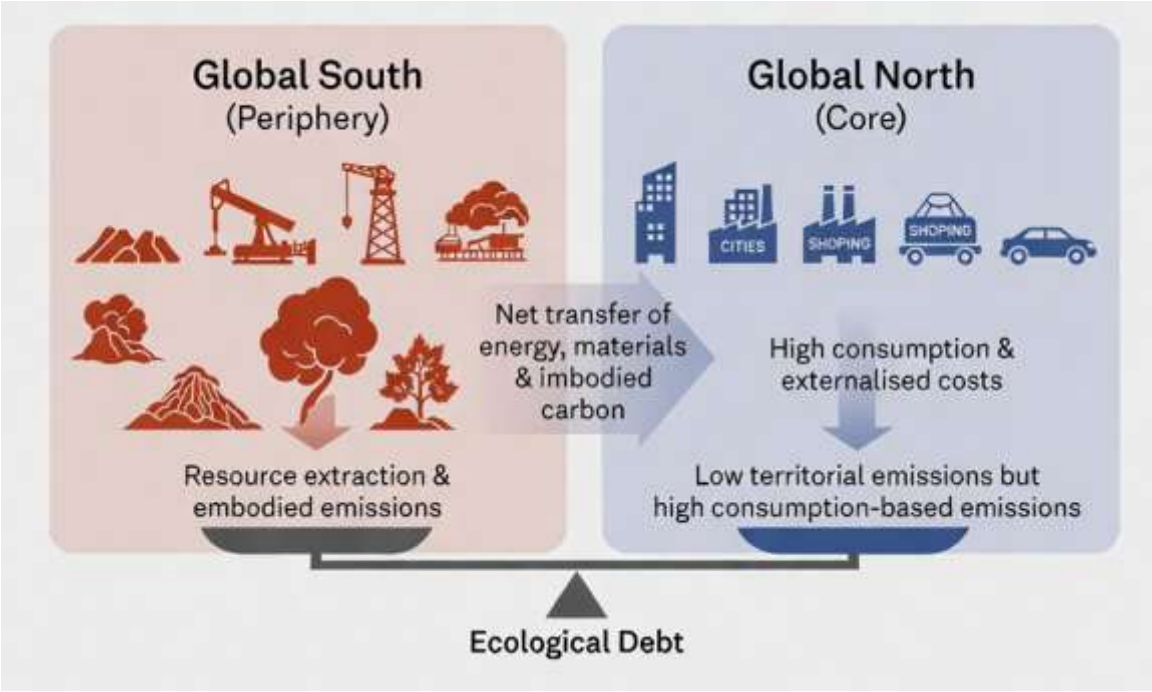

Figure 4. Ecological unequal exchange: Net transfer of resources and embodied emissions from Global South to North.

For climate change, ecological unequal exchange implies that conventional emissions accounting, based on territorial production, systematically underestimates the responsibility of wealthy countries. A full climate justice framework must account for embodied emissions the carbon emitted in producing goods that are exported to richer consumers (Figure 4). Roberts and Parks (2007) documented that this mechanism allows developed countries to partially externalise their consumption-based carbon emissions, creating an 'ecological debt' owed by the Global North to the Global South. Hornborg (2016) has further argued that technical progress is not a cornucopia signifying general human progress but the unevenly distributed result of unequal resource transfers that economics as a discipline is not equipped to perceive.
Cluster C: Justice beyond Distribution

2.8 Loss and damage

Loss and damage (L&D) is both a policy mechanism and a conceptual innovation in climate justice. Traditional climate justice frameworks focused on mitigation (cutting emissions) and adaptation (adjusting to impacts). Loss and damage addresses the residual harm that occurs after mitigation and adaptation have been exhausted harms that are irreversible, such as loss of territory, culture, biodiversity, and human life (Mechler et al., 2020).

The concept has a sharp political charge: it raises the question of *reparations* for climate harm and forces a reckoning with historical responsibility. García-Portela (2024) has developed a rectificatory justice account of loss and damage, arguing that it requires identifying duty-bearers and establishing policy mechanisms for compensation. The inclusion of loss and damage in the final Paris Agreement (2015) and the subsequent establishment of a Loss and Damage Fund at COP28 (2023) marks the concept's movement from activist demands to institutional reality, though its implementation remains deeply contested (Mechler et al., 2020) (Figure 5).

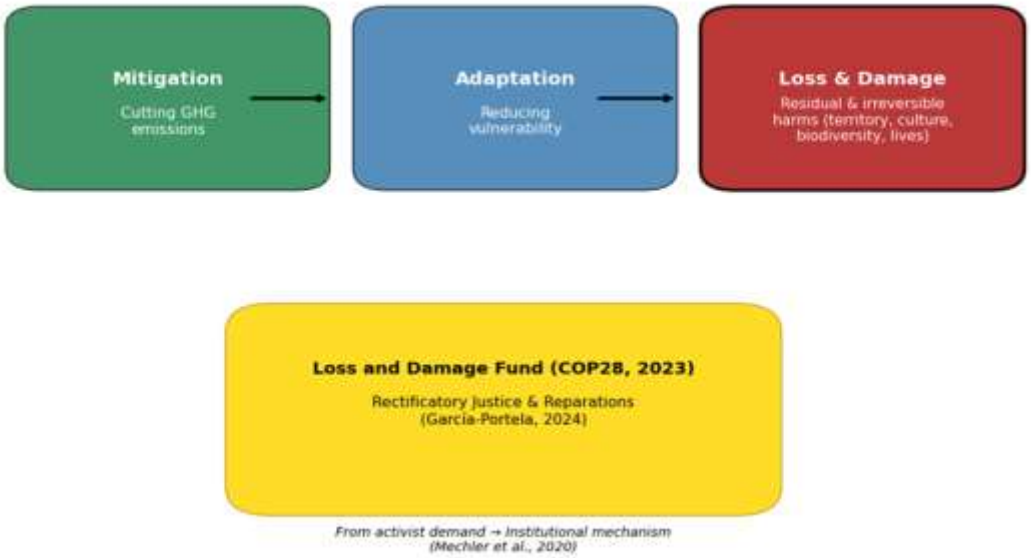

Figure 5. From activist demand to institutional mechanism: the evolution of loss and damage.

The figure presents loss and damage as a third pillar of climate response, positioned beyond mitigation and adaptation. Mitigation cuts GHG emissions, adaptation reduces vulnerability, and loss and damage addresses residual and irreversible harms, including loss of territory, culture, biodiversity, and lives (Mechler et al., 2020). Following COP28 in 2023, a dedicated Loss and Damage Fund was established, operationalising García-Portela's (2024) framework of rectificatory justice and reparations. The lower arrow captures the broader transformation: loss and damage has moved from activist demand to institutional mechanism (Mechler et al., 2020), institutionalising a justice-based approach to the climate crisis.

2.9 Just transition

Originating in North American trade union movements in the 1970s and 1980s, just transition has become a central concept in climate policy. The idea is that the shift from fossil fuels to renewable energy must not only achieve emissions reductions but also protect workers, frontline communities, and vulnerable populations from the economic and social costs of decarbonisation (Newell & Mulvaney, 2013). The concept has been taken up by the International Labour Organization, the UNFCCC (which established a Just Transition Work Programme at COP28), and a growing number of national and sub-national policies.

Social science scholarship has problematised the term by asking: *just for whom, and on whose terms?* There is an important distinction between a thin version of just transition (compensation for displaced workers) and a thick version (democratic ownership of energy systems, transformation of global supply chains, and reparations for historical injustices). Recent research by the Priestley Centre for Climate Futures highlights ongoing debates over competing interpretations of just transition, with Global South advocates advancing a whole-systems vision that was, according to some analyses, undermined by Global North negotiators at COP28.

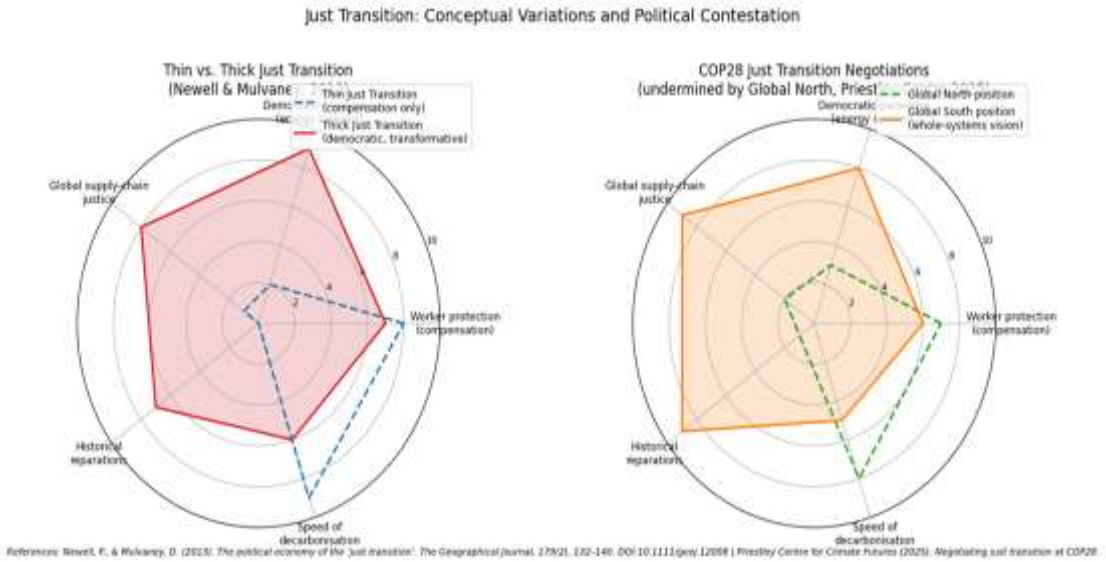

Figure 6. Thin versus thick just transition (left) and COP28 negotiation stances (right).

The left panel contrasts two interpretations of just transition. Following Newell and Mulvaney (2013, p. 133), the "thin" version prioritises worker compensation and rapid decarbonisation, whereas the "thick" version demands democratic energy ownership, global supply-chain justice and historical reparations. The right panel visualises COP28 negotiations. Global South advocates advanced a whole-systems vision, but Global North negotiators successfully narrowed the outcome to labour-focused, sectoral measures (Dietzel, 2025, p. 71). Together, the radar charts show how power asymmetries systematically favour thinner, less transformative just transition pathways, constraining climate justice.

2.10 Slow violence

Rob Nixon's (2011) concept of slow violence captures the attritional lethality of environmental crises – including climate change that unfolds gradually and often invisibly. Unlike the spectacular violence of war or terrorist attacks, slow violence does not fit the conventional news cycle or event-based humanitarian response. It occurs incrementally, through rising sea levels, desertification, ocean acidification, and the everyday degradation of livelihoods. Nixon's central argument is that this temporal lag and representational invisibility systematically disadvantages poor and marginalised communities, who bear the brunt of slow violence while wealthier populations remain insulated.

For climate globalisation, the concept of slow violence helps explain why some harms are politically neglected even though they cumulatively dwarf more dramatic forms of destruction. It also calls for new narrative and analytic strategies – what Nixon calls 'writer-activism' – to render visible these slow-moving catastrophes.

Cluster D: Critiques of Market-Based Solutions

2.11 Carbon offsets and carbon markets

Few concepts have generated as much critical social science attention as carbon offsets and the broader architecture of carbon markets (Article 6 of the Paris Agreement). Offsetting allows firms or countries to pay for emissions reductions elsewhere rather than reducing their own emissions. Proponents argue that markets can achieve emissions reductions at lower cost; critics contend that offsets are a 'licence to pollute' that perpetuates, rather than reduces, fossil fuel dependence.

A substantial critical literature argues that carbon offsetting perpetuates colonial logics. Bachram (2004) and Lohmann (2009) were early critics who framed offsets as a new form of enclosure of the global commons. More recently, research has documented how offset projects in Africa and Latin America displace Indigenous peoples, appropriate land and resources, and externalise environmental costs onto the Global South while allowing Northern emitters to continue business as usual (Bumpus & Liverman, 2008). Work on atmospheric colonisation (Stein & Held, 2025) and blue carbon coloniality (Winter, 2024) extends this critique to emerging forms of carbon trading.

2.12 Green growth vs. degrowth

One of the most consequential debates in contemporary climate social science concerns the feasibility of green growth the proposition that economic growth can be 'decoupled' from emissions and resource use through technological innovation. Hickel and Kallis (2020) subjected this claim to empirical scrutiny and found that absolute decoupling (a reduction in total emissions alongside GDP growth) has not occurred at the global scale and is unlikely to do so given present trends (Figure 7). They argue instead for degrowth: a planned reduction of energy and resource use designed to bring the economy back into balance with the living world.

The degrowth framework has been sharply contested, with critics arguing that it is politically infeasible or that it would harm the Global South's development prospects. Hickel (2023) rejects these criticisms, arguing that development in the Global South cannot take place within the logic of extractive capitalism and that degrowth in wealthy countries is a prerequisite for ecological space for the Global South.

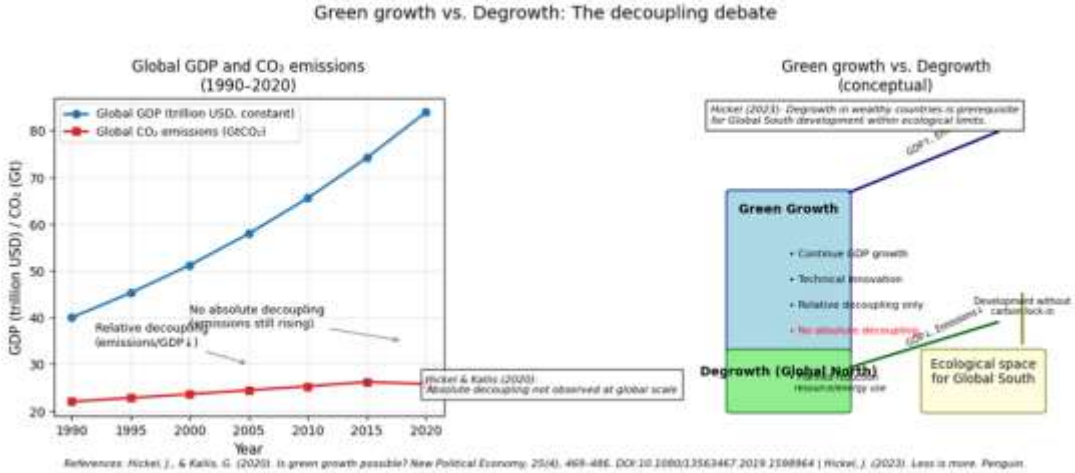

Figure 7. Global decoupling trends (left) and contrasting development pathways (right).

The left panel plots global GDP and CO_2 emissions from 1990 to 2020, demonstrating that while emissions intensity per unit GDP has fallen (relative decoupling), total CO_2 emissions have continued to rise alongside GDP. This empirically confirms that absolute decoupling has not occurred at the global scale (Hickel & Kallis, 2020, p. 470). The right panel contrasts the green growth pathway, which maintains GDP expansion and relies on technical innovation but fails to achieve absolute decoupling with the degrowth alternative. For the Global North, degrowth entails a planned reduction in energy and resource use, thereby creating ecological space for the Global South to develop without carbon lock-in (Hickel, 2020, p. 115).

Cluster E: Temporal and Geo-social Frames

2.13 Anthropocene and its critics

The Anthropocene the proposed geological epoch in which humans have become the primary driver of Earth system change – has been among the most widely diffused concepts linking natural science and social thought. Introduced by atmospheric chemist Paul Crutzen, the Anthropocene has been taken up across the humanities and social sciences as a provocation to rethink the relationship between human and natural history.

The political philosopher Dipesh Chakrabarty (2009) gave the concept its most influential social science articulation, arguing that the Anthropocene forces a collapse of the distinction between natural and human history that has defined modern historical thought. For Chakrabarty, climate change ushers in a new mode of historical consciousness in which the human species – not any particular class, nation, or civilisation is the agent, but in which inequalities of responsibility and vulnerability persist.

2.14 Capitalocene and related alternatives

The Anthropocene concept has faced sustained critique from materialist and postcolonial scholars. Jason Moore (2015) argued forcefully for replacing the Anthropocene with the Capitalocene, a concept that identifies capitalism, not humanity as a species, as the driving force of planetary change. For Moore, the 'anthropos' of the Anthropocene is a false universal that obscures the historical specificity of capitalist relations, including the epochal shift from the Green to Plantationocene.

Andreas Malm (2016) offers a complementary critique in *Fossil Capital*, arguing that the transition from coal to steam power decisively settled in favour of fossil fuels rather than renewable alternatives was not inevitable but was driven by the specific geographies and social relations of early industrial capitalism. Malm emphasises that this was a *choice* of a particular power source, with world-historical consequences.

Other scholars have proposed Plantationocene (Haraway, 2015) and Chthulucene (Haraway, 2016) as alternatives that foreground multispecies relations and the violent legacies of colonial agriculture.

III. Result and Discussion

3.1 Key Debates and Controversies

The emergence of this new conceptual vocabulary has been accompanied by vigorous debates. Table 1 synthesises the most consequential controversies.

Table 1. Major Debates in Climate Globalisation Concepts

Debate	Proponent position	Critical position	Stakes
Anthropocene vs. Capitalocene	Chakrabarty (2009): species-level analysis needed	Moore (2015), Malm (2016): obscures capitalist drivers	Who is the agent of change – 'humanity' or capital?
Methodological nationalism vs. cosmopolitanism	UNFCCC state-centric framing	Beck (2010), Bulkeley & Newell (2015): need transnational analysis	Should we move beyond nation-state emissions inventories?
Carbon markets as solution or problem	World Bank, carbon traders:	Lohmann (2009), Bachram (2004): new	Can globalisation be greened through

	efficient allocation	enclosures, perpetuates emissions	markets?
Resilience vs. transformation	Adaptive management, World Bank	Political ecologists: resilience as neoliberal maintenance	Does resilience preserve unjust systems?
Green growth vs. degrowth	OECD, green technology advocates	Hickel & Kallis (2020): absolute decoupling impossible	Is growth compatible with ecological limits?

3.2 Synthesis, Gaps, and Future Directions

a. What the new vocabulary achieves

The conceptual vocabulary reviewed in this article performs three critical functions. First, it *denaturalises globalisation*. Concepts such as carbon democracy, ecological unequal exchange, and climate colonialism expose global trade, investment, and energy systems as structured by power and history, not as neutral or inevitable flows. They show that what appears as 'development' for some is systematically produced by the underdevelopment of others.

Second, it *challenges methodological nationalism*. Terms like polycentric governance, transnational supply-chain emissions, and loss and damage, which have global but locally differentiated impacts – refuse to be contained within national frameworks. They demand analytic attention to processes that operate above, below, and across the state.

Third, it *opens normative horizons for action*. Concepts such as just transition and degrowth provide positive programmes, while slow violence and loss and damage name harms that conventional frameworks leave invisible. Together, they shift the question from 'what is efficient?' to 'what is just?'

3.3 Gaps and limitations

Despite these achievements, significant gaps remain. One notable lacuna is the under-theorisation of climate-finance instruments – green bonds, debt-for-nature swaps, carbon credits – in critical social science. While there is an extensive policy literature on climate finance, there is relatively little work that deploys the kinds of political-economic concepts reviewed here to analyse how these instruments reproduce or challenge unequal power relations.

A second gap concerns non-Western conceptual traditions. Concepts such as *buen vivir* (living well, from Andean Indigenous movements), *ubuntu* (relational personhood from Southern Africa), and *swaraj* (self-rule from Indian anti-colonial thought) have been proposed as alternatives to dominant climate vocabularies, but they remain largely marginal in mainstream Anglophone social science. Integrating these traditions would enrich the conceptual repertoire and challenge the Eurocentrism of even the 'critical' literature.

A third gap is empirical operationalisation. Many of the concepts reviewed here – ecological unequal exchange, slow violence, climate coloniality – have been developed primarily at the theoretical level. There is a need for systematic empirical research that measures, maps, and tracks these phenomena across time and space.

3.4 Future research agenda

Building on this review, I propose a future research agenda comprising four strands:

1. Empirical studies of ecological unequal exchange at sub-national and sectoral scales, using input-output analysis and supply-chain tracing.

2. Comparative analysis of just transition pathways across different political economies, examining how labour, Indigenous, and environmental movements articulate competing visions of a just transition.
3. Critical examination of climate governance beyond the state, including the role of cities, corporations, and transnational networks, using the analytic tools developed in the polycentric governance literature.
4. Integration of non-Western concepts; *buen vivir*, *ubuntu*, *swaraj* – into mainstream climate social science, both as analytic frameworks and as normative resources.

IV. Conclusion

Climate change is not merely an environmental problem with global dimensions; it is a problem of globalisation itself of the systems of production, trade, finance, and power that have produced the carbon economy. The new conceptual vocabulary of the social sciences reviewed in this article carbon democracy, climate colonialism, ecological unequal exchange, loss and damage, just transition, slow violence, and the Anthropocene–Capitalocene debates collectively re politicises climate change. These terms reveal the hidden spatialities, historical legacies, and power asymmetries that conventional policy vocabularies obscure.

The words we use to describe climate change are not neutral. They orient attention, allocate responsibility, and shape the horizons of political possibility. The vocabulary of 'carbon neutrality' and 'offsetting' suggests that the problem can be solved within the existing order of global capitalism. The vocabulary of 'climate colonialism' and 'ecological debt' suggests, instead, that the order itself must be transformed. The social sciences have a crucial role to play in clarifying these choices and in giving us the words to imagine, and to fight for, a different climate future.

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