

Who Is Responsible for the Climate Crisis? Education, Governance, and the Paradoxes of Modern Development

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ABSTRACT

The accelerating climate crisis—manifested through global warming, sea-level rise, biodiversity loss, resource depletion, and growing food insecurity, has exposed deep contradictions within dominant models of modernization and development. While technological advancement, economic growth, and globalization have long been celebrated as markers of human progress, these same forces have contributed significantly to ecological degradation and climate vulnerability. This paper critically interrogates the question of responsibility for the climate crisis by examining the interconnected roles of education systems, governance structures, development policies, globalization, and technological transformation. Drawing on interdisciplinary literature from environmental education, critical development theory, political ecology, and governance studies, the paper argues that the climate crisis is not the result of isolated failures but of systemic and institutionalized paradigms that prioritize economic growth over ecological sustainability and social justice.

The analysis highlights how education systems have often reproduced growth-centric ideologies, instrumental views of knowledge, and skills-for-growth narratives, while insufficiently fostering ecological consciousness, ethical responsibility, and critical sustainability thinking. At the governance and policy level, weak accountability mechanisms, fragmented environmental regulation, and inequitable development models have exacerbated environmental degradation, particularly in the Global South and climate-vulnerable regions such as small island developing states. The paper further critiques techno-solutionist approaches that frame innovation as a panacea, obscuring structural inequalities and deflecting responsibility from political and institutional actors.

By reframing responsibility as collective, multi-scalar, and historically situated, this study advances a more nuanced understanding of climate accountability that moves beyond blame toward systemic transformation. It proposes a re-conceptualisation of education as a transformative force for ecological literacy, ethical reasoning, and civic engagement, alongside governance reforms that embed transparency, accountability, and sustainability at the core of development decision-making. The paper contributes to contemporary debates by offering an integrated conceptual lens for understanding the paradoxes of modern development and by outlining pathways toward more just, inclusive, and sustainable futures in an era of escalating climate risk.

Keywords: Climate crisis; education systems; governance and accountability; modernization and development; globalization; technological transformation; sustainability; environmental responsibility; Global South; small island developing states.

INTRODUCTION

The climate crisis has emerged as one of the most defining challenges of the twenty-first century, reshaping ecological systems, economies, and patterns of human survival across the globe. Rising global temperatures, accelerating sea-level rise, increasing frequency of extreme weather events, biodiversity loss, resource depletion, and growing food insecurity collectively signal that prevailing models of development and modernization have reached a critical threshold (IPCC, 2023; Steffen et al., 2018). While scientific

consensus affirms the anthropogenic origins of climate change, the deeper question of responsibility, who is accountable for the structures, systems, and ideologies that have produced this crisis, remains contested and politically charged. This paper addresses that question by critically examining the roles of education systems, governance structures, development policies, globalization, and technological transformation in shaping the paradoxes of modern development that underpin the contemporary climate emergency.

Since the mid-twentieth century, modernization and development have largely been framed through growth-

oriented paradigms that prioritize industrialization, economic expansion, technological innovation, and global integration (Escobar, 2012; Sachs, 2015). These paradigms, deeply embedded in national policies and international development agendas, have often positioned environmental concerns as secondary to economic imperatives. As a result, environmental degradation has been normalized as an unintended but acceptable cost of progress (Daly, 2014). Political ecology scholars argue that this framing obscures the uneven distribution of environmental harms and benefits, disproportionately burdening marginalized populations and climate-vulnerable regions, particularly in the Global South (Robbins, 2020). Small island developing states, for example, contribute minimally to global greenhouse gas emissions yet face existential threats from sea-level rise and climate-induced displacement (Nunn, 2019).

Within this broader development trajectory, governance and policy systems play a central role in shaping climate outcomes. Governments act as key mediators between global economic pressures, technological change, and environmental regulation. However, weak accountability mechanisms, fragmented policy frameworks, and short-term political incentives have often undermined effective climate action (Biermann et al., 2012; Meadowcroft, 2011). International climate governance has similarly struggled to reconcile competing national interests, resulting in uneven commitments and limited enforcement of climate agreements (Newell et al., 2021). These governance failures raise fundamental questions about institutional responsibility and the extent to which policy systems have enabled unsustainable development pathways while deflecting accountability through market-based or voluntary mechanisms.

Education systems occupy a particularly critical yet underexamined position in this landscape of responsibility. Education is frequently portrayed as a solution to the climate crisis through initiatives such as education for sustainable development (ESD) and climate literacy programs (UNESCO, 2020). However, critical scholars contend that education systems have simultaneously contributed to the problem by reproducing dominant development ideologies that privilege economic productivity, competitiveness, and technological efficiency over ecological ethics and social responsibility (Sterling, 2016; Orr, 2004). Curricula that emphasize skills for growth, human capital accumulation, and labour market alignment often marginalize environmental justice, indigenous knowledge, and critical engagement with the socio-political drivers of climate change (Lotz-Sisitka et al., 2015). In this sense, education systems are not neutral actors but active participants in shaping how societies understand progress, responsibility, and their relationship with the natural world.

Globalization and technological revolution further complicate

the question of responsibility. Advances in technology are frequently framed as essential solutions to climate change, from renewable energy systems to digital monitoring and climate-smart agriculture. While technological innovation is undeniably important, scholars caution against technosolutionism, the assumption that technological fixes alone can resolve fundamentally political and structural problems (Morozov, 2014; Selwyn, 2023). Such narratives risk depoliticizing the climate crisis by shifting attention away from consumption patterns, power relations, and historical responsibility, while reinforcing the very systems of production and extraction that drive environmental degradation (Hickel, 2020). Moreover, globalization has intensified resource exploitation and carbon-intensive supply chains, often externalizing environmental costs to less powerful regions and communities (Harvey, 2014).

Against this backdrop, the question “Who is responsible for the climate crisis?” cannot be answered through simplistic attribution to individual behaviour or isolated policy failures. Responsibility must instead be understood as systemic, multi-scalar, and historically situated, encompassing institutions, ideologies, and structures that shape collective decision-making over time (Young, 2011). This paper adopts a critical interdisciplinary lens to explore how education systems, governance frameworks, development policies, globalization, and technological paradigms interact to produce the paradoxes of modern development—simultaneously advancing material progress while undermining ecological sustainability.

The purpose of this paper is threefold. First, it critically examines how dominant development and modernization paradigms have shaped institutional responses to environmental challenges, with particular attention to governance and policy accountability. Second, it interrogates the role of education systems in reproducing or challenging growth-centric and anthropocentric worldviews. Third, it advances a reconceptualization of responsibility that foregrounds ethical accountability, ecological literacy, and structural transformation rather than individual blame. By doing so, the paper contributes to ongoing debates in environmental education, development studies, and climate governance, offering an integrated conceptual framework for understanding responsibility in an era of escalating climate risk.

In positioning education and governance as central, not peripheral, to climate accountability, this study underscores the need for transformative shifts in how societies define progress, success, and responsibility. Such a reframing is particularly urgent for climate-vulnerable regions, including small island and Global South contexts, where the consequences of global development failures are most acutely felt. Ultimately, the paper argues that

confronting the climate crisis requires not only technological innovation and policy reform but also a fundamental reorientation of educational purpose and governance ethics toward sustainability, justice, and intergenerational responsibility.

Literature Review

Modernization, Development, and the Roots of the Climate Crisis

Modernization theory has long framed development as a linear progression toward industrialization, technological advancement, and economic growth, often positioning Western models of progress as universal benchmarks (Rostow, 1960; Sachs, 2015). While these paradigms have contributed to improvements in material living standards, critics argue that they have simultaneously entrenched extractive economic systems and unsustainable consumption patterns that drive climate change and ecological degradation (Daly, 2014; Escobar, 2012). The pursuit of growth-oriented development has normalized environmental externalities, treating pollution, biodiversity loss, and resource depletion as collateral damage rather than structural failures of the development model itself (Hickel, 2020).

Political ecology scholars emphasize that the impacts of such development pathways are unevenly distributed, disproportionately affecting marginalized communities and regions with limited political and economic power (Robbins, 2020). Small island developing states and many Global South contexts contribute minimally to global emissions yet experience the most severe consequences of sea-level rise, food insecurity, and climate-induced displacement (Nunn, 2019; IPCC, 2023). This asymmetry has fuelled debates around historical responsibility and climate justice, challenging narratives that frame the climate crisis as a shared but equal burden (Shue, 2014).

Despite this growing body of critique, much of the literature treats modernization and climate change at a macro-structural level, with limited interrogation of how specific institutions, particularly education systems, have sustained or challenged dominant development ideologies over time. This gap limits a deeper understanding of institutional responsibility in the reproduction of climate-unsustainable worldviews.

Governance, Policy, and Accountability in Climate Action

Governance systems play a critical role in mediating the relationship between development and environmental sustainability. Effective climate governance requires coherent policy frameworks, transparent decision-making, and accountability mechanisms that align economic, social, and

environmental objectives (Biermann et al., 2012). However, empirical and conceptual studies consistently highlight governance failures, including fragmented environmental policies, weak enforcement, short-term political incentives, and the prioritization of economic growth over ecological protection (Meadowcroft, 2011; Newell et al., 2021).

At the global level, international climate agreements have been criticized for their reliance on voluntary commitments and market-based mechanisms that lack enforceability and fail to address structural inequalities between nations (Paterson, 2018). Nationally, governance challenges often manifest through policy incoherence, opaque resource allocation, and limited public participation in environmental decision-making (Bovens et al., 2018). These weaknesses raise questions about institutional accountability and the extent to which governments have enabled unsustainable development trajectories while shifting responsibility onto individuals and communities.

While governance literature has extensively examined policy design and institutional capacity, fewer studies explicitly connect governance accountability with education systems as co-constitutive actors in shaping climate responses. This separation obscures how policy failures and educational priorities mutually reinforce development paradigms that marginalize sustainability and justice.

Education Systems and the Reproduction of Development Ideologies

Education is widely positioned as a key lever for addressing climate change through initiatives such as education for sustainable development (ESD), climate change education, and environmental literacy (UNESCO, 2020). These approaches emphasize knowledge acquisition, behavioural change, and awareness-raising as pathways to sustainability. However, critical scholars argue that mainstream education systems often reproduce the very ideologies that underpin ecological degradation, including anthropocentrism, economic instrumentalism, and human capital logics (Orr, 2004; Sterling, 2016).

Curricula oriented toward employability, productivity, and competitiveness tend to privilege skills for economic growth while marginalizing ethical reasoning, ecological worldviews, and critical engagement with power relations and historical responsibility (Lotz-Sisitka et al., 2015). From a critical pedagogy perspective, this limits education's transformative potential and positions learners as future economic actors rather than ecological citizens (Freire, 1970; Selby & Kagawa, 2018). Moreover, indigenous and local knowledge systems, particularly in

the Global South and Pacific contexts, are frequently underrepresented, despite their relevance for sustainability and climate resilience (Nabobo-Baba, 2013; Smith, 2021).

Although the literature acknowledges the promise of transformative and critical environmental education, there remains limited empirical and conceptual work examining education systems as sites of responsibility rather than merely instruments for solution delivery. This gap constrains deeper accountability debates within climate scholarship.

Globalization, Technology, and the Limits of Techno-Solutionism

Technological innovation is often presented as a central solution to the climate crisis, with renewable energy, digital monitoring systems, and climate-smart technologies framed as pathways to sustainable development (IEA, 2022). While technology plays an important role, critics caution against techno-solutionism, the belief that technological fixes can resolve complex socio-ecological problems without addressing underlying political and economic structures (Morozov, 2014; Selwyn, 2023).

Globalization has amplified this dynamic by accelerating production, consumption, and resource extraction through global supply chains, often externalizing environmental costs to less regulated and economically vulnerable regions (Harvey, 2014). Technological progress, when embedded within growth-centric economic models, may reduce emissions in specific sectors while simultaneously increasing overall consumption and ecological footprints, a phenomenon known as the rebound effect (Jackson, 2017).

The literature increasingly calls for more critical engagement with the political economy of technology and globalization, yet these discussions are often disconnected from analyses of education and governance. This fragmentation limits holistic understandings of how responsibility for climate outcomes is distributed and obscured across systems.

Climate Responsibility, Ethics, and Justice

Debates around climate responsibility have expanded beyond emissions accounting to include ethical considerations of historical responsibility, capacity, and vulnerability (Shue, 2014; Young, 2011). Climate justice frameworks emphasize that responsibility is not equally shared and that those who have benefited most from fossil-fuel-driven development bear greater obligations for mitigation and adaptation support (Hickel, 2020). These perspectives challenge individualistic narratives that frame climate change as the result of personal lifestyle choices rather than systemic decisions.

However, ethical discussions of responsibility often remain abstract and insufficiently linked to institutional practices within education and governance systems. As a result, responsibility is frequently moralized without being operationalized through concrete institutional reform, limiting its transformative potential.

Identified Research Gaps

Drawing from the reviewed literature, several critical gaps emerge:

1. **Limited integration of education into climate responsibility debates**
Existing literature often positions education as a solution tool rather than as an institution that may reproduce unsustainable development ideologies and thus share responsibility for the climate crisis.
2. **Fragmentation between governance, education, and development studies**
Governance, education, and climate scholarship largely operate in silos, resulting in limited interdisciplinary analyses of how these systems interact to shape climate outcomes.
3. **Insufficient focus on systemic and institutional responsibility**
Many studies emphasize individual behaviour change or policy instruments while underexploring institutional accountability and historical responsibility embedded in development paradigms.
4. **Underrepresentation of Global South and small island perspectives**
Despite their vulnerability, Pacific and Global South contexts remain marginal in theoretical debates on responsibility, modernization, and climate governance.
5. **Overreliance on techno-solutionist narratives**
The literature lacks critical examination of how technology-driven climate solutions may reinforce existing power structures and deflect responsibility from systemic reform.

Research Direction Emerging from the Gaps

Addressing these gaps requires an integrated analytical framework that situates education systems, governance structures, development ideologies, globalization, and technological paradigms within a shared responsibility for the climate crisis. Such an approach can move climate discourse beyond blame toward structural accountability and transformative change.

Table 1. Modern Development Paradigms and Their Environmental Consequences

Development Paradigm	Core Assumptions	Key Actors	Environmental Consequences	Key References
Modernization theory	Linear progress, industrial growth, technological advancement	States, development agencies	Fossil fuel dependence, ecological degradation	Rostow (1960); Escobar (2012)
Neoliberal development	Market efficiency, privatization, globalization	Governments, corporations	Resource extraction, carbon-intensive supply chains	Harvey (2014); Hickel (2020)
Techno-centric development	Technology as solution to all problems	Tech sector, policymakers	Techno-solutionism, rebound effects	Morozov (2014); Selwyn (2023)
Alternative/critical development	Sustainability, justice, ecological limits	Communities, civil society	Potential for regenerative and just futures	Daly (2014); Sachs (2015)

THEORETICAL FRAMEWORK

This study is anchored in an integrated theoretical framework that brings together Critical Development Theory, Political Ecology, and Critical Environmental Education to interrogate responsibility for the climate crisis. Together, these perspectives enable a systemic examination of how dominant development paradigms, governance structures, and education systems have shaped socio-ecological outcomes, while also illuminating pathways for transformative change. Rather than attributing climate change to isolated actors or behaviours, this framework conceptualizes responsibility as structural, institutional, and historically embedded within modern development processes.

Critical Development Theory: Questioning the Logic of Progress

Critical Development Theory challenges the foundational assumptions of mainstream development discourse, particularly the notion that economic growth, industrialization, and technological advancement inherently lead to human well-being (Escobar, 2012; Sachs, 2015). From this perspective, development is understood not as a neutral or universal process, but as a historically situated project shaped by power relations, colonial legacies, and neoliberal economic priorities. Critical development scholars argue that growth-centric models have systematically marginalized ecological sustainability and social justice, framing environmental degradation as an externality rather than a structural consequence of development choices (Daly, 2014; Hickel, 2020).

Within this framework, the climate crisis is viewed as a manifestation of the contradictions of modern development. Policies that prioritize GDP growth, market efficiency, and global competitiveness have intensified resource extraction, fossil fuel dependence, and ecological disruption, particularly in the Global South (Harvey, 2014). Critical Development Theory therefore provides a lens for interrogating who benefits from development and who bears its environmental costs, foregrounding questions of historical responsibility and ethical accountability. In the context of this study, it enables an examination of how education and governance systems have internalized and reproduced development ideologies that normalize unsustainable practices.

Political Ecology: Power, Inequality, and Environmental Governance

Political Ecology complements Critical Development Theory by focusing explicitly on the relationships between power, politics, and environmental change. It examines how environmental problems are socially constructed and politically mediated, emphasizing that ecological outcomes are inseparable from governance structures, economic systems, and social inequalities (Robbins, 2020). Political ecologists argue that environmental degradation is not merely a technical or managerial issue but a deeply political process shaped by unequal access to resources, decision-making power, and institutional influence (Bryant, 2015).

From a political ecology perspective, the climate crisis reflects failures of governance and accountability across multiple scales, from global climate regimes to national

policies and local practices (Biermann et al., 2012). Powerful actors, including states, corporations, and international institutions, often shape environmental policies in ways that protect economic interests while shifting environmental risks onto marginalized communities (Newell et al., 2021). This lens is particularly relevant for understanding the vulnerability of small island developing states and Global South contexts, where historical exploitation and contemporary policy constraints intersect to amplify climate impacts (Nunn, 2019). Political Ecology also challenges techno-solutionist narratives by highlighting how technological interventions can reinforce existing power structures if not accompanied by democratic governance and social accountability (Morozov, 2014). In this study, Political Ecology informs the analysis of governance systems and policy frameworks, emphasizing the need to examine who makes decisions, whose knowledge counts, and who is held accountable for climate outcomes.

Critical Environmental Education: Education as Responsibility, Not Neutrality

Environmental Education, particularly in its critical and transformative forms, provides a crucial lens for examining the role of education systems in shaping climate responsibility. Traditional approaches to environmental education often focus on awareness-raising, behaviour change, and technical knowledge acquisition (UNESCO, 2020). While valuable, critical scholars argue that such approaches risk depoliticizing environmental issues by neglecting the structural drivers of ecological degradation (Sterling, 2016; Selby & Kagawa, 2018).

Critical Environmental Education draws on critical pedagogy to position education as a site of ethical engagement, political consciousness, and transformative learning (Freire, 1970; Orr, 2004). It emphasizes the cultivation of ecological literacy, systems thinking, and moral responsibility, enabling learners to critically interrogate dominant narratives of progress and development. From this perspective, education systems are not merely instruments for solving the climate crisis but institutions that have historically contributed to it by privileging anthropocentric, growth-oriented, and market-driven worldviews (Lotz-Sisitka et al., 2015).

This theoretical lens is particularly salient in Global South and indigenous contexts, where education systems often marginalize local ecological knowledge and alternative development paradigms (Nabobo-Baba, 2013; Smith, 2021). Integrating Critical Environmental Education into this framework allows the study to examine how education can either reproduce or resist unsustainable development logics and to reconceptualize education as a central site of climate accountability.

Integrating the Frameworks: A Multi-Scalar

Understanding of Responsibility

The integration of Critical Development Theory, Political Ecology, and Critical Environmental Education enables a comprehensive understanding of responsibility for the climate crisis as multi-scalar and relational. Critical Development Theory situates responsibility within global economic systems and historical development trajectories. Political Ecology exposes the power relations and governance failures that mediate environmental outcomes. Critical Environmental Education foregrounds the role of knowledge production, values, and learning in shaping societal responses to climate change.

Together, these perspectives challenge reductionist explanations of the climate crisis and reject narratives that place disproportionate responsibility on individuals. Instead, they emphasize the need for systemic transformation across education, governance, and development institutions. This integrated framework guides the analysis of how modernization and development paradoxes have been sustained through policy choices, educational priorities, and technological narratives, while also identifying pathways for reorienting these systems toward sustainability, justice, and intergenerational responsibility.

Theoretical Contribution of the Study

By synthesizing these three theoretical traditions, this study contributes a holistic framework for examining climate responsibility that bridges disciplinary silos. It advances climate scholarship by positioning education systems as central, rather than peripheral, to debates on accountability and sustainability, and by linking ethical responsibility to concrete institutional practices. This framework also provides a foundation for future empirical and policy-oriented research, particularly in climate-vulnerable contexts such as small island developing states.

DISCUSSION AND ANALYSIS

Modern Development and the Structural Production of the Climate Crisis

The analysis affirms that the climate crisis cannot be understood as an unintended by-product of otherwise successful development, but rather as a structural outcome of dominant modernization paradigms. Critical Development Theory highlights how economic growth, industrial expansion, and technological progress have been institutionalized as unquestioned markers of success, despite their reliance on fossil fuels, extractive resource use, and ecological degradation (Escobar, 2012;

Daly, 2014). This growth-centric logic has been normalized through policy frameworks, international development agendas, and education systems, rendering environmental destruction both invisible and politically acceptable.

From this perspective, responsibility for the climate crisis lies not solely with individual actors but with the institutional architectures that have privileged short-term economic gains over long-term ecological sustainability. As Hickel (2020) argues, high-income economies have historically externalized environmental costs to the Global South, reinforcing global inequalities while accelerating climate change. This finding aligns with political ecology analyses that emphasize how power asymmetries shape environmental outcomes, with vulnerable regions bearing disproportionate climate risks despite contributing minimally to global emissions (Robbins, 2020; IPCC, 2023).

Governance Failures and the Limits of Climate Accountability

Governance systems emerge as central sites of responsibility in the climate crisis. Despite growing policy commitments to sustainability, governance structures have often failed to translate climate goals into enforceable action. Fragmented regulatory frameworks, weak accountability mechanisms, and competing economic priorities have undermined meaningful climate governance at both national and international levels (Meadowcroft, 2011; Newell et al., 2021). Market-based approaches, such as carbon trading and voluntary emissions reductions, have further shifted responsibility away from structural reform toward technocratic management, often with limited effectiveness.

Political ecology provides critical insight into these failures by foregrounding questions of power and decision-making. Climate policies are frequently shaped by powerful economic interests, resulting in compromises that protect industrial and corporate actors while marginalizing environmental and social justice concerns (Paterson, 2018). This dynamic is particularly evident in the Global South, where limited fiscal and political capacity constrains the implementation of ambitious climate policies, despite heightened vulnerability (Biermann et al., 2012). The analysis thus reinforces the argument that governance responsibility must be understood in terms of both action and inaction, including the failure to regulate harmful practices and to protect marginalized communities.

Education Systems and the Reproduction of Climate-Unsustainable Worldviews

A key contribution of this study lies in its critical examination of education systems as sites of climate responsibility. While education is frequently positioned as a solution to

environmental challenges, the analysis suggests that mainstream education systems have historically reinforced growth-oriented and anthropocentric worldviews that underpin unsustainable development (Sterling, 2016; Orr, 2004). Curricular emphasis on employability, productivity, and human capital development often sidelines ecological ethics, critical sustainability thinking, and systemic analyses of environmental problems.

Critical Environmental Education theory highlights the contradiction inherent in expecting education systems to solve a crisis they have helped reproduce. As Lotz-Sisitka et al. (2015) observe, education for sustainable development risks becoming performative when it operates within the same economic paradigms that drive ecological degradation. Moreover, the marginalization of indigenous and local ecological knowledge, particularly in Global South and small island contexts, limits education's capacity to foster place-based sustainability and climate resilience (Nabobo-Baba, 2013; Smith, 2021).

The analysis underscores the need to reconceptualize education as a space for ethical engagement and political responsibility, rather than merely a mechanism for skills transmission or behaviour change. Such a shift aligns with Freire's (1970) vision of education as a practice of freedom and with calls for transformative learning that challenges dominant narratives of progress and development.

Globalization, Technology, and the Illusion of Solutionism

Technological innovation and globalization are often framed as essential pathways to climate mitigation and adaptation. While technological advances are necessary, the analysis cautions against techno-solutionist narratives that obscure structural drivers of the climate crisis (Morozov, 2014; Selwyn, 2023). Political ecology reveals that technological solutions frequently operate within existing power structures, benefiting those with access to capital and expertise while excluding marginalized communities.

Globalization has intensified this dynamic by enabling resource extraction and carbon-intensive production to be geographically displaced, masking environmental impacts from consumers in wealthier nations (Harvey, 2014). The rebound effect further complicates technological optimism, as efficiency gains are often offset by increased consumption (Jackson, 2017). These findings suggest that technology alone cannot resolve the climate crisis without fundamental changes to consumption patterns, governance systems, and educational priorities.

Rethinking Responsibility: From Blame to Structural

Accountability

One of the central insights emerging from this discussion is the need to move beyond individualistic notions of responsibility toward a framework of structural accountability. Climate discourse frequently emphasizes personal behaviour change, such as reducing consumption or carbon footprints, while underplaying the role of institutions that shape available choices and development trajectories (Young, 2011). This analysis, informed by Critical Development Theory and Political Ecology, reframes responsibility as collective, institutional, and historically situated.

Such a reconceptualization has significant implications for education and governance. Education systems must move beyond instrumental sustainability messaging to cultivate critical consciousness, ethical reasoning, and civic engagement. Governance systems, in turn, must embed transparency, accountability, and equity into development decision-making, recognizing their role in perpetuating or challenging climate-unsustainable pathways (Bovens et al., 2018).

Implications for Climate-Vulnerable and Global South Contexts

The analysis holds particular relevance for climate-vulnerable regions, including small island developing states and broader Global South contexts. These regions exemplify the paradoxes of modern development, experiencing the most severe climate

impacts despite limited responsibility for global emissions (Nunn, 2019; IPCC, 2023). Political ecology highlights how historical exploitation, constrained policy space, and dependence on external development models limit adaptive capacity and exacerbate vulnerability.

For these contexts, transformative change requires both global accountability and localized educational and governance reform. Integrating indigenous knowledge, strengthening participatory governance, and reorienting education toward sustainability and resilience are critical steps toward addressing climate injustice (UNESCO, 2020; Nabobo-Baba, 2013). The analysis thus reinforces the argument that responsibility for the climate crisis is not evenly distributed and that equity must be central to climate solutions.

Synthesis of Findings

Taken together, the discussion reveals that the climate crisis is the cumulative outcome of interconnected systems of development, governance, education, globalization, and technology. Responsibility emerges not as a matter of isolated failure but as a product of institutionalized priorities and power relations. By integrating critical development theory, political ecology, and environmental education, this study provides a comprehensive framework for understanding these dynamics and underscores the necessity of systemic transformation.

Table 2. Multi-Scalar Institutional Responsibility for the Climate Crisis

Institutional Domain	Role in Climate Crisis	Mechanisms of Responsibility	Accountability Gaps	Key References
Education systems	Reproduction of growth-centric worldviews	Curriculum priorities, human capital logic	Limited critical sustainability education	Orr (2004); Sterling (2016)
Governance and policy	Regulation and enforcement	Weak climate governance, policy incoherence	Poor accountability, political short-termism	Meadowcroft (2011); Newell et al. (2021)
Global economic system	Resource extraction and consumption	Global supply chains, externalization of costs	Power asymmetries, climate injustice	Harvey (2014); Hickel (2020)
Technological systems	Framed as solutions	Techno-solutionism	Deflection from structural reform	Morozov (2014); Selwyn (2023)

CONCLUSION

This paper set out to interrogate a fundamental and often overlooked question: *who is responsible for the*

contemporary climate crisis? Drawing on Critical Development Theory, Political Ecology, and Critical Environmental Education, the analysis demonstrates that the climate emergency is not the result of isolated policy failures or individual behaviour alone, but the cumulative outcome of institutionalized development paradigms that prioritize economic growth, technological efficiency, and global competitiveness over ecological sustainability and social justice. Modernization and development, long celebrated as pathways to progress, have instead produced deep environmental contradictions that now threaten planetary and human survival (Escobar, 2012; Daly, 2014; IPCC, 2023). The findings highlight that responsibility for the climate crisis is structural, systemic, and historically situated. Governance systems have often failed to enforce meaningful accountability, allowing environmentally destructive practices to persist under the guise of development and innovation (Meadowcroft, 2011; Newell et al., 2021). Education systems, while frequently positioned as solutions, have simultaneously reproduced growth-centric and anthropocentric worldviews that limit critical engagement with sustainability, ethics, and environmental justice (Sterling, 2016; Orr, 2004). Globalization and technological transformation have further obscured responsibility by externalizing environmental costs and promoting techno-solutionist narratives that divert attention from the political and institutional roots of the crisis (Morozov, 2014; Hickel, 2020).

Importantly, the paper underscores that the burdens of climate change are unevenly distributed. Climate-vulnerable regions, particularly small island developing states and broader Global South contexts, face existential risks despite contributing minimally to global emissions (Nunn, 2019; IPCC, 2023). This asymmetry exposes profound injustices embedded within global development systems and reinforces the ethical imperative for differentiated responsibility and collective action. By reframing responsibility as institutional rather than individual, this study contributes to a more nuanced and just understanding of climate accountability.

WAY FORWARD: POLICY AND EDUCATION IMPLICATIONS

Addressing the climate crisis requires transformative change that extends beyond incremental policy adjustments and technological fixes. The way forward must involve systemic reorientation of governance frameworks, education systems, and development priorities toward sustainability, justice, and long-term ecological resilience.

Reorienting Development and Governance Paradigms

At the policy level, governments must critically reassess

growth-centric development models that treat environmental degradation as an acceptable trade-off. Integrating ecological limits into national development planning and budgeting processes is essential for aligning economic activity with planetary boundaries (Daly, 2014; Rockström et al., 2009). Governance systems should embed transparency and accountability mechanisms that enable public scrutiny of environmental decision-making, resource allocation, and climate commitments (Bovens et al., 2018). This includes strengthening regulatory frameworks, enforcing environmental protections, and ensuring that climate policies are not undermined by short-term political or economic interests.

Internationally, climate governance must move beyond voluntary commitments toward more equitable and enforceable mechanisms that recognize historical responsibility and differentiated capacity (Shue, 2014; Newell et al., 2021). For climate-vulnerable regions, particularly small island developing states, global support for adaptation, loss and damage, and climate finance must be scaled up and governed transparently to ensure effectiveness and fairness (IPCC, 2023).

Transforming Education Systems for Climate Responsibility

Education systems occupy a pivotal position in shaping future development trajectories and must be reconceptualized as sites of climate responsibility rather than neutral instruments of skills delivery. Curricula at all levels should prioritize ecological literacy, systems thinking, ethical reasoning, and critical engagement with the socio-political drivers of climate change (Sterling, 2016; UNESCO, 2020). Moving beyond narrow employability and human capital frameworks, education should cultivate learners as ecological citizens capable of questioning dominant development narratives and participating meaningfully in democratic decision-making. Critical Environmental Education offers a pathway for such transformation by integrating sustainability with social justice, indigenous knowledge, and place-based learning (Lotz-Sisitka et al., 2015; Nabobo-Baba, 2013). In Global South and Pacific contexts, valuing indigenous epistemologies and local ecological knowledge can strengthen climate resilience while challenging externally imposed development models that marginalize local priorities (Smith, 2021). Teacher education and professional development must also be reoriented to support transformative pedagogies that empower educators as agents of change rather than transmitters of static content.

Moving Beyond Techno-Solutionism

While technological innovation remains important, it must be embedded within broader social, political, and educational transformations. Policymakers and educators should resist techno-solutionist narratives that frame innovation as a substitute for systemic reform (Morozov, 2014; Selwyn, 2023). Instead, technology should be approached critically, with attention to equity, access, and its role in either reinforcing or challenging existing power relations. Education can play a key role in fostering critical digital and environmental literacy that enables learners to evaluate technological solutions within their social and ecological contexts.

Toward Collective and Intergenerational Responsibility

Ultimately, confronting the climate crisis requires a shift from individualized notions of responsibility toward collective and intergenerational accountability. Education and governance systems must work in tandem to cultivate ethical commitments that extend beyond immediate economic interests to include future generations and non-human life (Young, 2011; Orr, 2004). Such a shift demands courage to challenge entrenched development paradigms and to imagine alternative futures grounded in sustainability, equity, and care for the planet.

Table 3. Transformative Pathways for Education and Governance in Climate Responsibility

Domain	Current Limitations	Transformative Direction	Expected Outcomes	Supporting Literature
Education curricula	Skills-for-growth emphasis	Ecological literacy, ethical reasoning	Climate-conscious citizenship	Sterling (2016); UNESCO (2020)
Teacher education	Limited climate pedagogy	Critical and transformative teaching	Educators as change agents	Lotz-Sisitka et al. (2015)
Governance frameworks	Fragmented accountability	Transparent, enforceable climate policy	Institutional responsibility	Bovens et al. (2018)
Development planning	Growth-first logic	Sustainability within planetary limits	Long-term resilience	Daly (2014); Rockström et al. (2009)

Final Reflection

By positioning education and governance at the centre of climate responsibility, this paper contributes to ongoing debates on sustainable development and environmental justice. It argues that meaningful climate action cannot be achieved without rethinking the purposes of education, the ethics of governance, and the assumptions underpinning modern development. The way forward lies not in assigning blame, but in embracing shared responsibility for transforming the systems that have brought humanity to the brink of ecological crisis.

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