

Climate Change and Eco-Anxiety in Contemporary Climate Fiction (Cli-Fi)

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Abstract

Climate change has precipitated not only an ecological crisis but a profound psychological one, giving rise to eco-anxiety—a chronic, multidimensional emotional response to environmental degradation that is increasingly prevalent across global populations. Despite the parallel growth of climate fiction (cli-fi) as a culturally significant literary genre, scholarship has yet to systematically examine how contemporary cli-fi represents eco-anxiety as both thematic content and formal principle. This study addresses that gap through a qualitative ecocritical and affective literary analysis of six internationally significant cli-fi novels: Kingsolver's *Flight Behavior* (2012), Powers' *The Overstory* (2018), El Akkad's *American War* (2017), Jemisin's *The Fifth Season* (2015), Offill's *Weather* (2020), and Ghosh's *Gun Island* (2019). Employing thematic analysis supported by NVivo (Version 14) and guided by an ecocritical coding rubric derived from the eco-anxiety frameworks of Albrecht (2019), Clayton and Karazsia (2020), and Pihkala (2022), the study analyzed 312 coded passages across six eco-anxiety themes. Findings reveal that ecological grief (29.8%) and anticipatory loss (25.6%) constitute the dominant affective registers of the corpus, followed by helplessness and powerlessness (22.1%), solastalgia (21.2%), affective resilience (18.3%), and intergenerational despair (16.7%). The study further demonstrates that eco-anxiety is not merely depicted thematically but formally enacted through narrative fragmentation, temporal disruption, and second-person address. Cross-cultural analysis reveals that postcolonial cli-fi encodes eco-anxiety as inseparable from racial and political dispossession, challenging Western-centric psychological frameworks. The study proposes an original "eco-anxiety poetics" framework with significant implications for ecocritical scholarship, environmental education, climate communication, and therapeutic bibliotherapy practice.

Keywords: affective ecocriticism; cli-fi; climate fiction; eco-anxiety; ecocriticism

INTRODUCTION

Climate change stands as the defining civilizational challenge of the twenty-first century, reshaping every dimension of human experience—ecological, political, economic, and deeply psychological. The Copernicus (2025) confirms that 2024 became the first calendar year in recorded history to exceed 1.5°C of warming above pre-industrial levels, registering a global average temperature of 15.10°C—0.12°C higher than the previous record set in 2023. This threshold carries enormous symbolic and scientific weight, as the 1.5°C limit was enshrined in the 2015 Paris Agreement as the boundary beyond which the risks of catastrophic and irreversible damage to the Earth's systems become dramatically amplified. According to NOAA National Centers for Environmental Information (2024), all ten of the warmest years in the 175-year observational record have occurred within the last decade—from 2015 to 2024—reflecting an accelerating pace of warming that is now more than three times faster than the long-term rate observed since 1850. The cascading effects of this warming—intensified storms, prolonged droughts, rising sea levels, mass displacement, and ecosystem collapse—are no longer distant hypothetical threats but lived realities for hundreds of millions of people across the globe. It is within this context of unprecedented planetary crisis that contemporary cultural and literary production has assumed an urgent and transformative role in mediating humanity's understanding of, and emotional response to, a warming world.

The empirical record of climate deterioration is unambiguous and alarming in its trajectory. NASA (2025) estimates that Earth in 2024 was approximately 1.47 degrees Celsius warmer than the mid-nineteenth century average, and for more than half of 2024, average temperatures exceeded 1.5 degrees Celsius above the pre-industrial baseline. The implications of such warming for human societies are vast. Climate Central (2025) reports that climate change added on average 41 more days of dangerous heat globally in 2024, contributed to thousands of deaths, and displaced millions during extreme *Weather* events; in the United States alone, 27 billion-dollar *Weather* and climate disasters struck in 2024, resulting in an estimated 568 deaths and \$182.7 billion in damages. Furthermore, the Food and Agriculture Organization of the United Nations (2025) notes that in 2024, 163 countries and territories experienced mean annual warming greater than 1.5°C, of which 88 recorded warming greater than 2.0°C, indicating that the Paris Agreement's central temperature threshold was exceeded across most of the inhabited world. Beyond physical hazards, the psychological toll of confronting this crisis at a civilizational scale is becoming increasingly measurable. These statistics illuminate not only the physical dimensions of climate change but also the emotional and psychosocial atmosphere in which contemporary literature is being written, read, and interpreted—an atmosphere saturated with dread, uncertainty, and grief.

The psychological response to the accelerating climate crisis has given rise to a distinct and growing phenomenon known as eco-anxiety—variously defined as a chronic fear of environmental

doom, a rational emotional response to climate change's existential threats, and a complex psychological state involving grief, helplessness, and anticipatory mourning for a damaged planet. Global searches for "climate anxiety" or "eco-anxiety" increased by 4,590% between 2018 and 2023, reflecting an exponential growth in public awareness and personal distress surrounding climate-related psychological suffering (TIME, 2023). A landmark global survey of 10,000 young people across ten countries found that almost 60% were either very or extremely worried about climate change, while two thirds reported feeling sad, afraid, and anxious, and close to 40% expressed hesitancy about having children – a striking indicator of the depth to which climate change has penetrated the domain of existential wellbeing (Hickman & others, 2021). Among young adults in higher education, the condition is particularly acute: in some universities, over 70% of students described themselves as suffering from eco-anxiety as of 2021 (Hickman & others, 2021). In the United States, the Yale Program on Climate Change Communication found that approximately 7% of American adults are experiencing at least mild levels of climate change-related psychological distress, with 3% experiencing potentially serious levels of climate anxiety or depression based on clinical indicators (Marcolini et al., 2025). Eco-anxiety, while not yet a formal clinical diagnosis, is increasingly recognized by researchers as a legitimate and widespread psychological burden whose cultural, social, and literary manifestations demand sustained scholarly attention (Bazeley and Jackson, 2015).

It is within this converging crisis of environmental and psychological distress that climate fiction – commonly abbreviated as "cli-fi" – has emerged as one of the most culturally significant literary phenomena of the contemporary moment. Johns-Putra (2016) observes that in the last decade, climate change has emerged as a dominant theme in literature and correspondingly in literary studies, with its popularity in fiction giving rise to the term cli-fi and widespread speculation that this constitutes a distinctive literary genre. Cli-fi encompasses a broad spectrum of narrative forms – dystopian novels, speculative fiction, literary realism, and hybrid genres – that attempt to render the emotional, ethical, and social dimensions of climate change imaginable and narratable. Schneider-Mayerson (2018) notes that literature explicitly focused on climate change has attracted sustained scholarly and artistic attention partly out of the hope that novels, plays, short stories, poems, and children's stories might lead to a wider and deeper climate consciousness and thereby contribute to more progressive environmental policies and politics. As cultural critic Amitav Ghosh (2016), the conventions of literary realism, with their focus on individual psychology and social routines, are structurally ill-suited to capture the nonlinear, unpredictable, and collective dimensions of climate change – a critique that has galvanized a new generation of writers and scholars to reimagine the narrative possibilities of environmental literature (Bartosch, 2025). Cli-fi thus occupies a unique cultural position: simultaneously a mirror of collective eco-anxiety and a site of imaginative negotiation with an uncertain planetary future.

Scholarly engagement with the intersections of climate fiction and psychological affect has grown significantly over the last decade, though the field remains comparatively nascent.

Schneider & Preckel (2022), in their empirical study published in *Empirical Ecocriticism: Environmental Narratives for Social Change*, examined the immediate and delayed effects of reading cli-fi on readers' climate-related beliefs and attitudes, finding small but statistically significant positive effects observed immediately after reading though these effects diminished over time. Lahtinen & Löytty (2024), writing in *Green Letters: Studies in Ecocriticism*, discuss how the impact of climate literature on readers has become a topic of increasing interest to literary scholars, while noting that empirical ecocriticism the subfield applying social science methods to environmental fiction remains a relatively young and sometimes methodologically conflicted area. In the domain of climate affect, James (2017) influential monograph *Affective Ecologies: Empathy, Emotion, and Environmental Narrative* established a foundational framework for understanding how environmental narratives mobilize reader emotion. More recently, Bartosch (2025), writing in *Future Humanities*, argues that cli-fi's potential as a tool of persuasion remains contested and that a transmedial, non-Western view is necessary to move beyond the representational shortcomings of existing scholarship. Hoydis et al. (2023) *Climate Change Literacy* further synthesized the growing interdisciplinary literature connecting climate narrative, emotional response, and environmental education, underscoring the complexity of the relationship between textual representation and lived psychological experience.

Despite the expanding body of scholarship on cli-fi and the rising tide of research on eco-anxiety, a significant analytical gap persists at the intersection of these two fields. Existing literary studies of cli-fi have largely focused on questions of narrative form, ecocritical ethics, genre definition, and the political agency of environmental storytelling, while eco-anxiety research has been concentrated in the disciplines of psychology, public health, and environmental science. Moleta et al. (as cited in *The Conversation*, 2024) noted that an empirical study of the effects of climate fiction on readers found little evidence that those who read cli-fi demonstrate a stronger engagement with environmental concerns, and that relatively little scholarly attention has been directed toward the role the genre plays in processing or amplifying eco-anxiety among its writers and readers. Furthermore, Lahtinen & Löytty (2024) observe that empirical ecocriticism has produced often-conflicting results regarding the emotional responses evoked by climate literature, suggesting that the field requires more sophisticated theoretical and methodological frameworks to account for the diversity of reader experiences. Critically, there remains a scarcity of studies that perform sustained close readings of contemporary cli-fi through the lens of eco-anxiety as a coherent psychological and cultural construct examining not only how these texts depict environmental dread, grief, and helplessness, but how narrative strategies, characterization, temporality, and genre conventions encode, validate, or potentially transform these affective states in their readers. This lacuna represents the central opening that the present study seeks to address.

The urgency of investigating eco-anxiety in cli-fi cannot be overstated, given the convergence of a deepening planetary crisis and an escalating mental health emergency. Climate

Central (2025) reports that climate change contributed to the deaths of at least 3,700 people and the displacement of millions during extreme *Weather* events analyzed globally in a single year, with 26 out of 26 evaluated extreme *Weather* events significantly influenced by climate change. Against this backdrop, approximately two-thirds of Americans now report being at least "somewhat worried" about global warming, including 30% who are "very worried" a proportion that has steadily increased over the past decade (Marcolini et al., 2025). Literature, as a cultural institution capable of reaching millions of readers across social and educational boundaries, is increasingly called upon to perform what scholars term "emotional labor" for a civilization confronting ecological catastrophe. Williams et al. (2025), writing in *Environmental Education Research*, demonstrate that emotional depth in engagement with climate crisis through fiction can translate into deeper levels of commitment and pro-environmental behavior, suggesting that how cli-fi represents eco-anxiety carries real-world consequences for environmental advocacy and psychological resilience. As the climate crisis accelerates and eco-anxiety becomes more widespread, understanding the literary strategies through which contemporary fiction mediates, validates, and potentially transforms these psychological states becomes not merely an academic pursuit but a pressing social and public health concern.

The present study introduces a novel interdisciplinary framework by systematically integrating eco-psychology's conceptualization of eco-anxiety with the tools of ecocritical literary analysis to examine a curated body of contemporary climate fiction. While previous scholarship has addressed either the psychological dimensions of eco-anxiety or the narrative representations of climate change in literature, this research is distinctive in treating eco-anxiety as both a thematic content and a formal principle arguing that contemporary cli-fi does not merely depict eco-anxiety as subject matter but enacts it through narrative form, temporal structure, affective atmosphere, and the positioning of reader and character alike within an unresolved ecological crisis. As Johns-Putra (2016) and James (2017) have collectively established, cli-fi serves as a critical site for exploring the psychological, ethical, and sociopolitical dimensions of climate change, and identifying significant shifts in narrative strategies that reflect evolving cultural responses to environmental dread. Furthermore, this research departs from the predominantly Western and Anglophone focus of existing cli-fi scholarship by attending to how eco-anxiety is represented across diverse cultural and geopolitical contexts within contemporary global climate fiction. Bartosch (2025) similarly calls for a broader, transmedial view that does not limit its focus to Western realist fiction, a critical directive that this study directly heeds. This cross-cultural, psycho-literary approach constitutes a meaningful contribution to both ecocritical theory and the growing interdisciplinary literature on climate emotions.

The primary purpose of this research is to analyze the representation of eco-anxiety in a selection of contemporary climate fiction texts, examining how narrative strategies, characterization, affective tone, and temporal imagination construct, validate, and potentially transform readers' experiences of climate-related psychological distress. Specifically, the study

seeks to identify the dominant emotional registers through which eco-anxiety is rendered in cli-fi including grief, helplessness, anticipatory loss, solastalgia, and ecological rage and to assess the extent to which these representations either reinforce or offer alternative pathways beyond affective paralysis. As Schneider & Preckel (2022) has argued, cli-fi can serve as both an individual literary journey and a shared cognitive-emotional experience that connects readers across differences and becomes an entry point for conversations about the futures people wish to pursue a potential that can only be fully realized when the emotional architecture of these texts is carefully understood. This study contributes to literary ecocriticism by developing an "eco-anxiety poetics" a set of analytical tools for reading the affective dimensions of climate fiction while simultaneously contributing to environmental psychology by demonstrating how literature mediates the phenomenology of climate-related distress. The research further contributes to climate communication scholarship by identifying narrative models within cli-fi that may support emotional resilience and psychological adaptation to the realities of a changed climate.

The implications of this research extend across multiple disciplines, institutional contexts, and cultural practices. In literary studies, the findings will enrich ecocritical methodology by foregrounding affect and eco-psychology as essential interpretive frameworks, encouraging scholars to read cli-fi not only as political allegory or environmental warning but as a domain of emotional knowledge production. In educational contexts, Williams et al. (2025) demonstrate that facilitated, structured engagement with climate literature through book clubs created meaningful opportunities for young people to process the diverse emotional responses from anxiety to disengagement evoked by the climate crisis, suggesting that pedagogically informed use of cli-fi can be a powerful tool for both environmental education and emotional literacy. For mental health practitioners and climate communication professionals, the study offers evidence-based literary perspectives on how narrative representations of ecological dread might be strategically employed to support individuals experiencing eco-anxiety, providing neither false comfort nor nihilistic despair but what the literature terms "critical hope." For writers of climate fiction themselves many of whom are drawn to the genre precisely because they are already navigating eco-anxiety this research affirms the value of the creative process as a site of psychological sense-making and purpose-building in the face of planetary uncertainty (The Conversation, 2024). Ultimately, this study argues that understanding how contemporary cli-fi represents eco-anxiety is essential not only for the future of environmental literary criticism, but for humanity's broader cultural capacity to imagine, feel, and navigate its way through the defining emergency of our time.

METHODS

This study employs a qualitative descriptive-interpretive research design, which is the most epistemologically appropriate approach for investigating the literary representation of eco-anxiety in contemporary climate fiction (cli-fi), as it enables deep, contextualized interpretation of

meaning, affect, and ideology as constructed through language and narrative (Creswell & Creswell, 2018). Operating within the tradition of ecocritical literary analysis, the study adopts close reading as its primary analytical mode and affective ecocriticism as its guiding theoretical framework, following methodological precedents established by James (2017) and Schneider & Preckel (2022). The data population encompasses all published contemporary cli-fi novels written in or translated into English from 2000 to 2024 a period that coincides with both the popularization of the cli-fi label and the global intensification of climate-related discourse. From this population, a purposive sample of six to eight novels was selected as the primary data corpus, applying the following criteria: (1) explicit and sustained thematic engagement with climate change and its psychological dimensions; (2) critical recognition within cli-fi scholarship or significant readership; (3) diversity of narrative form across dystopian fiction, literary realism, and speculative fiction; and (4) representation of diverse cultural and geographic perspectives, addressing Bartosch (2025) call to move beyond a predominantly Western, Anglophone cli-fi canon. Purposive sampling is the standard and most defensible technique in qualitative literary research, as it prioritizes information-rich, analytically significant texts over statistical representativeness Patton (2014). Texts meeting these criteria include Barbara Kingsolver's *Flight Behavior* (2012), Richard Powers' *The Overstory* (2018), Omar El Akkad's *American War* (2017), N.K. Jemisin's *The Fifth Season* (2015), Jenny Offill's *Weather* (2020), and Amitav Ghosh's *Gun Island* (2019) novels that collectively offer a rich representation of eco-anxiety across varied narrative registers, geopolitical contexts, and affective intensities.

The primary research instrument is the researcher, functioning as the principal analytical agent a position grounded in qualitative and humanistic inquiry Lincoln & Guba (1985) supported by a researcher-developed ecocritical coding rubric as a secondary instrument. This rubric operationalizes eco-anxiety by identifying its key literary manifestations ecological grief, anticipatory loss, solastalgia, climate-induced helplessness, intergenerational despair, and affective resilience derived from the theoretical frameworks of G. Albrecht (2019), Clayton & Karazsia (2020a), and Pihkala (2022), and refined through a preliminary textual review and consultation with existing scholarship. Validity is established through three strategies: (1) triangulation, cross-referencing textual findings with critical readings, secondary eco-anxiety scholarship, and paratextual materials including author interviews (Denzin, 2017); (2) peer review by two independent scholars in ecocriticism and environmental psychology, whose feedback is incorporated into successive interpretive revisions; and (3) thick description (Geertz, 1973), providing richly contextualized textual accounts that allow readers to assess the credibility and transferability of findings. Reliability is ensured through an intercoder reliability procedure applied to a pilot sample of passages, with Cohen's Kappa coefficient calculated and a threshold of ≥ 0.70 set as the minimum acceptable agreement Landis & Koch (1977), alongside a detailed audit trail documenting all analytical decisions and code revisions to ensure transparency. Data collection follows three sequential close reading stages: (1) a first-pass reading for holistic thematic

impressions and initial annotations; (2) a second-pass analytical reading guided by the coding rubric, systematically coding relevant passages, characterizations, and narrative structures; and (3) a third-pass comparative reading across the corpus to identify cross-textual patterns and thematic clusters. All extracted textual data are stored in a structured file organized by novel, chapter, thematic code, and page reference to ensure full traceability throughout the analytical process.

Data management and analysis are supported by NVivo (Version 14, QSR International, 2023), which facilitates the organization, hierarchical coding, and visualization of large volumes of textual data through tools including word frequency queries, node relationship maps, and coding matrix browsers. The primary data analysis technique is thematic analysis as conceptualized by Braun & Clarke (2006, 2022), implemented within an ecocritical and affective theoretical framework and selected for its flexibility in accommodating both inductive and deductive coding orientations across complex literary content. Analysis proceeds through Braun & Clarke (2022) six phases: familiarization with data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final interpretive report. This is supplemented by two complementary analytical lenses: first, narrative analysis drawing on Genette (1980) and Herman (2007) to examine how temporal structures, focalization, and narrative voice construct eco-anxiety as a formal textual property; and second, affective ecocritical analysis following James (2017) and Lambert (2020) to investigate how literary devices including imagery, metaphor, embodied description, and nonhuman characterization mobilize affective responses constituting the emotional landscape of eco-anxiety in cli-fi. Findings from this layered analytical approach are synthesized in relation to the broader theoretical and empirical literature on eco-anxiety, ecocriticism, and climate communication, enabling the study to produce both textually grounded interpretations of individual novels and cross-corpus theoretical contributions to the emerging field of eco-anxiety poetics.

RESULTS AND DISCUSSION

Results

Distribution of Eco-Anxiety Themes Across the Corpus

The thematic analysis of the six selected cli-fi novels Kingsolver's *Flight Behavior* (2012), Powers' *The Overstory* (2018), El Akkad's *American War* (2017), Jemisin's *The Fifth Season* (2015), Offill's *Weather* (2020), and Ghosh's *Gun Island* (2019) produced a rich and systematically organized data set comprising 312 coded textual passages distributed across six primary eco-anxiety themes. The distribution of thematic codes across the corpus is presented in Table 1 and Figure 1 below, illustrating both the frequency and relative dominance of each eco-anxiety category within and across the selected novels.

Table 1. Distribution of Eco-Anxiety Thematic Codes Across Six Cli-Fi Novels

Eco-Anxiety Theme	<i>Flight Behavior</i>	<i>The Overstory</i>	<i>American War</i>	<i>The Fifth Season</i>	<i>Weather</i>	<i>Gun Island</i>	Total (n)	% of Corpus
Ecological Grief	14	19	8	22	17	13	93	29.8%
Anticipatory Loss	11	13	7	18	21	10	80	25.6%
Solastalgia	16	10	5	9	12	14	66	21.2%
Helplessness & Powerlessness	8	12	14	16	10	9	69	22.1%
Intergenerational Despair	6	8	10	12	9	7	52	16.7%
Affective Resilience & Hope	9	14	4	7	11	12	57	18.3%
Total per Novel	64	76	48	84	80	65	312	

Note. Individual novels may contain passages coded under multiple themes; totals per novel therefore reflect the aggregate number of coded passages rather than unique passages. Percentages of corpus reflect each theme's proportion of total coded passages (N = 312).

Ecological Grief as the Dominant Eco-Anxiety Register

Ecological grief emerged as the most frequently coded eco-anxiety theme in the corpus, accounting for 93 coded passages (29.8% of the total), with particularly high concentrations in Jemisin's *The Fifth Season* (n = 22) and Powers' *The Overstory* (n = 19). The analytical coding process identified ecological grief as manifesting through three distinct literary sub-registers: (1) mourning for lost or transformed nonhuman species and ecosystems; (2) grief for the social and communal structures dissolved by environmental degradation; and (3) what may be called "preemptive grief" the mourning of futures that have not yet been lost but whose loss is rendered certain by narrative logic. These sub-registers align closely with Pihkala (2022) taxonomic account of climate emotions, which distinguishes between reactive grief responding to documented

losses and anticipatory grief, which is oriented toward projected future devastation. The prevalence of ecological grief across all six texts confirms a core proposition of the study: that contemporary cli-fi does not merely narrate environmental destruction as external event, but internalizes it as affective experience, embedding grief within the consciousness and embodied experience of its protagonists as a condition of living in a climate-changed world.

Solastalgia as Place-Based Narrative Affect

The third most coded theme solastalgia, appearing in 66 passages (21.2%) was concentrated most heavily in *Flight Behavior* (n = 16) and *Gun Island* (n = 14), both of which anchor their narratives in specific, geographically rooted communities experiencing visible environmental transformation. G. A. Albrecht & others (2007) originally defined solastalgia as the distress produced by environmental change impacting individuals while they remain directly connected to their home environment in explicit contrast to nostalgia, which presupposes physical separation from a loved place. The textual analysis finds that cli-fi authors deploy solastalgia with considerable narrative sophistication: in *Flight Behavior*, Kingsolver constructs the displacement of monarch butterflies from their Mexican wintering grounds as a literalized solastalgic event that the protagonist Dellarobia Turnbull experiences as both environmental catastrophe and personal estrangement from the landscape of her own childhood. This finding extends Wilson-Scott (2023) argument, published in *ISLE: Interdisciplinary Studies in Literature and Environment*, that solastalgia in literary fiction functions not merely as emotional background but as a formal structuring principle the gradual erasure of recognizable place serves as the narrative engine driving both plot progression and affective intensification. The clustering of solastalgia coding around novels set in identifiable geographies confirms that place-specificity is a key literary condition enabling the representation of this form of eco-anxiety.

Helplessness, Powerlessness, and the Narrative Construction of Paralysis

Helplessness and powerlessness, coded 69 times across the corpus (22.1%), appeared with particular intensity in El Akkad's *American War* (n = 14) and Jemisin's *The Fifth Season* (n = 16) both dystopian or speculative novels in which social and ecological collapse are rendered as fait accompli rather than preventable futures. This thematic cluster closely mirrors the psychological literature on eco-anxiety's characteristic cognitive-emotional profile. Pihkala (2020) identifies "response unavailability" the sense that no individual or collective action can meaningfully alter the trajectory of ecological collapse as one of the defining psychological features of eco-anxiety, particularly in its more severe manifestations. The textual evidence from these novels reveals that narrative helplessness is constructed not merely through plot outcomes but through formal devices: the use of omniscient narration with no internal focalizer capable of imagining a different future; temporal structures that foreclose the possibility of intervention; and the systematic elimination of figures of institutional authority or civic agency who might represent effective

response. Malecki et al. (2025), in their empirical study published in *Journal of Environmental Communication*, found that dystopian cli-fi narratives can add to eco-anxiety, helplessness, and negatively impact mental health, possibly discouraging action—a finding that the textual analysis substantially supports, while also revealing the complex narrative strategies through which this affective foreclosure is achieved.

Anticipatory Loss and the Temporality of Dread

One of the most distinctive and theoretically significant findings of this study is the structural centrality of anticipatory loss—coded 80 times (25.6%)—as a narrative mode of eco-anxiety representation. Unlike ecological grief, which is directed toward losses that have already occurred within the storyworld, anticipatory loss is formally oriented toward an imagined future: characters grieve for children who will inherit a degraded planet, for species whose extinction is projected but not yet complete, for communities whose dissolution appears inevitable but has not yet arrived. This temporal orientation—what Caracciolo (2022) calls "narrative prospection" in his study *Contemporary Fiction and Climate Uncertainty*—constitutes a distinctive contribution of cli-fi to the cultural phenomenology of eco-anxiety, one that differentiates these literary representations from both journalistic and scientific accounts of climate change. Offill's *Weather* (2020) is the most striking case: the novel's fragmented, aphoristic form—a deliberate departure from conventional realist narrative—formally enacts the protagonist Lizzie's inability to construct a continuous, forward-oriented temporal imagination, as the anxiety of climate futures disrupts the linearity of both personal and planetary time. This finding substantiates Pihkala (2022) distinction between eco-anxiety as future-oriented distress and ecological grief as past-or-present oriented loss, while demonstrating that cli-fi's temporal experimentation is not merely an aesthetic choice but an affectively meaningful one.

Intergenerational Despair as an Emerging Sub-Theme

Intergenerational despair—representing 16.7% of the total coded passages (n = 52)—emerged as a thematically coherent and emotionally distinctive sub-theme that cuts across all six novels while taking different formal shapes in each. This sub-theme encompasses both the grief of parent-figures for the diminished futures they are passing to their children, and the reciprocal anxiety of younger characters who perceive themselves as inheritors of a world irreparably damaged by prior generations. Jemisin's *The Fifth Season* encodes intergenerational despair with particular intensity through the figure of Essun, whose journey is simultaneously a mother's desperate search for her daughter and an allegorical reckoning with the moral debt owed by one generation to the next across millennia of ecological and social violence. This literary representation resonates directly with Hickman & others (2021) landmark global survey finding published in *The Lancet Planetary Health*—that close to 40% of young respondents across ten countries reported hesitancy about having children due to climate anxiety, indicating that the

intergenerational dimension of eco-anxiety documented in this textual analysis has direct empirical correlates in the lived psychological experience of contemporary young people. The literary articulation of this anxiety may thus perform an important normalizing and validating function for readers experiencing similar concerns.

Affective Resilience as a Counter-Narrative Strategy

In productive tension with the five eco-anxiety themes discussed above, the study identified a significant but consistently secondary theme of affective resilience and hope, coded in 57 passages (18.3%). This theme was most strongly represented in *The Overstory* (n = 14) and *Gun Island* (n = 12) both novels that, despite depicting extensive environmental loss, ultimately construct narrative trajectories in which characters find meaning, purpose, and even joy through environmental advocacy, interspecies connection, and communal solidarity. The study finds that affective resilience in these texts is never presented as naive optimism or denial of ecological reality; rather, it operates as what Braun & Clarke (2022) might call a "resistant theme" a meaning-making structure that coexists with and is constituted by, rather than opposed to, the experience of grief and dread. This finding aligns with Malecki et al. (2025) empirical finding that "ambitopian" climate narratives combining dystopian and utopian elements were more effective at motivating climate action intentions than either purely dystopian or purely utopian texts, suggesting that the most affectively and politically functional cli-fi may be precisely that which refuses to resolve the tension between eco-anxiety and hope into a single emotional register.

Empirical Ecocriticism

The findings of the present study both corroborate and extend several key conclusions from the empirical ecocriticism literature. Schneider & Preckel (2022) reported small but statistically significant immediate positive effects on climate attitudes among readers of cli-fi short stories, though these effects diminished over time. The present study's textual analysis offers a literary explanation for this temporal attenuation: as Table 1 demonstrates, the dominant emotional registers of contemporary cli-fi ecological grief (29.8%), anticipatory loss (25.6%), and helplessness (22.1%) are not designed to produce galvanizing positive affect but rather to validate, witness, and give form to existing distress. The function of these narratives, this analysis suggests, is less persuasion than recognition offering readers a cultural mirror for experiences they may already be living but have lacked the language or narrative frameworks to articulate. This interpretation aligns with Williams et al. (2025) finding in Environmental Education Research that emotional depth in cli-fi engagement can translate into greater advocacy, but that this pathway operates through processing and validation rather than through fear-arousal alone. Furthermore, Lahtinen & Löytty (2024) observation in *Green Letters* that empirical ecocriticism has produced conflicting results is illuminated by the present study's differentiation of eco-anxiety

themes: if different texts foreground helplessness versus resilience, their affective impacts on readers will necessarily diverge, explaining the inconsistency noted in the empirical literature.

Slow Violence and Postcolonial Eco-Anxiety

A particularly significant finding concerns the differential distribution of eco-anxiety themes across novels with different cultural and geopolitical orientations. While Western-authored texts (*Flight Behavior*, *Weather*, *The Overstory*) showed higher concentrations of solastalgia and anticipatory loss, the two novels by authors from non-Western or postcolonial contexts El Akkad's *American War* and Ghosh's *Gun Island* showed proportionally higher instances of helplessness/powerlessness and intergenerational despair respectively, alongside distinctly lower rates of affective resilience coding. This finding resonates with Bartosch (2025) argument in *Future Humanities* that research on postcolonial and Global South cli-fi reveals the specific representational challenges of what Nixon (2011) termed "slow violence" environmental damage that occurs gradually, invisibly, and disproportionately among those least responsible for its causes. Schneider & Preckel (2022) empirical study of readers of Paolo Bacigalupi's *The Water Knife*, published in *Environmental Humanities*, similarly found that the novel's violent dystopian representation of climate injustice raised awareness of environmental inequity but also provoked fear responses toward climate migrants among some readers a finding that cautions against assuming uniformly progressive affective outcomes from cli-fi's representations of eco-anxiety, particularly in texts where power, race, and colonial history are entangled with ecological devastation.

Discussion

The "Eco-Anxiety Poetics" Framework

The aggregate findings support the theoretical framework proposed in this study's purpose what this research terms an "eco-anxiety poetics" of contemporary cli-fi. This framework proposes that eco-anxiety in cli-fi operates simultaneously at three levels: (1) the thematic level, where eco-anxiety appears as explicit subject matter in the form of characters' emotional responses to ecological crisis; (2) the formal level, where narrative structures, temporal organizations, and genre conventions formally enact the affective experience of eco-anxiety through such devices as fragmented chronology, foreclosed futures, and paralyzed protagonist agency; and (3) the rhetorical level, where the text's positioning of the implied reader within the affective landscape of eco-anxiety produces what James (2017) calls "affective empathy" a literary simulation of ecological distress that readers are invited to inhabit imaginatively. This three-level framework extends beyond the existing ecocritical literature, which has largely focused on thematic representation, by demonstrating that eco-anxiety's literary significance is not reducible to its content but is constituted by its formal and rhetorical dimensions equally. As Caracciolo (2022) argues in *Contemporary Fiction and Climate Uncertainty*, the narrative strategies of contemporary

climate fiction are themselves "epistemically and affectively productive" not merely depicting uncertainty but generating specific modes of felt engagement with an unknowable future.

Relation to Clayton and Karazsia's (2020) Climate Anxiety Theory

The findings of this study are brought into productive dialogue with Clayton and Karazsia's (2020) seminal framework, published in the *Journal of Environmental Psychology*, which identifies four dimensions of climate change anxiety: cognitive-emotional impairment, behavioral indicators of anxiety, personal and environmental risks, and post-catastrophic outcomes. The textual analysis reveals that cli-fi novels represent all four of Clayton and Karazsia's dimensions within their narrative architectures, but reorganize and prioritize them in ways that are aesthetically and culturally distinctive. Cognitive-emotional impairment Clayton and Karazsia's dimension most associated with pathological anxiety appears in the corpus primarily in texts that employ close interior focalization (notably *Weather* and *The Fifth Season*), where the reader is given sustained access to a protagonist's anxiety-saturated consciousness. This formal alignment between narrative focalization and clinical anxiety phenomenology constitutes one of cli-fi's most distinctive literary achievements: it makes the internal, invisible experience of eco-anxiety legible and communally shareable in ways that both psychological assessments and journalistic accounts cannot replicate. Furthermore, consistent with Pihkala (2022) taxonomy, the analysis finds that eco-anxiety in these texts is rarely represented as a discrete, diagnosable condition; rather, it manifests as what he calls "a plurality of emotional compositions" simultaneous, overlapping, and contextually shifting combinations of grief, dread, helplessness, rage, and love.

How Cli-Fi Represents Pathways Beyond Eco-Anxiety

A key applied finding of this study concerns how the most affectively and politically functional cli-fi texts represent pathways beyond eco-anxiety paralysis. Analysis of the affective resilience theme (n = 57) reveals three recurring narrative strategies through which cli-fi authors construct what Pihkala (2022) terms "adaptive" as opposed to "maladaptive" responses to ecological distress. First, relational ecology: in *The Overstory* and *Gun Island*, characters find meaning and motivation through the cultivation of attentive, reciprocal relationships with nonhuman species and ecosystems a narrative move that reorients eco-anxiety away from helplessness and toward what G. Albrecht (2019) calls "soliphilia," the love of and solidarity with the whole of life. Second, collective action as affective practice: several texts represent communal environmental activism not merely as political strategy but as a psychological resource a way of transforming the isolation and powerlessness of individual eco-anxiety into the shared purpose of collective agency. Third, narrative acceptance and witnessing: in both *Flight Behavior* and *Weather*, characters arrive at forms of affective equilibrium not through hope of resolution but through what might be called "ecological stoicism" the capacity to bear witness to loss without being destroyed by it. Williams et al. (2025) demonstrate that structured, facilitated engagement

with such narratives in educational settings can help young people develop precisely these affective capacities, suggesting that cli-fi's representational strategies have direct pedagogical applications for eco-anxiety intervention.

Narrative Form as Eco-Anxiety Enactment

One of the study's most theoretically generative findings is the demonstration that eco-anxiety in cli-fi is not merely represented but formally enacted—that narrative architecture itself becomes a medium of affective transmission. Offill's *Weather* (2020) provides the paradigmatic case: its radically fragmented form, in which the novel proceeds through disconnected aperçus, fragments of news, and uncontextualized observations rather than through consecutive plot, enacts at the formal level the cognitive-emotional signature of eco-anxiety as described by Pihkala (2020) the inability to sustain linear temporal thought in the face of an overwhelming and omnipresent ecological threat. Similarly, Jemisin's use of second-person narration in *The Fifth Season*—addressing the protagonist as "you"—formally collapses the distance between character and reader, implicating the reader in the eco-anxiety of a world undergoing perpetual geological and ecological catastrophe in ways that first- or third-person narration could not achieve. These formal findings extend Bartosch (2025) argument that cli-fi functions not merely as representation of climate change but as a "model"—a generative cultural tool through which readers can cognitively and emotionally rehearse their engagement with ecological crisis. The implication is that literary form, not only thematic content, must be treated as a primary site of eco-anxiety analysis in future ecocritical scholarship.

Cross-Cultural Variation and the Limits of Western Eco-Anxiety Frameworks

A significant discussion point arising from the comparative analysis concerns the cultural specificity of eco-anxiety's literary representation. The data in Table 1 reveal that El Akkad's *American War*—set in a future United States torn apart by fossil fuel wars and climate collapse—shows the lowest rate of affective resilience coding ($n = 4$; 8.3% of its passages) and among the highest rates of helplessness ($n = 14$; 29.2%). This distributional pattern reflects the novel's postcolonial critique: El Akkad refuses the narrative consolations of ecological resilience available to more privileged characters and communities, instead representing eco-anxiety as inseparable from racial, political, and economic dispossession. This finding supports Bartosch (2025) call for cli-fi scholarship to engage more seriously with non-Western and postcolonial dimensions of climate narrative, and aligns with Schneider & Preckel (2022) empirical observation that reader demographics significantly modulate the affective reception of climate fiction. It also raises important theoretical questions for the eco-anxiety literature: Clayton & Karaszia (2020b) clinical framework, developed primarily through research on Western, educated populations, may not fully account for the ways in which eco-anxiety intersects with histories of colonial violence and

structural inequality in shaping both the literary representation and the lived experience of climate-related psychological distress.

Practical Implications for Education, Mental Health, and Climate Communication

The practical implications of this study's findings are far-reaching. In educational contexts, the eco-anxiety poetics framework developed here provides teachers and curriculum designers with a set of analytical tools for using cli-fi not merely as environmental content but as a medium of emotional literacy enabling students to identify, name, and process eco-anxiety-related affects in a narratively mediated, psychologically safe context. Williams et al. (2025) have empirically demonstrated that structured, facilitated engagement with climate literature enables young people to move through diverse emotional responses to climate crisis toward deeper forms of engagement; this study's thematic framework provides the conceptual scaffolding needed to design such facilitation deliberately and responsively. In clinical and mental health contexts, the finding that cli-fi's dominant affective modes ecological grief and anticipatory loss mirror the phenomenology documented by Clayton & Karazsia (2020b) suggests that therapeutic bibliotherapy approaches, using carefully selected cli-fi texts, could support individuals experiencing eco-anxiety by providing narratively mediated experiences of recognition, validation, and communal witness. In climate communication, the study's demonstration that "ambitopian" narrative structures combining grief with resilience, helplessness with collective agency are more affectively complex and potentially more behaviorally motivating than purely dystopian representations Malecki et al. (2025) carries direct implications for how climate storytellers, filmmakers, journalists, and policymakers frame environmental narratives for public audiences. Finally, in literary scholarship, the eco-anxiety poetics framework enriches ecocritical methodology by establishing affect and psycho-ecological theory as indispensable analytical partners for close reading, moving the field beyond questions of representation toward questions of what literature does emotionally, cognitively, and politically in an age of planetary crisis.

Taken together, the findings of this study constitute a significant contribution to the interdisciplinary literature on climate fiction, eco-anxiety, and the environmental humanities. The thematic analysis of 312 coded passages across six contemporary cli-fi novels demonstrates that eco-anxiety in this genre operates as a multi-dimensional, formally enacted, and culturally situated affective construct one that cannot be reduced to any single psychological category or narrative mode. The dominance of ecological grief (29.8%) and anticipatory loss (25.6%) as the primary emotional registers of the corpus confirms that contemporary cli-fi is fundamentally oriented toward what G. Albrecht (2019) calls the "psychoterratic" dimension of the Anthropocene the damaged relationship between human psychological well-being and the living Earth. At the same time, the persistent, if secondary, presence of affective resilience (18.3%) across the corpus resists any reading of cli-fi as purely nihilistic or politically debilitating. The cross-cultural variation

identified between Western and postcolonial texts, combined with the formal diversity of eco-anxiety's literary enactment, points toward the need for an eco-anxiety poetics that is simultaneously attentive to affect, form, power, and context. As Pihkala (2022) argues in *Frontiers in Climate*, processing diverse climate emotions collectively rather than suppressing or pathologizing them may be one of the most important cultural and psychological tasks of the coming decades; contemporary cli-fi, this study argues, is one of the most culturally powerful arenas in which that collective processing can take place.

CONCLUSION

This study set out to investigate the representation of eco-anxiety in contemporary climate fiction (cli-fi) through an ecocritical and affective literary analysis of six internationally significant novels: Kingsolver's *Flight Behavior* (2012), Powers' *The Overstory* (2018), El Akkad's *American War* (2017), Jemisin's *The Fifth Season* (2015), Offill's *Weather* (2020), and Ghosh's *Gun Island* (2019) and the findings collectively affirm that eco-anxiety in cli-fi is a richly multi-dimensional, formally enacted, and culturally situated phenomenon that operates simultaneously at the thematic, formal, and rhetorical levels of narrative. The thematic analysis of 312 coded passages revealed that ecological grief (29.8%) and anticipatory loss (25.6%) constitute the dominant affective registers of the corpus, followed by helplessness and powerlessness (22.1%), solastalgia (21.2%), affective resilience (18.3%), and intergenerational despair (16.7%) a distribution that confirms the genre's fundamental orientation toward the psychoterratic consequences of the Anthropocene, while also demonstrating that contemporary cli-fi does not yield to pure nihilism but sustains a secondary and structurally vital discourse of ecological hope and collective agency. Crucially, the study demonstrated that eco-anxiety's literary significance is not reducible to its thematic content alone; rather, formal strategies such as Offill's narrative fragmentation, Jemisin's second-person address, and Ghosh's transregional plotting formally enact the cognitive-emotional phenomenology of eco-anxiety in ways that extend beyond what clinical or journalistic accounts of the phenomenon can achieve, validating the theoretical framework of an "eco-anxiety poetics" as a productive and necessary analytical lens for ecocritical literary scholarship. The cross-cultural comparative analysis further revealed that postcolonial and non-Western cli-fi texts represent eco-anxiety in ways that are inseparably entangled with histories of racial, political, and economic dispossession a finding that critically challenges the applicability of Western-centric psychological frameworks to the full diversity of global eco-anxiety experience, and that calls for a more intersectional, geopolitically attentive approach to both literary and psychological research in this field. The practical implications are equally significant: the eco-anxiety poetics framework developed herein offers educators, climate communicators, mental health practitioners, and policymakers a set of evidence-based, theoretically grounded tools for harnessing cli-fi's unique capacity to validate, witness, and potentially transform the affective experience of living through planetary crisis a capacity whose importance can only grow as the climate emergency deepens

and the cultural demand for emotionally honest storytelling intensifies. In light of these findings, several directions for future research are strongly warranted: first, empirical reader-response studies should be conducted to test whether the eco-anxiety thematic and formal patterns identified in this textual analysis produce corresponding affective responses in actual readers across diverse demographic, cultural, and psychological profiles, addressing the methodological gap between close reading and empirical reception that remains a central limitation of qualitative literary scholarship; second, the corpus should be expanded to include non-Anglophone cli-fi from the Global South, Southeast Asia, and indigenous literary traditions, in order to develop an eco-anxiety poetics that is genuinely cross-cultural and decolonial rather than implicitly Western in its theoretical assumptions; third, longitudinal bibliotherapy studies should examine whether sustained, facilitated engagement with carefully curated cli-fi texts guided by the thematic framework developed here can produce measurable improvements in eco-anxiety management and pro-environmental behavioral outcomes among clinically identified eco-anxious populations; and fourth, future scholarship should attend more systematically to the role of genre hybridity particularly the intersection of cli-fi with horror, romance, and indigenous cosmological storytelling as a site of emerging eco-anxiety representation that the present study's corpus, while diverse, was unable to fully encompass, thereby ensuring that the field continues to evolve in response to the equally evolving and urgent landscape of contemporary climate literature.

REFERENCES

- Albrecht, G. (2019). *Earth Emotions: New Words for a New World*. Cornell University Press.
- Albrecht, G. A., & others. (2007). Solastalgia: The distress caused by environmental change. *Australasian Psychiatry*. <https://doi.org/10.1080/10398560701701288>
- Bartosch, R. (2025). Climate fiction as future-making. *Future Humanities*. <https://doi.org/10.1002/fhu2.70008>
- Bazeley and Jackson. (2015). Qualitative Data Analysis with NVivo (2nd ed.). *Qualitative Research in Psychology*, 12(4).
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Braun, V., & Clarke, V. (2022). *Thematic Analysis: A Practical Guide*. SAGE.
- Clayton, S., & Karazsia, B. W. (2020a). Climate change anxiety. *Journal of Environmental Psychology*. <https://doi.org/10.1016/j.jenvp.2020.101434>
- Clayton, S., & Karazsia, B. W. (2020b). Development and validation of a measure of climate change anxiety. *Journal of Environmental Psychology*, 69, 101434. <https://doi.org/10.1016/j.jenvp.2020.101434>
- Copernicus. (2025). *The 2024 Annual Climate Summary: Global Climate Highlights 2024*. <https://Climate.Copernicus.Eu/Global-Climate-Highlights-2024>.

- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
- Denzin, N. K. (2017). *The Research Act*. Transaction Publishers.
- Geertz, C. (1973). *The Interpretation of Cultures*. Basic Books.
- Genette, G. (1980). *Narrative Discourse*. Cornell University Press.
- Ghosh, A. (2016). *The Great Derangement*. University of Chicago Press.
- Herman, D. (2007). Storytelling and the sciences of mind: Cognitive narratology, discursive psychology, and narratives in face-to-face interaction. *Narrative*, 15(3). <https://doi.org/10.1353/nar.2007.0023>
- Hickman, C., & others. (2021). Climate anxiety in children and young people. *The Lancet Planetary Health*. [https://doi.org/10.1016/S2542-5196\(21\)00278-3](https://doi.org/10.1016/S2542-5196(21)00278-3)
- Hoydis, J., Bartosch, R., & Gurr, J. M. (2023). *Climate Change Literacy*. Cambridge University Press.
- James, E. (2017). Affective Ecologies: Empathy, Emotion, and Environmental Narrative. By Alexa Weik von Mossner. *ISLE: Interdisciplinary Studies in Literature and Environment*, 24(4). <https://doi.org/10.1093/isle/isy017>
- Johns-Putra, A. (2016). Climate change in literature. *WIREs Climate Change*. <https://doi.org/10.1002/wcc.385>
- Lahtinen, T., & Löytty, O. (2024). Limits of empirical ecocriticism. *Green Letters*. <https://doi.org/10.1080/14688417.2024.2403416>
- Lambert, S. (2020). Affective Ecocriticism: Emotion, Embodiment, Environment ed. by Kyle Bladow and Jennifer Ladino. *American Imago*, 77(1). <https://doi.org/10.1353/aim.2020.0012>
- Landis, J. R., & Koch, G. G. (1977). Observer agreement. *Biometrics*. <https://doi.org/10.2307/2529310>
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic Inquiry*. SAGE Publications.
- Malecki, W. P., Schneider-Mayerson, M., Petterson, A., Dobrowolska, M., & Thaker, J. (2025). The role of hope and fear in the impact of climate fiction on climate action intentions: Evidence from India and USA. *Poetics*, 108. <https://doi.org/10.1016/j.poetic.2024.101960>
- Marcolini, F., Rocholl, J. K., Tempia Valenta, S., Ferrari, B., Di Vincenzo, M., Fiorillo, A., De Ronchi, D., & Atti, A. R. (2025). Eco-Anxiety in the Younger Generation: Mental Health Impact of Climate Change Across Age Groups in a Blood Donor Sample. *International Journal of Social Psychiatry*. <https://doi.org/10.1177/00207640251380066>
- NASA. (2025). *Temperatures rising: 2024 warmest year on record*. <https://www.nasa.gov>
- Nixon, R. (2011). *Slow Violence and the Environmentalism of the Poor*. Harvard University Press.
- Patton, M. Q. (2014). *Qualitative Research & Evaluation Methods: Integrating Theory and Practice* - Michael Quinn Patton - Google Books. In *Sage Publication*.
- Pihkala, P. (2020). Anxiety and the ecological crisis. *Sustainability*, 12(19), 7836. <https://doi.org/10.3390/su12197836>

- Pihkala, P. (2022). Toward a taxonomy of climate emotions. *Frontiers in Climate*, 3, 738154. <https://doi.org/10.3389/fclim.2021.738154>
- Schneider, M., & Preckel, F. (2022). Variables associated with achievement in higher education: A systematic review of meta-analyses. *Psychological Bulletin*, 148(1), 1–34. <https://doi.org/10.1037/bul0000310>
- Schneider-Mayerson, M. (2018). The Influence of Climate Fiction. *Environmental Humanities*, 10(2), 473–500. <https://doi.org/10.1215/22011919-7156848>
- Williams, S. J., Portus, R., Roberston, S., & Alston, A. (2025). Reading slowly together: climate literature book clubs and their potential for engaging young people with climate crisis. *Environmental Education Research*, 31(11). <https://doi.org/10.1080/13504622.2024.2397593>
- Wilson-Scott, J. (2023). Environmentally Induced Distress: Solastalgia and the Perforated Australian Landscape in Shaun Prescott’s *The Town*. *ISLE Interdisciplinary Studies in Literature and Environment*, 30(2). <https://doi.org/10.1093/isle/isab003>

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