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Review

The Youngest Minds in a Warming World: A Review of Climate Change and Child and Adolescent Mental Health

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Abstract

Climate change poses a growing threat to the mental health of children and adolescents. This narrative review synthesizes global, interdisciplinary research on the psychological impacts of climate disruption during critical developmental stages, with attention to marginalized populations. We explore three key pathways of harm: direct exposure to environmental disasters, chronic disruption of ecological and social systems, and existential distress such as eco-anxiety. Drawing on eco-social theory and developmental psychopathology, the review highlights how these impacts are shaped by age, geography, identity, and systemic inequities. It identifies both risk and protective factors, emphasizing the importance of caregiving relationships, cultural practices, education, and youth climate engagement. While activism can foster resilience and purpose, it may also incur emotional burdens that require clinical and policy attention. We argue that child and adolescent mental health must be recognized as central to climate justice and adaptation, and we offer urgent recommendations for integrated action across sectors.

Keywords: climate change; child and adolescent mental health; eco-anxiety; solastalgia; climate justice; intergenerational equity

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1. Introduction

Climate change is an escalating global crisis with wide-ranging consequences—not only for ecosystems and physical health, but also for the mental and emotional well-being of children and adolescents [1,2]. Developmentally, young people are especially vulnerable due to their ongoing cognitive, emotional, and social maturation [3]. Psychologically, they are impacted by both the immediate and existential dimensions of climate change, including direct impacts such as disasters and displacement, as well as the emotional toll of global ecological disruption [4–6].

These impacts are unevenly distributed and often magnified in already marginalized populations—such as those in low- and middle-income countries, Indigenous communities, and areas affected by poverty or conflict [7–9]. Yet despite mounting evidence, youth mental health remains underexamined in climate response strategies [10,11]. This review addresses that gap by integrating developmental, structural, and existential perspectives to examine pathways of harm and resilience and reframe youth mental health as a core concern of climate justice.

2. Methods

This narrative review employed a structured yet flexible methodology to explore the interdisciplinary, developmental, and global dimensions of climate change impacts

on child and adolescent mental health. Literature was identified through the Summon Discovery Service, an academic meta-search platform that aggregates results from major databases including PubMed, PsycINFO, Scopus, and Web of Science. The search strategy combined terms related to climate change, mental health, and youth populations. Boolean operators were used to construct a search string such as: ("climate change" OR "global warming" OR "climate crisis") AND ("mental health" OR "eco-anxiety" OR "solastalgia" OR "psychological distress") AND (child* OR adolescent* OR youth OR "young people").

Searches were limited to peer-reviewed articles published in English with full-text availability. Both empirical and conceptual literature were included to ensure a broad synthesis of findings. Studies were selected if they focused explicitly on the psychological, developmental, emotional, or sociocultural experiences of children and adolescents in relation to climate change. Articles focusing exclusively on adult populations, lacking a mental health focus, or unavailable in full-text were excluded. We did not include gray literature, non-English sources, or preprints, which may limit the inclusion of regional or community-based perspectives, particularly from LMICs. After screening 117 titles and abstracts for relevance, 90 full-text publications were assessed. Of these, 46 publications were included in the final synthesis. Although we did not apply a formal critical appraisal tool to rate study quality (e.g., CASP, MMAT), we prioritized peer-reviewed publications and assessed methodological robustness through integrative reading, with attention to sample size, transparency of methods, and conceptual clarity. Findings were organized through an integrative reading process informed by key theoretical frameworks from developmental psychopathology, eco-social theory, and existential ecological perspectives. This approach supported the identification of shared patterns, conceptual linkages, and points of divergence across studies, with particular attention to pathways of psychological impact, developmental timing, vulnerability, resilience, and implications for policy and practice.

3. Conceptual Frameworks for Understanding Climate Change and Youth Mental Health

To fully grasp the multifaceted impact of climate change on child and adolescent mental health, it is essential to apply integrative conceptual frameworks that bridge disciplines and contextualize the interplay between environmental stressors, psychological development, and socio-structural inequities. Three key frameworks—eco-social theory, developmental psychopathology, and existential ecological perspectives—offer critical lenses through which to understand how young people are uniquely positioned within the climate crisis and how their mental health is shaped by it.

3.1. The Eco-Social Model: Intersections of Environment, Society, and Health

The eco-social model, originally developed in public health and social epidemiology, posits that health outcomes arise from the dynamic interaction between ecological conditions, social structures, and biological processes [12]. Applied to mental health and climate change, this model provides a way to understand how macro-level environmental degradation interacts with micro-level social determinants to shape the well-being of individuals—especially those in developmentally sensitive periods such as childhood and adolescence [13].

Within this framework, climate change is not merely an environmental issue but a structural determinant of health, one that amplifies existing inequities. Marginalized youth are disproportionately exposed to both ecological and psychosocial stressors, highlighting how structural inequalities shape vulnerability—an insight central to the eco-social model of health [7].

Importantly, the eco-social perspective also highlights that resilience is not evenly distributed. Protective factors—such as stable housing, access to care, and social support—are themselves products of social and economic systems. This calls for a shift from solely individual-level interventions to broader structural changes that address the root causes of vulnerability.

3.2. Developmental Psychopathology: Timing, Context, and Trajectory

The field of developmental psychopathology offers a complementary lens, emphasizing how experiences of stress and trauma affect children and adolescents differently depending on their stage of development, neurobiological sensitivity, and relational environment [14]. This perspective is particularly relevant in the context of climate change, where disruptions may occur during critical windows of emotional and cognitive growth.

Early childhood exposure to climate-related disasters or displacement can interfere with foundational processes such as attachment, self-regulation, and trust in caregivers, potentially laying the groundwork for internalizing disorders, behavioral issues, or later psychopathology. In contrast, adolescents may experience climate distress through more abstract and existential channels, including fear for the future, identity confusion, and loss of hope—all while navigating the psychosocial challenges typical of their age group [3].

Moreover, this framework emphasizes developmental trajectories. A single exposure to a climate-related disaster may not lead to pathology on its own, but when compounded with repeated disruptions, cumulative stress, or the absence of protective relationships, the risks increase substantially over time. Early, sustained, and age-appropriate interventions are essential to address children's developmental stage, environment, and prior experiences. To support conceptual clarity throughout the manuscript, Table 1 provides working definitions of key psychological constructs discussed in this review.

Table 1. Key psychological constructs in the climate and youth mental health literature.

Term	Definition	Normative or Clinical?
Eco-anxiety	Persistent worry or distress about climate change and its anticipated effects	Often normative; may become clinical if it impairs function)
Solastalgia	Distress caused by environmental change to one's home or familiar landscape	Normative or clinical depending on intensity and context
Climate grief	Mourning for actual or anticipated ecological loss, including species or ecosystems	Normative; not necessarily pathological
Moral injury	Psychological distress arising from perceived betrayal or ethical violations related to inaction	Emerging concept; may contribute to clinical symptoms
Existential distress	Feelings of meaninglessness, despair, or hopelessness in response to global ecological threats	Can be normative but may overlap with clinical depression
Vicarious trauma	Emotional impact of witnessing or learning about traumatic climate events (e.g., via media)	May be subclinical or clinical depending on exposure and support

4. Mechanisms Linking Climate Change to Child and Adolescent Mental Health

Climate change impacts the mental health of children and adolescents through a constellation of mechanisms that are often interactive, compounding, and chronic. These mechanisms can be broadly categorized into three overlapping pathways: direct exposure to climate-related disasters, indirect disruption of social and environmental systems, and existential ecological distress rooted in climate awareness.

4.1. Direct Impacts: Disaster-Related Trauma and Acute Stress

Children exposed to extreme climate-related events—such as floods, wildfires, heatwaves, droughts, and typhoons—frequently suffer acute psychological effects, including post-traumatic stress, anxiety, depression, and grief. These impacts are not merely short-term reactions but can become chronic and debilitating in the absence of adequate support and recovery systems [1,15,16]. For example, a large-scale survey in Pakistan found that children exposed to climate-induced flooding experienced significant symptoms of anxiety, sleep disturbance, and behavioral issues in the months following the event [17]. Teachers and caregivers observed heightened irritability, concentration difficulties, and emotional withdrawal—often in children with no previous mental health history. Similarly, in Thailand, rising temperatures were associated with increased psychiatric admissions and outpatient diagnoses of mood and anxiety disorders among children, particularly during prolonged heatwaves [8]. These findings suggest that acute disasters and even extreme weather conditions can directly trigger psychological dysregulation. In Australia, adolescents who directly experienced the catastrophic 2019–2020 Black Summer bushfires reported significantly elevated symptoms of depression, anxiety, stress, adjustment disorder, and substance use compared to peers who were not directly exposed [18]. These youth also showed reduced psychological resilience and greater concern and distress related to climate change, along with a heightened sense of its social, geographic, and temporal proximity. These findings suggest that exposure to climate-amplified natural disasters not only triggers acute psychological distress, but also alters perceptions of climate risk and personal vulnerability in lasting ways.

A large-scale spatial analysis in the U.S. revealed that not only heatwaves but also drought—and particularly their co-occurrence—were linked to significant increases in emergency department visits among youth for mood disorders and suicidality [19]. Mood disorder admissions were over six times more likely during droughts, and nearly three times more likely during compound drought-heatwave days. This synergistic exposure created identifiable geographic clusters of psychiatric risk, especially in socioeconomically marginalized communities, suggesting that both climate patterns and social conditions converge to heighten youth mental health vulnerability.

Trauma responses are shaped by multiple mediating factors, including the child's age, level of exposure, familial stability, and the availability of post-disaster psychosocial support. Children who are separated from caregivers, displaced from their communities, or witness injury and death are at elevated risk for developing PTSD, as shown in multiple studies across Asia and Latin America [3,20]. A global scoping review of over 11,000 children exposed to natural disasters identified not only the commonly observed resilient and recovery trajectories, but also significant proportions of youth with chronic and delayed symptom patterns [21]. Risk factors included female gender, high trauma exposure, and lack of social support, while more favorable outcomes were associated with early intervention and coping supports. These findings underscore the dynamic nature of trauma responses over time and highlight the importance of sustained monitoring beyond the initial aftermath of disasters.

Beyond discrete disasters, chronic exposure to degraded environmental conditions can also impair mental health. For instance, postnatal exposure to particulate matter and nitrogen dioxide—pollutants exacerbated by climate change—has been systematically associated with increased risk of attention-deficit/hyperactivity disorder in children [22]. This underscores how ongoing environmental exposures can interfere with neurodevelopment and emotional regulation during sensitive developmental periods.

4.2. Indirect Impacts: Displacement, Deprivation, and Structural Breakdown

In addition to acute events, climate change also generates indirect mental health consequences through long-term environmental degradation and systemic instability. These include food and water insecurity, economic stress, educational disruption, and forced migration. Children may internalize these disruptions as instability, unpredictability, and loss of agency.

Displacement is one of the most well-documented indirect drivers of child and adolescent mental health deterioration. Children displaced by climate-induced flooding or drought experience not only the trauma of loss but also the chronic stress of resettlement, social disconnection, and economic precarity [11]. These stressors can interfere with sleep, emotional regulation, and school engagement, with long-term implications for psychosocial development. In some settings, children take on adult responsibilities prematurely, such as caregiving or income generation, which can further exacerbate psychological burden [23].

Evidence from the Philippines also demonstrates how slow-onset changes—such as coastal erosion and saltwater intrusion—can have profound emotional impacts on children in affected communities. Aruta [24] highlighted cases of Filipino youth expressing grief and hopelessness as their ancestral lands became uninhabitable, disrupting their sense of identity and belonging.

Emerging evidence also suggests that climate-related stressors in utero may contribute to long-term cognitive, emotional, and economic vulnerabilities. A systematic review of over two dozen studies found that prenatal exposure to heat was associated with later-life psychiatric disorders, reduced educational attainment, and lower adult earnings [25]. These effects were especially pronounced in female infants and marginalized populations, highlighting how prenatal climate impacts may compound social inequities across the life course.

4.3. Existential Ecological Distress: Awareness, Emotion, and Moral Injury

Beyond immediate trauma and developmental disruption, many children and adolescents experience profound emotional responses simply through awareness of the climate crisis. Concepts such as eco-anxiety, climate grief, and solastalgia have emerged to describe psychological states rooted not in direct exposure, but in anticipatory loss, moral concern, and perceived abandonment by adults and institutions [4–6]. These experiences often manifest as sadness, fear, helplessness, and disillusionment—emotions that are not pathological, but deeply rational responses to an unfolding ecological emergency.

While these emotional responses are valid and often adaptive, it is important to distinguish between normative emotional reactions—such as sadness, fear, or concern—and clinical distress that significantly impairs functioning. For younger children, whose cognitive and emotional development is still maturing, climate-related distress may manifest in less abstract ways, including somatic complaints, separation anxiety, irritability, or sleep disturbances. Yet current psychometric tools often struggle to differentiate between developmentally appropriate worry and pathological anxiety, especially in this age group. The lack of validated, age-sensitive instruments complicates efforts to assess and respond to eco-anxiety and solastalgia in clinical contexts [26–28].

Recent large-scale research among adolescents in Germany further confirms that climate-related distress independently predicts higher levels of anxiety and depression, as well as lower health-related quality of life [29]. Even after accounting for pandemic- and war-related distress, climate concerns emerged as a significant mental health burden, suggesting that ecological awareness itself constitutes a unique domain of youth vulnerability. Also, recent evidence from over 45,000 adolescents in Quebec shows that while many youth feel concern about climate change, a notable proportion experience functional impairments

such as sleep disruption and reduced academic performance [30]. These impairments were more common among youth with generalized anxiety and those from less affluent backgrounds, reinforcing how emotional and material vulnerabilities interact in shaping climate-related distress.

In the digital era, young people are increasingly exposed to vivid and often distressing imagery of climate-related disasters through social media, news platforms, and user-generated content [31–35]. This real-time visibility of global crises creates what some scholars term "vicarious trauma," where distant events—such as wildfires in Australia, floods in Pakistan, or droughts in East Africa—are experienced as emotionally proximate, despite occurring thousands of miles away [36]. Unlike previous generations, today's children and adolescents can witness environmental devastation as it unfolds, sometimes without adult mediation or developmental filtering. This unbuffered exposure can lead to heightened eco-anxiety, and a sense of moral urgency or despair. Adolescents, in particular, may internalize these global events as both personal threats and ethical imperatives, especially when they perceive institutional failure to act. Studies have shown that repeated digital encounters with climate-related loss, suffering, or inaction can exacerbate psychological strain, intensify perceived helplessness, and deepen intergenerational mistrust [37,38]. In this context, the digital environment functions not merely as a medium of awareness, but as a psychosocial amplifier of existential and emotional vulnerability.

For many youth, this awareness becomes a backdrop to everyday life, shaping their worldview, identity development, and future aspirations. Feelings of betrayal and intergenerational injustice may arise when governments or older generations appear to ignore or deny the crisis—leading some scholars to describe this as a form of moral injury or existential harm [11]. Qualitative research has shown that adolescents often express a blend of sadness, guilt, anger, and powerlessness when discussing the climate crisis [39]. Many describe feeling responsible for environmental harm yet lacking the power to make meaningful change. This disconnect between care and perceived efficacy contributes to a broader sense of moral dissonance and existential distress, particularly when they observe institutional inaction or adult indifference.

Qualitative interviews with adolescents further reveal the depth of these emotional reactions. In the UK, one 17-year-old shared, "I sometimes feel helpless. . . we're being told this is going to happen, and no one's doing anything" [39]. Another described the emotional toll of awareness: "It's like this constant dread in the back of your mind. . . even if it's not happening here right now, you know it's coming" [39]. Youth also express a profound desire for action and moral clarity. As one adolescent quoted in a media analysis stated, "If we don't care, no one will. And then who's left to fix it?" [40]. These narratives are not only evidence of distress but also expressions of agency, urgency, and an evolving ethical framework among young people grappling with climate breakdown.

Climate-related distress rarely occurs in isolation. For many adolescents, it converges with other global stressors—such as economic precarity, the COVID-19 pandemic, and international conflict—creating what some have described as a cumulative "hit-wave" on youth's ability to imagine and plan for the future. This erosion of future thinking during a critical stage of identity development has been linked to increased psychological vulnerability and diminished motivation, suggesting that existential concerns may arise as much from perceived structural collapse as from environmental degradation itself [41].

Longitudinal evidence suggests that climate-related worry intensifies as children move through adolescence [42]. Youth become more aware of ecological instability over time, and concern often deepens rather than dissipates—especially among girls and those from lower-income households. This growing worry reflects not only emotional sensitivity but also increasing cognitive capacity to grasp the scope of global environmental threats.

Importantly, this pattern supports the notion that climate concern is developmentally grounded and likely to persist into adulthood without adequate support or intervention.

Children in environmentally degraded regions may experience solastalgia: a grief-like unease as familiar places are irrevocably transformed. This is especially pronounced in communities where cultural identity is tied to land and seasonal patterns, such as in Indigenous territories, rural coastlines, or island nations [3,9]. Research from high-income countries also suggests that climate-related psychological stress frequently overlaps with concerns about other global crises—such as pandemics or armed conflict. In Germany, for instance, survey data revealed that while climate change was perceived as a less immediate threat than COVID-19 or war, it remained a persistent source of stress, particularly for younger adults and women [43]. These findings highlight how existential distress may emerge not only from environmental degradation itself but from the cumulative emotional toll of navigating an unstable and unpredictable world.

In narratives collected from mainstream media, youth often describe living with both ecological despair and an urgent desire to act [40]. Their language reflects a deep emotional entanglement with nature, but also a sense of betrayal and disillusionment when adult institutions fail to respond. These narratives are not only expressions of anxiety—they are acts of meaning-making, moral positioning, and intergenerational critique. The dual emotional weight of care and helplessness frequently emerges, shaped as much by cultural storytelling as by direct environmental exposure. Table 2 summarizes the primary pathways through which climate change impacts youth mental health, alongside associated risks and protective factors.

Table 2. Pathways linking climate change to child and adolescent mental health: Risks and protective factors.

Pathway	Examples of Mental Health Impacts	Risk Factors	Protective Factors
Direct exposure to disasters	PTSD, anxiety, depression, grief after floods, wildfires, hurricanes, or heatwaves	Young age; separation from caregivers; injury or loss of loved ones; high trauma exposure; gender (girls at higher risk)	Psychological first aid; caregiver presence; trauma-informed care; access to schools and routines
Indirect Disruption of systems	Emotional distress from displacement, food insecurity, school interruption, housing loss	Low socioeconomic status; chronic poverty; lack of health care or education access; early caregiving burden	Stable housing and schooling; social support; culturally relevant services; family cohesion
Existential ecological distress	Eco-anxiety, solastalgia, climate grief, moral injury, despair about the future, vicarious trauma via digital media	High climate awareness; digital overexposure; perceived adult inaction; low self-efficacy; generalized anxiety	Age-appropriate climate education; peer/community engagement; opportunities for activism; caregiver validation

5. Global Evidence Synthesis

The mental health effects of climate change on children and adolescents are now globally recognized, but they are neither evenly distributed nor uniformly studied [44]. While some experiences of distress—such as climate anxiety, trauma, and identity disruption—appear across contexts, the depth, duration, and available support varies drastically based on geography, infrastructure, and sociopolitical conditions. A review of the literature across different global regions reveals common threads of psychological vulnerability, but also highlights persistent disparities in exposure, research attention, and policy response.

In high-income countries, children and adolescents are increasingly experiencing climate-related mental health effects both through direct exposure and through heightened awareness of planetary crisis. In Germany, for instance, Hieronimi et al. [45] documented the psychological consequences of extreme weather events, including PTSD symptoms among youth exposed to floods and storms. Despite the availability of health systems, responses often remain reactive rather than preventive. In many European countries, mental health is still viewed as peripheral within climate adaptation strategies, despite clear evidence of psychological strain in disaster-affected youth [7].

This pattern is echoed in Greece, where an emerging public health discourse increasingly frames climate change not only as an environmental concern but also as a complex psychosocial challenge for youth [10]. Interdisciplinary perspectives highlight the need to recognize ecological grief, climate-related anxiety, and the erosion of environmental identity as central to youth mental health. Similarly, calls have been made across Europe for the integration of child and adolescent mental health into climate preparedness frameworks, with an emphasis on prevention, cross-sector collaboration, and coordinated care [1].

In countries like Australia and Canada, adolescents often channel their distress into activism. While this engagement can be driven by frustration and moral outrage, it also serves as a powerful source of resilience, meaning, and community—a theme explored in greater depth later in the discussion of protective factors [2,9].

Low- and middle-income countries, while experiencing some of the most severe climate impacts, remain underrepresented in the literature. The Pakistan floods of 2022 offer a particularly stark example. Soomro et al. [17] found widespread emotional distress among school-aged children, including heightened anxiety, behavioral problems, and academic disengagement. The psychological burden was compounded by displacement, disruption of education, and economic hardship. Similar findings have emerged from Southeast Asia. In Thailand, Wongpanarak and Langkulsen [8] documented a rise in childhood psychiatric concerns linked to heat exposure and agricultural disruption, while in the Philippines, Aruta [24] emphasized the emotional consequences of gradual coastal loss and forced relocation. Emerging participatory studies, such as a youth co-led qualitative study from Bangladesh, Guatemala, and Nigeria, have begun to document how adolescents perceive and experience the physical and mental health consequences of climate change, including eco-anxiety, hopelessness, and disrupted access to services [46].

Recent evidence from East Africa further underscores how climate-related emotional distress manifests in LMIC youth. In a large cross-sectional survey of over 2600 Kenyan high school students, worry, fear, and feelings of powerlessness about climate change were widespread [47]. These emotional responses were significantly associated with higher scores on the Strengths and Difficulties Questionnaire (SDQ), indicating increased risk of emotional symptoms, conduct problems, and peer difficulties. Importantly, climate-related worry and powerlessness also emerged as predictors of suicidality, including suicidal thoughts, plans, and attempts. These findings not only reinforce the global relevance of climate-related psychological harm, but also highlight urgent mental health concerns in African youth populations that are often overlooked in both research and response planning.

Across these LMIC contexts, mental health services are often limited, underfunded, or absent altogether. Even when distress is recognized, there is a lack of culturally relevant frameworks for treatment, and psychosocial responses are rarely integrated into disaster risk reduction plans. This gap not only impedes recovery but also perpetuates cycles of vulnerability and inequality [3]. Research in these regions also reflects the lived experience of cumulative adversity, as opposed to discrete traumatic events. Children are not only affected by storms or droughts, but by their interactions with food insecurity, parental

stress, migration, and under-resourced schools. More research is needed into how children's awareness of climate change interacts with their emotional development, particularly in contexts where lived experience and education about the crisis co-exist in difficult ways [48].

Globally, Indigenous and culturally distinct communities continue to voice the psychological toll of environmental degradation as both a material and spiritual crisis. Among Arctic and sub-Arctic Indigenous youth, changes to land, wildlife, and seasonal patterns have been linked to ecological grief and loss of identity. Similar expressions of place-based sorrow have been recorded among youth in Latin America, Southeast Asia, and Oceania. These forms of distress are often collective, historical, and deeply rooted in intergenerational memory—calling for culturally anchored approaches to mental health and climate adaptation.

Across all regions, one truth remains consistent: children and adolescents are experiencing the climate crisis not only in their bodies and homes, but in their minds and futures. Yet the capacity to cope—and the visibility of that distress within health and policy systems—varies drastically. The evidence base is still shaped by disparities in research funding, publication access, and institutional capacity. Youth in the most affected regions continue to be the least studied and least supported, despite bearing the brunt of global environmental harm.

To truly respond to the mental health dimensions of the climate crisis, the global community must commit to research, interventions, and governance models that are equitable, interdisciplinary, and explicitly focused on young people. Mental health must be recognized not as a peripheral concern, but as a core measure of climate resilience and justice. Table 3 provides a regional overview of key psychological impacts and exposure types, illustrating the geographic variation in risk, visibility, and evidence coverage.

Table 3. Regional variation in psychological impacts of climate change on youth.

Region	Exposure Types	Psychological Impacts	Notes
North America	Wildfires, hurricanes, heatwaves	PTSD, anxiety, depression, eco-anxiety	Strong research base; urban-rural disparities; racial inequities noted
Western Europe	Flooding, temperature extremes	Anxiety, solastalgia, existential worry	Increasing focus on climate grief and activism-related strain
Australia	Bushfires, drought	Depression, anxiety, climate-related worry	Youth activism prominent; mental health linked to perceived inaction
South Asia	Flooding, heatwaves, drought	PTSD, anxiety, academic disruption, helplessness	High exposure; limited mental health services
Southeast Asia	Coastal erosion, saltwater intrusion	Displacement stress, grief, loss of place	Impacts tied to disrupted place-based identity
Sub-Saharan Africa	Drought, food and water insecurity	Suicidality, emotional symptoms, powerlessness	Emerging evidence; very limited service provision
Latin America	Flooding, heat, forced displacement	Anxiety, grief, identity disruption	Youth narratives emphasize moral and ecological concerns
Arctic/Indigenous	Permafrost melt, disrupted seasonal cycles	Solastalgia, ecological grief, cultural and intergenerational loss	Trauma linked to land, identity, and ancestral continuity

6. Vulnerable Populations and Risk Factors

While all children and adolescents are susceptible to the psychological effects of climate change, certain groups are far more likely to bear its burden due to structural inequities, geographic location, developmental stage, and systemic exclusion. Climate change does not produce vulnerability in isolation; rather, it magnifies existing disparities in

exposure, support, and social power. A clear understanding of these layered vulnerabilities is essential for the development of targeted, ethical, and effective mental health responses.

Age remains one of the most fundamental determinants of vulnerability. Young children, particularly those in early developmental stages, may not fully grasp the causes or implications of climate disruptions, yet they experience profound emotional responses to environmental trauma. Their distress is often mediated by caregiver presence and predictability, both of which can be disrupted by displacement, housing loss, or family economic instability. Adolescents, in contrast, frequently understand the climate crisis in cognitive and existential terms. For them, climate change may provoke feelings of fear, betrayal, or hopelessness—particularly when they perceive adults and institutions as failing to act. These emotional states can interfere with identity development, future planning, and trust in social systems, with lasting mental health consequences.

Socioeconomic status compounds these risks. Children from low-income households are more likely to reside in high-risk environments—such as flood zones, heat islands, or rural drought-prone areas—where infrastructure is fragile and services are sparse. In Pakistan, Soomro et al. [17] documented how economic deprivation following floods exacerbated psychological symptoms in children, particularly those unable to return to school or access safe housing. In Thailand, Wongpanarak and Langkulsen [8] found that rural children affected by crop failures and displacement faced heightened psychiatric risks, which were intensified by their families' limited capacity to access formal support.

Displacement is another powerful risk factor. Whether driven by sudden disasters or slow-onset environmental degradation, the experience of uprooting disorients young people's sense of place, stability, and belonging. Displaced children often experience compounded trauma: the shock of environmental events, the loss of homes and schools, and the social fragmentation that follows resettlement [3]. These children are frequently overlooked in both mental health services and policy design, particularly when displacement occurs within informal or undocumented settings.

Indigenous youth face distinct forms of vulnerability rooted not only in material exposure, but in the disruption of ecological, cultural, and ancestral lifeways. Environmental degradation in Indigenous territories often constitutes a dual trauma: the loss of physical habitat and the unraveling of intergenerational knowledge, land-based identity, and cultural continuity [3,9,49]. These experiences are best understood not solely through Western psychiatric models, but through relational, historical, and spiritual frameworks that account for colonial histories and place-based worldviews.

Youth living with disabilities or chronic health conditions face additional layers of vulnerability. During disasters, their access to services, safe mobility, communication support, or routine medical care may be severely disrupted. Few emergency preparedness frameworks include disability-inclusive protocols, leaving these children disproportionately exposed to stress and trauma [7]. The same applies to youth with pre-existing mental health conditions, whose symptoms may worsen when routines are interrupted, medications are inaccessible, or therapeutic relationships are severed.

Gender, too, is a critical axis of vulnerability. In many regions, girls face increased caregiving burdens, early marriage, and risk of violence during climate-related displacement. LGBTQ+ youth may experience marginalization or hostility in shelter systems, schools, or community settings—particularly where their identities are stigmatized. These intersecting identities are often rendered invisible in climate and health policy, leading to serious gaps in inclusive care planning and psychosocial support [50].

The psychological impact of climate change is not experienced in isolation. It is shaped by the interaction of social identity, historical marginalization, environmental exposure, and access to care. Vulnerability, in this sense, is not only a condition of individual risk but

a reflection of collective neglect. A just response to the mental health dimensions of climate change requires us to move beyond universal models and toward intersectional, context-specific, and community-driven frameworks. Only then can we begin to understand what it truly means to protect those most affected—and most often unheard.

7. Protective Factors and Resilience

In the face of escalating psychological burdens, children and adolescents also demonstrate remarkable resilience—rooted not only in individual coping, but in relationships, social systems, cultural identity, and access to meaningful engagement. Resilience in this context is best understood as the capacity to adapt and grow within adversity, shaped by caregiving, community belonging, and opportunities for collective action.

At the core of psychological resilience is the presence of safe, responsive, and emotionally available caregivers. Stable caregiver relationships are among the strongest predictors of resilience, especially when children face displacement or environmental upheaval. The ability of caregivers to buffer psychological stress is closely tied to the presence of supportive systems that also attend to their own emotional well-being [3]. Conversely, when caregivers are overwhelmed by stress or loss themselves, their diminished capacity can intensify children's sense of instability, confusion, or abandonment. Interventions focused on family systems and caregiver support are therefore foundational to mental health protection in climate-exposed populations.

Schools, too, are critical sites of resilience. As previously noted, they serve not only educational purposes but also offer structure, social connection, and opportunities for psychosocial support—especially when integrated with trauma-informed practices and climate literacy.

Educational content also matters. Programs that incorporate accurate, age-appropriate information about climate change—while simultaneously offering space for emotional processing—can reduce anxiety and foster agency. Hope-based messaging, which highlights community action, adaptation successes, and youth-led initiatives, helps prevent the onset of helplessness or despair. Climate-related curricula should not avoid the reality of environmental threats but rather help children navigate the emotional and cognitive dimensions of this knowledge with care, creativity, and developmental sensitivity [13].

Participation in climate action itself can be a source of profound resilience, especially among adolescents. Social media has emerged as a major arena for such engagement. Many youth use platforms like Instagram and TikTok to gather climate information, build community, and mobilize action—experiences that can enhance self-efficacy and emotional connection [31,33]. However, exposure to 'doomism,' misinformation, or uncensored emotional content can also heighten distress, underscoring the need for digital literacy and supportive adult guidance in online spaces.

Many young people report that engaging in activism—whether through strikes, environmental clubs, storytelling, or peer organizing—reduces feelings of isolation and transforms anxiety into purpose [5,9]. These actions foster community, increase self-efficacy, and reaffirm the moral agency of youth in confronting the crisis. However, activism can also bring emotional risks. Exposure to climate denialism, institutional inaction, or burnout may leave some youth disillusioned. Mental health professionals and adult allies must be prepared to support young people in navigating these emotional cycles, offering spaces for rest and reflection as well as mobilization.

Qualitative narratives illustrate that activism is often motivated by emotional urgency as well as hope. In a UK media analysis, one teenager stated, "Climate action helps me deal with how scared I feel—it makes me feel like I'm doing something, not just sitting with it" [40]. Another expressed that organizing school strikes gave them "a sense of

power and a voice, even if adults don't always listen" [40]. These insights demonstrate that collective action is not only political but also therapeutic, providing emotional grounding amid overwhelming ecological awareness.

Indigenous and community-based frameworks offer distinct understandings of resilience that are relational, ecological, and culturally grounded. For Indigenous and culturally rooted communities, resilience often emerges through continuity with land, story, and ancestral knowledge. Emerging cross-cultural research also points to nature contact in urban environments as a vital resource for promoting youth well-being and ecological engagement. One study currently underway in Dhaka, Kampala, and Utrecht uses geographic ecological momentary assessment and mental model mapping to examine how greenspace exposure and nature connectedness support mental health and pro-environmental behavior in urban youth [51]. This approach highlights the restorative and relational value of everyday environmental interactions, even in densely built environments. Children in these communities may experience climate change not only as environmental loss but as spiritual and cultural disruption. Yet, traditional practices—such as communal ceremonies, intergenerational storytelling, and land-based healing—offer powerful forms of restoration. Such practices are not peripheral but central to the wellbeing of children who draw strength and identity from place-based relationships [3,10]. These cultural frameworks also challenge the often individualistic orientation of Western psychology by emphasizing collective memory, historical responsibility, and reciprocal care with the environment.

Importantly, resilience is also about systems, not just individuals. Public health infrastructures that ensure continuity of mental health services during climate events, community networks that mobilize mutual aid, and policies that invest in climate adaptation for schools and families all contribute to the broader ecology of resilience. It is within this ecology that children find their footing—not because they are naturally resilient, but because they are surrounded by structures that uphold their right to stability, care, and voice.

Resilience in the climate era is not a passive return to normalcy. It is an active, relational, and often radical practice of sustaining life, meaning, and connection in conditions that are shifting rapidly. Young people already care deeply; they do not need to be taught this. What they need is support to carry that care with strength, safety, and solidarity. That is where our efforts must now be directed.

8. Clinical, Public Health, and Policy Implications

Climate-related mental health impacts demand urgent, coordinated action across clinical, public health, and policy domains [52]. These effects are not transient or peripheral—they are foundational disruptions to emotional, developmental, and existential security. To meet this moment, institutions must move beyond reactive care models toward systemic, interdisciplinary strategies that are preventative, participatory, and rooted in justice.

Within clinical settings, there is a growing recognition that climate change is a present and escalating mental health issue, but clinician readiness remains limited [53]. Many child and adolescent mental health professionals lack formal training in identifying or addressing climate-related distress. Clinicians must move beyond pathologizing youth concerns and instead recognize them as valid emotional responses to real and escalating environmental threats [54]. Therapeutic practice must adapt to include developmentally appropriate discussions about climate anxiety, ecological grief, and future uncertainty. Interventions should foster resilience without invalidating fear, and clinicians must be prepared to support both emotional processing and constructive engagement.

Training curricula in psychology, psychiatry, social work, and pediatrics should be expanded to incorporate climate-related mental health, particularly for professionals serving

disaster-prone regions [1]. Tools such as psychological first aid, trauma-informed care, and culturally responsive approaches must be integrated into child mental health protocols. For children exposed to displacement or repeated disasters, continuity of care is essential—not only through formal therapy but also through peer support, school-based programming, and community networks.

Educational systems are uniquely positioned to act as both protective environments and frontline intervention spaces. Schools serve not only as places of learning but as anchors of safety, routine, and psychosocial restoration after climate-related disruptions. Integrating emotional literacy, climate awareness, and participatory dialogue into the curriculum can foster collective coping and prevent isolation. School nurses, counselors, and educators should be equipped to recognize climate-related distress and respond with empathy and evidence-based strategies [50]. An exemplary case is the implementation of trauma-informed disaster mental health training in Puerto Rico following Hurricane Maria, which trained over 9000 professionals using culturally adapted programs, resulting in over 650 youth being identified and referred to services [55]. Beyond emergency preparedness, educational systems must be resourced to support ongoing mental wellness in climate-affected regions.

In the public health sector, mental health must be integrated into climate adaptation frameworks—not as an addendum, but as a core objective. Embedding mental health within national climate and disaster risk reduction plans has been widely recognized as an essential component of comprehensive public health strategy [23]. This includes ensuring that mental health services are accessible, resilient, and scalable in climate-exposed areas. Public health systems must be prepared not only to respond to acute events but to anticipate and monitor long-term psychological trends across age groups and regions.

There is growing recognition of the need for public health frameworks that reflect the interdisciplinary nature of climate-related mental health—linking environmental health, education, social services, and mental care through integrated strategies [1,10]. This integration requires political will, inter-agency coordination, and sustainable funding. Particularly in low-resource settings, community-based mental health models—delivered by trained lay counselors or embedded within schools—can serve as accessible, scalable interventions.

At the policy level, governments must recognize that protecting child and adolescent mental health is a core responsibility of climate governance. Every decision made about infrastructure, emissions, land use, or disaster response has implications for young people's psychological well-being. Intergenerational justice must be understood not as an abstract ideal, but as a concrete responsibility to ensure that children are not left to bear the psychological burden of a crisis they did not create [11]. This includes national adaptation and mitigation plans, post-disaster recovery funding, school climate curricula, child protection laws, and youth participation in planning processes.

Policy must be informed by the lived experiences of young people. Youth are not simply beneficiaries of policy—they are witnesses, interpreters, and active participants in the climate struggle. Supporting their mental health requires not only listening to their fears but responding with tangible change. Institutionalizing youth participation in policymaking is one way to both honor their agency and create solutions that are developmentally relevant and ethically responsive.

As the climate crisis unfolds, it is no longer sufficient to prepare for physical impacts while treating mental health as collateral. The psychological well-being of children and adolescents must be centered—not only to alleviate suffering but to create a world in which the next generation can imagine and build a viable, meaningful future. The time to act is now, and the responsibility lies with all of us.

9. Research Gaps and Future Directions

Despite increasing attention to the psychological dimensions of climate change, research on its impact on children and adolescents remains strikingly underdeveloped [56]. While the evidence base is growing, it is fragmented, concentrated in high-income contexts, and often limited to descriptive or cross-sectional designs. A recent evidence gap map review found that although nearly 200 studies examine climate-related risks for children under five—such as preterm birth, malnutrition, and respiratory illness—very few address mental health outcomes [57]. Additionally, the majority of studies are quantitative and concentrated in Asia and Africa, leaving substantial geographic and methodological gaps, particularly in the Caribbean, Central America, and qualitative research domains. As the climate crisis intensifies, there is a critical need for a more global, inclusive, and developmentally nuanced research agenda that informs both clinical practice and policy.

9.1. Underrepresentation of LMICs and Climate-Vulnerable Populations

One of the most striking shortcomings of the existing literature is its geographic imbalance. The vast majority of studies originate from high-income countries, particularly in Western Europe, North America, and Australia. In contrast, low- and middle-income countries—where climate change is already having the most severe and immediate impacts—remain substantially underrepresented in both empirical and theoretical work [3,8]. This asymmetry not only distorts the global understanding of climate-related mental health but also undermines the development of interventions that are appropriate and effective in high-risk settings.

Regions such as South Asia, sub-Saharan Africa, and the Pacific Islands face frequent disasters, chronic environmental degradation, and systemic health inequities. Yet, research in these areas is sparse, often fragmented, and rarely locally led. Moreover, certain subpopulations remain nearly invisible in the literature. Indigenous children, youth living with disabilities or chronic illnesses, stateless and rural youth, and LGBTQ+ adolescents in climate-affected areas are frequently excluded from mainstream research narratives. These omissions are not accidental; they reflect broader patterns of structural neglect and epistemic injustice.

This imbalance reflects broader patterns of epistemic injustice, whereby knowledge production is disproportionately driven by institutions in the Global North, often sidelining local voices and experiences. Addressing this requires more than geographic inclusion—it demands investment in locally led research, capacity building for youth scholars, and the development of culturally grounded mental health frameworks. Equitable research partnerships, funding mechanisms that prioritize local leadership, and the cross-cultural validation of assessment tools are essential to building a global evidence base that is both scientifically robust and socially just.

To correct this, future research must invest in community-driven, culturally grounded studies that center the voices and leadership of youth and scholars in the Global South. Local institutions should be empowered not just as sites of data collection but as drivers of inquiry and action. Without this shift, the global evidence base will remain skewed, and the solutions derived from it will be inequitable by design.

9.2. Longitudinal and Developmental Approaches

Another major gap in the literature lies in its overreliance on cross-sectional studies. While such designs are valuable for identifying patterns of distress and correlation, they are inadequate for understanding how mental health trajectories evolve over time. Longitudinal research is essential for tracing the developmental consequences of climate-related exposures—from early childhood through adolescence and into adulthood. These studies

could illuminate, for example, how early trauma resulting from disaster or displacement affects later emotional regulation, identity formation, or social functioning.

Similarly, there is a pressing need to examine how repeated or cumulative exposure to climate-related events interacts with psychological vulnerability and resilience. Longitudinal designs would allow researchers to distinguish between temporary distress and more enduring psychopathology. They could also assess the long-term effectiveness of different resilience-building interventions, providing a stronger empirical basis for program development.

Moreover, these studies must be developmentally attuned. Measures and methodologies must reflect the unique cognitive, emotional, and relational capacities of children at different life stages. A five-year-old's experience of eco-anxiety cannot be measured with the same tools used for an adolescent or young adult. Developmentally appropriate tools, informed by both clinical insight and lived experience, are essential for ethical and accurate research.

9.3. Theoretical Clarity and Measurement Tools

While the concepts of eco-anxiety, solastalgia, and climate grief have gained traction in both academic and public discourse, they remain inconsistently defined and poorly operationalized. Many studies rely on unvalidated or adapted scales, making it difficult to compare findings across contexts or draw conclusions about prevalence, severity, or implications. In particular, younger children are often excluded from measurement tools altogether, either because the constructs are assumed to be too abstract or because appropriate instruments do not exist.

Future research must prioritize the development and validation of psychometrically sound tools that are age-appropriate, culturally sensitive, and capable of distinguishing between adaptive and maladaptive responses. Variations in how eco-anxiety is defined—such as framing it as general worry versus clinical anxiety—can significantly influence the strength of its association with psychological outcomes. Stronger links to distress and affective symptoms tend to emerge when eco-anxiety is conceptualized as a form of anxiety rather than as a more diffuse concern. This distinction plays a crucial role in both research validity and how findings are interpreted in clinical and public health contexts [28]. It is important to differentiate between concern that motivates civic engagement and distress that leads to functional impairment or despair. In addition to refining existing constructs, scholars should consider integrating newer theoretical frameworks—such as moral injury or intergenerational betrayal—to better capture the ethical and political dimensions of youth distress in the climate context.

Equally important is the need to bridge Western psychological models with collective, spiritual, and land-based conceptions of mental health, particularly in Indigenous and rural communities. Without this integration, the field risks reproducing cultural biases and missing vital dimensions of experience.

9.4. Intervention Development and Implementation Science

Although climate-related psychological distress among children and adolescents is increasingly recognized, there remains a striking absence of empirical studies evaluating the effectiveness of interventions designed to address it. To date, no peer-reviewed research has systematically tested or validated interventions specifically targeting climate-related mental health outcomes in youth populations. Without robust evidence on what works, when, and for whom, practitioners and policymakers are left to rely on intuition or extrapolate from unrelated contexts.

Particularly absent are studies conducted in low-resource settings or post-disaster environments, where the need for effective mental health support is most acute. Interventions must be evaluated not only for their psychological outcomes but also for their feasibility, cultural resonance, and scalability. Programs delivered in schools, through community healing initiatives, via peer support networks, or through digital platforms all show promise—but they require rigorous study, ideally through mixed-method designs that capture both quantitative outcomes and lived experience.

Implementation science offers a useful lens for understanding how effective programs can be adapted across geographies and institutional contexts. This approach acknowledges that interventions do not exist in a vacuum but are embedded in systems shaped by policy, infrastructure, and local trust. Research must therefore attend to the conditions under which mental health support can be sustained, scaled, and equitably distributed.

Early evidence from post-disaster mental health programs in South Asia and East Africa suggests that school-based group interventions [58,59], youth peer support models [60–62], and lay counselor-delivered care [61–63] can be both effective and scalable in low-resource settings. These approaches emphasize cultural relevance, local ownership, and integration with existing educational and health infrastructures. For example, group-based psychosocial support in schools has been shown to improve emotional well-being and classroom behavior, while peer-led models promote trust, accessibility, and stigma reduction among adolescents. Lay counselor programs—such as those adapted from task-shifting models in global mental health—can deliver evidence-informed care with appropriate training and supervision, especially in regions where access to specialized providers is limited.

9.5. Youth-Led and Interdisciplinary Research Models

Finally, one of the most transformative directions for future research lies in its methodology. Studies must move beyond viewing young people as passive subjects and instead embrace them as collaborators, co-researchers, and narrators of their own experiences. Participatory action research, youth-led inquiry, and co-design processes are not just ethical imperatives—they produce more grounded, nuanced, and impactful findings. Young people bring developmentally attuned insight into the emotional, social, and existential dimensions of the climate crisis—insight that must be centered in research, not merely extracted or observed [5].

Moreover, the complexity of climate-related mental health calls for interdisciplinary collaboration. Psychology alone cannot capture the full scope of this issue. Insights from environmental science, public health, education, Indigenous knowledge systems, and political ecology are essential for constructing a truly comprehensive understanding. Such collaboration allows for the development of interventions that address both individual symptoms and the structural conditions that produce them.

To envision a world in which children and adolescents not only survive but emotionally and psychologically thrive amidst climate change, research must become more inclusive, contextually grounded, and justice-oriented. We must ask not only what young people are feeling, but what they are seeing, fearing, and demanding. And we must allow those questions to shape our scientific, institutional, and collective response.

9.6. Limitations and Areas of Debate

While this narrative review provides a comprehensive overview of the literature, several limitations should be acknowledged. Our inclusion criteria were designed to ensure a focused exploration of the intersection between climate change and the mental health of children and adolescents. Specifically, we included only peer-reviewed studies published

in English that directly addressed this intersection—both empirical research and theoretical articles. In contrast, studies focusing exclusively on adult populations, lacking a clear focus on mental health outcomes, or not available in full-text were excluded. Although these criteria helped maintain a targeted scope, they may have inadvertently excluded relevant findings from non-English sources or broader mental health contexts. Furthermore, despite incorporating systematic elements, our narrative approach may not capture every nuance or emerging debate in this rapidly evolving field. Challenges also persist in standardizing the operational definitions of key constructs such as eco-anxiety, solastalgia, and climate grief, which are subject to ongoing scholarly debate. Future research employing more systematic methodologies, broader inclusion criteria, and longitudinal designs could help address these gaps and offer further clarity on these complex issues.

10. Conclusions

Climate change is no longer a distant or abstract threat for children and adolescents; it is a lived and immediate reality. Around the world, young people are experiencing not only the physical consequences of a destabilized planet, but also the psychological weight of environmental loss, displacement, and uncertainty about the future. These mental health impacts are amplified by structural inequities—particularly among marginalized, under-resourced, and climate-vulnerable communities—making climate change both a psychological and a justice issue.

The emotional toll is diverse: from acute trauma following disasters to chronic stress from environmental degradation and existential distress in the face of inaction. Yet amid these burdens, many young people exhibit profound resilience—nurtured through caregiving relationships, cultural continuity, peer support, and opportunities for civic engagement. Youth activism has emerged as a powerful source of agency and meaning for many, though it can also expose young people to burnout, moral injury, and disillusionment. Supporting youth mental health therefore requires not only encouragement of engagement but safeguards for their emotional well-being.

Responding to the mental health dimensions of the climate crisis demands action across clinical, educational, public health, and policy domains. Mental health must be treated not as an ancillary concern, but as integral to climate adaptation and intergenerational equity. This means investing in youth-centered services, integrating psychosocial support into climate planning, and ensuring that the voices of young people—especially those in the most affected regions—shape our collective response.

To protect the minds of the youngest generation is to affirm their right to safety, meaning, and hope in a rapidly changing world. This is not only a public health priority—it is a moral imperative.

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