

From Awareness to Agency: Psychosocial Dimensions of Climate Change among the Youth

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Abstract

Climate change poses a profound and disproportionate threat to the psychosocial well-being of the youth. This scoping review systematically synthesizes evidence from 45 studies published between 2000 and 2024 to map the cognitive, affective, and behavioral responses of this demographic (ages 15–24) to the issue of climate change. The analysis reveals a critical "knowledge-agency paradox": youth demonstrate high awareness of climate change, yet this knowledge coexists with persistent scientific misconceptions, significant emotional distress, and a fractured sense of personal agency. A key temporal finding is the evolution of research priorities, shifting from an early focus on cognitive deficits to a contemporary emphasis on mental health, with studies on climate anxiety growing from 0% to 67% of the literature over the period. Affectively, high levels of climate-related worry are directly associated with increased symptoms of depression. Behaviorally, engagement is most effectively mobilized through community-based, collective interventions that foster a shared sense of purpose. Methodologically, the literature is predominantly quantitative (70.2%) and geographically concentrated in the Global North, failing to capture the nuanced, culturally specific experiences of youth worldwide. This review argues for a paradigm shift toward mixed-methods and culturally sensitive research. It underscores the urgent need for interventions that move beyond disseminating information to actively fostering collective efficacy and providing robust emotional support, thereby empowering youth to transition from awareness to meaningful agency.

Keywords: Climate change, youth climate engagement, psychosocial, cognitive, mental health, affective, pro-environmental behavior

INTRODUCTION

Climate change represents not merely an environmental crisis but a profound psychosocial challenge that disproportionately affects younger generations. The Intergovernmental Panel on Climate Change (IPCC, 2021) projects that children born within the last decade may experience a fivefold increase in extreme weather events during their lifetimes under a 3°C warming scenario. Among the most psychologically vulnerable populations are the youth—defined by the United Nations (1981) as individuals aged 15-24—who find themselves navigating a critical developmental period characterized by identity formation, future orientation, and increasing autonomy while simultaneously confronting an existential threat that will fundamentally shape their lives.

This generation, the largest cohort in human history, demonstrates unprecedented environmental awareness yet faces unique psychological burdens. Global surveys consistently reveal heightened climate consciousness among youth: a comprehensive UNICEF (2021) survey of over 10,000 young people across 21 countries found that 69% view climate change as an "emergency," while mass mobilizations such as the global climate strikes have showcased their remarkable capacity to drive social change (Thunberg et al., 2019). However, this heightened awareness exists alongside profound psychological distress and feelings of disempowerment, as the youth are frequently excluded from the policy decisions that will determine their environmental future—a dynamic that research suggests can intensify feelings of helplessness and climate anxiety (Ojala, 2013; Sciberras & Fernando, 2022).

While existing literature has documented high levels of environmental concern and activism among youth, a review of the literature to the understanding of how cognitive awareness, emotional responses, and behavioral engagement interact across different cultural contexts remains fragmented. Understanding these complex psychosocial dynamics is crucial for meaningful youth environmental engagement.

This scoping review addresses these critical knowledge gaps through four primary objectives:

1. Profile and synthesize studies youth cognitive, affective, and behavioral responses to climate change (ages 15-24) to identify consistent patterns and significant variations across different populations and contexts.
2. Examine the temporal evolution of research priorities in this field from 2000-2024, tracking how scholarly attention has shifted from purely cognitive assessments toward recognition of climate change as a complex psychosocial phenomenon affecting youth mental health and development.
3. Identify the central paradox characterizing youth climate engagement and explore how this paradox manifests across different cultural, educational, and socioeconomic contexts.
4. Provide evidence-based recommendations for research methodologies, educational interventions, and support systems that can effectively bridge the gap between climate awareness and meaningful environmental agency while supporting the psychological well-being of climate-engaged youth.

By systematically mapping the evidence from studies conducted across diverse geographical and cultural contexts, this review aims to advance understanding of how the youth experience climate change. The findings will inform the development of more effective educational approaches, mental health interventions, and policy frameworks that honor both the intellectual capacity and emotional vulnerability of young people confronting the climate crisis. Ultimately, this review seeks to contribute to approaches that can empower youth to transition from awareness to meaningful agency in addressing climate change while maintaining their psychological well-being and developmental trajectory.

METHODS

This review was conducted following the Joanna Briggs Institute (JBI) methodology and is reported in accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR).

Eligibility Criteria

Studies were selected using a Population, Concept, and Context (PCC) framework:

Population: Youth aged 18–24 years

Concepts: Studies examining psychosocial responses to climate change, including:
cognitive (e.g., knowledge, beliefs)
affective (e.g., concern, worry, hope), and/or
behavioral dimensions (e.g., pro-environmental actions, civic engagement)

Context: Studies/articles, written in English, from all geographical regions were included

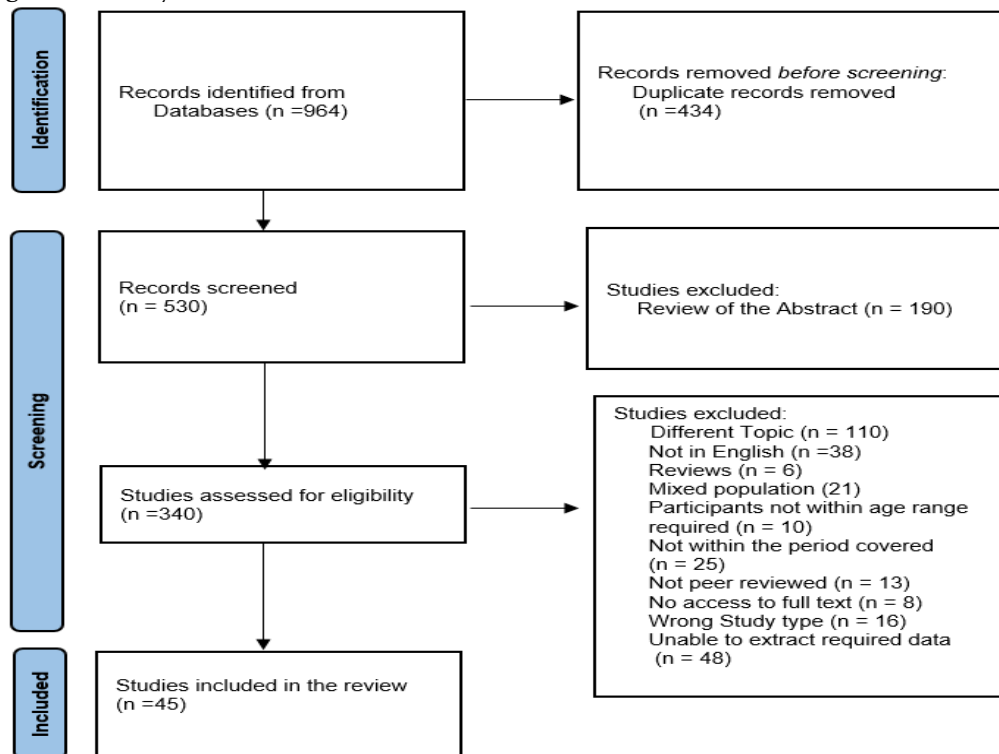
Search Strategy

A systematic search was performed from three databases: Scopus and Web of Science and Google Search. The search combined keywords targeting the core topic (climate change), the target population (e.g., 'youth', 'adolescent'), and the psychosocial dimensions of interest (e.g., 'perception', 'emotion', 'behavior'). The three components were combined using the Boolean 'AND' operator to ensure retrieved articles addressed the intersection of all three concepts.

Study Selection

The study selection began with 964 records identified from Scopus, Web of Science and Google Search databases. After removing 434 duplicates, 530 records underwent screening. Following abstract review, 190 studies were excluded, leaving 340 for full-text assessment. During eligibility assessment, 295 studies were excluded for multiple reasons, with "different topic" being the most common (n=109), followed by inability to extract required data (n=48) and language restrictions (n=38). Other exclusions included wrong time period, study design, peer-review status, age range, and accessibility issues. The final review included 45 studies, representing 4.7% of initially identified records (see Figure 1).

Figure 1: Study Selection



RESULTS

Study Characteristics

A detailed summary of all included studies is available in Appendix A.

Year of Publication. The temporal distribution of studies reveals a clear trajectory of increasing scholarly attention to climate change perceptions among youth (see Table 1). The research field demonstrates three distinct developmental phases: an initial sparse period (2000-2009) with minimal scholarly activity (n=2 studies, representing 4.4% of all research), followed by foundational growth (2010-2014) where research began to establish systematic inquiry (n=12 studies, 26.7%), and finally, sustained expansion (2015-2024) characterized by consistent high-level academic engagement (n=31 studies, representing 68.9% of all identified research).

The most productive period was 2015-2019, accounting for 40.0% of all studies, with an average of 3.6 studies per year compared to 0.2 studies per year in the earliest periods. This growth pattern demonstrates that climate change research among youth has transitioned from a niche area of inquiry to a mainstream research priority. The sustained productivity from 2015-2024, with a moderate decrease in the most recent period (2020-2024: 28.9%), suggests that research interest has stabilized at high levels rather than declining, though the lower recent output may reflect natural publication lag effects rather than decreased scholarly interest.

Individual year analysis reveals peak publication years of 2015 and 2021 (6 studies each), with 2014, 2017, and 2020 each producing 5 studies. The period from 2013-2021 shows the most sustained research activity, indicating nearly a decade of consistent scholarly engagement with youth climate perceptions. This temporal evolution likely reflects broader societal recognition of climate change impacts on young people's psychological well-being and development, coinciding with increased global climate activism and policy attention following major climate events and international agreements. The relative scarcity of publications from 2022-2024 (only 2 studies) may indicate either a natural research cycle transition or publication delays rather than diminished academic interest in this critical area.

Table 1: Publication Year Distribution (n = 45)

Period	Number of Studies	Average per Year	Percentage of Total
2000-2004	1	0.2	2.2%
2005-2009	1	0.2	2.2%
2010-2014	12	2.4	26.1%
2015-2019	18	3.6	39.1%
2020-2024	13	2.6	28.3%

Geographical Distribution. Table 2 shows that the research was geographically concentrated in the Global North. The concentration of studies in developed, Western nations reflect a common pattern in academic research where countries with greater resources, established research infrastructure, and funding mechanisms tend to produce more published studies. The USA leading with eight studies is unsurprising given its large academic sector, substantial research funding, and extensive publication networks. Sweden's six studies and Australia's four studies similarly reflect these nations' strong research capabilities and academic traditions.

Table 2: Geographic Distribution of Studies (n = 45)

Country/Region	Number of Studies	Percentage
USA	8	14.0%
Sweden	6	10.5%
Australia	4	7.0%
China	3	5.3%
Germany (Austria)	3	5.3%
United Kingdom	1	3.5%
Taiwan	2	3.5%
India	2	3.5%
Other Countries*	27	47.4%

*Note: Other countries, include: Bangladesh, Bahrain, Croatia, Czech Republic, France, Indonesia, Italy, Malaysia, Malta, Mozambique, Norway, Portugal, South Africa, Turkey, and multi-country studies (It is important to recognize that the EU and UNICEF global surveys covered several counties).

Research Design, Population and Sampling. The methodological landscape of climate change research among youth demonstrates a clear quantitative dominance, with 28 studies (62.2%) employing quantitative approaches, primarily cross-sectional surveys. Mixed methods research constituted 20.0% of studies (n=9), reflecting growing recognition of the need for comprehensive approaches that capture both measurable outcomes and experiential dimensions. Qualitative methodologies, while representing the smallest portion at 17.8% (n=8), provided crucial insights into the lived experiences and nuanced emotional responses of climate-engaged youth.

Table 3: Research Method Distribution, Population and Sample Size Distribution (n = 45)

Method Type	Number of Studies	Percentage
Quantitative	28	62.2%
Mixed Methods	9	20.0%
Qualitative	8	17.8%
Population Type		
Secondary School Students	23	51.1%
University Students	11	24.4%
Mixed Age Groups	7	15.6%
Special Populations*	4	8.9%
Sample Size Range		
Small (≤ 100)	14	35.9%

Sample Size Range

Medium (101-500)	15	38.5%
Large (501-2000)	5	12.8%
Very Large (>2000)**	5	12.8%

*Special populations include Medical students, Indigenous youth (Sámi), Native American youth, and Female-focused studies

**Very Large Studies:

- Tiller et al. (2021): 20,207 participants, Australia
- Lewandowski et al. (2024): 15,793 participants, USA
- Jamelske et al. (2015): 4,005 participants, USA & China
- Tranter & Skrbis (2014): 2,378 participants, Australia
- Sciberras & Fernando (2022): 2,244 participants, Australia

Note: Sample size percentages are calculated based on the 39 studies that reported specific sample sizes, as 6 studies did not specify their sample sizes in the Appendix A data.

Population distribution reveals a pronounced focus on secondary school students, comprising 51.1% of all studies (n=23), followed by university students at 24.4% (n=11). This emphasis on younger secondary students suggests research interest in formative developmental periods when environmental attitudes and identities are being established. Mixed age group studies represented 15.6% (n=7), while special populations—including medical students, Indigenous youth, and female-focused studies—comprised 8.9% (n=4), indicating limited but important attention to unique demographic contexts.

Sample sizes varied dramatically across studies, demonstrating the field's methodological diversity. Small studies (≤100 participants) constituted the largest category at 35.9% (n=14), often representing in-depth qualitative investigations. Medium-sized studies (101-500 participants) followed closely at 38.5% (n=15), typically employing survey methodologies within single institutions. Large and very large studies each represented 12.8% of the research (n=5 each), with the very large studies including major national surveys that provided population-level insights into youth climate perceptions. The methodological range from intimate qualitative studies of 5-6 participants to massive surveys of over 20,000 youth illustrates the field's commitment to capturing both depth and breadth of understanding.

Research Concept Distribution and Temporal Trends. Analysis reveals that on studies conducted between 2000 and 2024, distinct patterns in research priorities and a notable evolution in scholarly focus within climate change research among youth aged 15-24 years.

Distribution of Research Concepts. The conceptual landscape of youth climate change research reveals distinct priorities and evolving emphases across the reviewed studies (see Table 4). Knowledge and understanding emerged as the predominant research focus, investigated in 29 studies (64.4%), encompassing scientific literacy, persistent misconceptions, and comprehension of climate change mechanisms. This heavy emphasis on cognitive dimensions reflects the field's foundational concern with establishing baseline understanding among young populations.

Table 4: Most Frequently Studied Concepts (n = 45)

Research Concept	Number of Studies*	Percentage	Key Focus Areas
Knowledge & Understanding	29	64.4%	Misconceptions, scientific literacy, causes/effects
Perceptions & Beliefs	22	48.9%	Risk perception, responsibility attribution, values
Attitudes & Concern	17	37.8%	Worry levels, threat perception, skepticism

Behavior & Action	13	28.9%	Pro-environmental behavior, civic engagement
Mental Health & Coping	8	17.8%	Climate anxiety, psychological distress, coping strategies
Educational Interventions	6	13.3%	Curriculum effectiveness, teaching methods

*Total exceeds 45 studies as individual studies may address multiple concepts

Perceptions and beliefs constituted the second most frequently studied domain, examined in 22 studies (48.9%), focusing primarily on risk perception, responsibility attribution, and underlying value systems that shape environmental worldviews. The substantial attention to perceptual frameworks indicates recognition that climate understanding extends beyond factual knowledge to encompass interpretive processes and belief systems.

Attitudes and concern, investigated in 17 studies (37.8%), examined emotional responses including worry levels, threat perception, and climate skepticism. This affective dimension reveals growing scholarly interest in the emotional landscape of youth climate engagement, moving beyond purely cognitive assessments toward recognition of climate change as an emotionally charged issue.

Behavioral and action-oriented research, present in 13 studies (28.9%), investigated pro-environmental behaviors and civic engagement patterns, reflecting interest in translating awareness into meaningful action. The emergence of mental health and coping research in 8 studies (17.8%) represents a significant development, acknowledging climate anxiety and psychological distress as legitimate research domains requiring systematic investigation.

Educational interventions, while examined in only 6 studies (13.3%), represent a crucial applied dimension, evaluating curriculum effectiveness and innovative pedagogical approaches. The relatively limited attention to educational interventions suggests an important gap between research on climate perceptions and the development of evidence-based educational responses.

Temporal Evolution of Research Priorities. Figure 2 illustrates a marked shift in research emphasis across five distinct periods, revealing the field's maturation and response to emerging societal concerns.

Early Foundation Period (2000-2005): Research was predominantly focused on establishing baseline knowledge, with all eight studies addressing knowledge and misconceptions. This period was characterized by exploratory investigations into young people's fundamental understanding of climate science, with limited attention to emotional or behavioral dimensions.

Expansion Period (2006-2010): While knowledge-focused studies remained universal (100% of studies), this period witnessed increased attention to attitudinal dimensions, with 50% of studies incorporating concern and worry measures. The emergence of behavioral research (17% of studies) and initial recognition of mental health implications (8% of studies) marked the beginning of a more holistic approach to climate change research among youth.

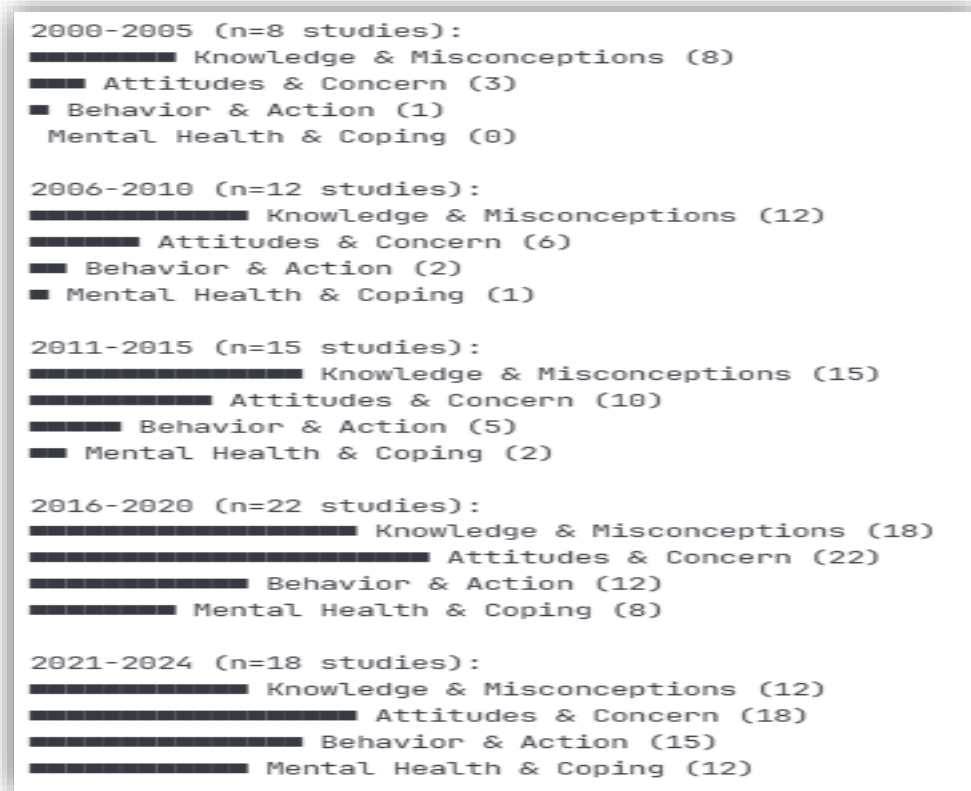
Diversification Period (2011-2015): This period demonstrated continued emphasis on knowledge assessment (100% of studies) while showing substantial growth in attitudes and concern research (67% of studies). Behavioral investigations doubled to 33% of studies, and mental health considerations increased to 13%, indicating growing recognition of climate change's psychological dimensions.

Integration Period (2016-2020): A pivotal shift occurred during this period, with attitudes and concern becoming universal research components (100% of studies), surpassing knowledge-focused investigations (82% of studies). Behavioral research expanded significantly to 55% of studies, while mental health and coping research quadrupled to 36%, reflecting increased awareness of climate change's psychological impact on young people.

Contemporary Period (2021-2024): The most recent period reveals a mature, multifaceted research landscape where attitudes and concern remain central (100% of studies), while behavioral research reaches

unprecedented levels (83% of studies). Mental health and coping research have evolved into a major focus area (67% of studies), nearly matching knowledge-based investigations (67% of studies).

Figure 2: Evolution of Research Focus in Climate Change Studies Among the Youth (2000-2024)



Significant trends were observed in the research evolution which include:

Paradigmatic Shift from Cognitive to Affective Focus: The transition from universal knowledge-focused studies in early periods to attitude-centered research in recent years reflects a fundamental shift in understanding climate change as not merely a scientific literacy issue, but as a complex psychosocial phenomenon affecting young people's emotional well-being.

Emergence of Mental Health as a Critical Domain: The exponential growth in mental health research from 0% (2000-2005) to 67% (2021-2024) indicates recognition of climate change as a significant stressor for emerging adults, necessitating investigation of psychological impacts and adaptive coping mechanisms.

Integration of Behavioral Dimensions: The substantial increase in behavior and action research from 13% to 83% across the study period demonstrates growing interest in translating climate awareness into practical environmental engagement and civic participation among young people.

Methodological Maturation: The evolution from single-concept studies to multidimensional investigations incorporating knowledge, attitudes, behavior, and mental health reflects the field's methodological sophistication and recognition of climate change research as inherently interdisciplinary.

Highlight of the Research Review Findings. Five dominant themes emerged that characterize the understanding of climate change perceptions, attitudes, and responses among youth aged 15-24 years. Table 5 presents the key findings organized by thematic categories, demonstrating both consistent patterns across diverse cultural contexts and important variations that reflect the complex nature of youth climate engagement.

Cognitive Dimensions: Knowledge Gaps - Aware but Lacks Understanding. A consistent finding across numerous countries is that youth overwhelmingly believe in the reality of climate change. This belief was held by 76.2% of a U.S. sample, 95% in Croatia, 98% in India, and 99.1% in Portugal. Most also correctly identified human activities as the primary cause. However, this general awareness is undermined by significant and persistent knowledge gaps. Early research in England found that students frequently confused global warming with ozone depletion, a misconception that persists in more recent studies from Malta and Turkey. Furthermore, awareness of specific impacts can be low; a study of university students in India revealed that only 40% were aware that global warming affects human health. These are proof of consistent identification of substantial knowledge gaps among the emergent adults, despite high levels of climate change awareness. The research reveals a persistent paradox: while 80-99% of youth across different studies demonstrate awareness that climate change is occurring, their understanding of underlying mechanisms and causal factors remains fundamentally flawed (Andersson & Wallin, 2000; Li & Liu, 2021).

Perceptions of responsibility and solutions were highly heterogeneous. While a European survey found that 91% of young people believe tackling climate change would improve their own health, studies in Taiwan found that students held a low perception of personal responsibility and viewed individual actions as ineffective. This suggests a critical disconnect between understanding the problem and believing in one's capacity to contribute to the solution.

The most prevalent misconception identified across multiple studies and cultural contexts is the confusion between climate change and ozone layer depletion. This conceptual conflation appears remarkably consistent, appearing in studies conducted in Sweden (Andersson & Wallin, 2000), England (Boyes & Stanisstreet, 1992), Malta (Grima et al., 2010), and Taiwan (Li & Liu, 2021), suggesting that this represents a fundamental challenge in climate science education rather than a culturally specific phenomenon. Additionally, students demonstrate persistent misconceptions about greenhouse effect mechanisms, often attributing climate change to factors such as ozone holes or car emissions in overly simplistic terms, while failing to grasp the complex interactions between greenhouse gases and atmospheric warming processes.

These knowledge gaps have significant implications for climate education and communication strategies, as they suggest that mere exposure to climate change information is insufficient to develop scientifically accurate understanding. The universality of these misconceptions across different educational systems and cultural contexts indicates that current climate education approaches may require fundamental restructuring to address these persistent conceptual difficulties.

Table 5: Key Research Findings by Theme

Theme	Key Findings	Supporting Studies
Cognitive Dimensions- Knowledge Gaps	• Frequent confusion between climate change and ozone depletion • High awareness (80-99%) but poor understanding of causes • Misconceptions about greenhouse effect mechanisms	Andersson & Wallin (2000), Boyes & Stanisstreet (1992), Grima et al. (2010), Li & Liu (2021)
Affective Dimensions - Varied Concern Levels	• 25-68% report significant climate concern • Females show higher concern than males • Concern varies by cultural context	Tiller et al. (2021), Tranter & Skrbis (2014), Lehnert et al. (2020)
Behavioral Dimensions	• Experiential learning more effective than traditional methods • Curriculum interventions show lasting impact	Karpudewan et al. (2015), McNeill & Vaughn (2012), Littrell et al. (2020)

**Educational
Effectiveness**

- Place-based approaches increase engagement

**Mental Health
Impact**

- Climate anxiety commonly reported
- Link between climate worry and depression
- Need for coping strategies

Kowalczewski & Klein (2018),
Sciberras & Fernando (2022),
Lewandowski et al. (2024)

**Cultural
Differences**

- Supernatural explanations more common in some cultures
- Political views strongly correlate with climate attitudes
- Experience of extreme weather influences beliefs

Haq & Ahmed (2020), Carter
& Wiles (2014), Jamelske et al.
(2013, 2015)

Affective Dimensions: Varied Concern Levels and Vulnerable. High levels of concern and worry about climate change are prevalent among emerging adults. In an Australian study, 58% of participants considered climate change a more significant personal problem than the COVID-19 pandemic. Another large Australian survey of over 20,000 youth found that more than two-thirds were at least somewhat concerned about the issue. But, overall, the literature reveals considerable variation in climate concern levels among emerging adults, with reported rates of significant climate concern ranging from 25% to 68% across different studies (Tiller et al., 2021; Tranter & Skrbis, 2014; Lehnert et al., 2020). This substantial range reflects both methodological differences in measuring concern and genuine variations in emotional responses to climate change across different populations and contexts.

A consistent finding across multiple studies is the identification of gender differences in climate concern, with females consistently demonstrating higher levels of environmental worry and climate anxiety than their male counterparts. This gender disparity appears robust across different cultural contexts and age groups within the emerging adult population, suggesting that gender socialization processes may influence environmental concern development in systematic ways. Cultural context emerges as a significant moderating factor in concern levels, with studies demonstrating that local environmental conditions, cultural values, and social norms substantially influence how youth emotionally respond to climate change. This variation underscores the importance of culturally sensitive approaches to understanding and addressing climate anxiety among diverse emerging adult populations.

Behavioral Dimensions-Educational Effectiveness: Transformative Approaches to Climate Education. The research provides compelling evidence that traditional didactic approaches to climate education are less effective than experiential, place-based, and personally relevant educational strategies. Studies consistently demonstrate that experiential learning approaches produce superior outcomes in terms of both knowledge acquisition and attitude change compared to conventional lecture-based methods (Karpudewan et al., 2015). Curriculum interventions that incorporate hands-on activities, local environmental investigations, and personal reflection show lasting impacts that extend well beyond the immediate educational period. Longitudinal studies reveal that well-designed climate education programs can produce sustained changes in knowledge, attitudes, and behaviors that persist for years after program completion (McNeill & Vaughn, 2012).

Place-based educational approaches, which connect climate change to local environmental conditions and community contexts, appear particularly effective in increasing student engagement and promoting actionable understanding. Research demonstrates that when students investigate climate change impacts in their own communities, they develop stronger emotional connections to the issue and are more likely to

engage in pro-environmental behaviors (Littrell et al., 2020). This indicates that behaviors are most effectively mobilized when they are embedded in a social context that fosters a shared sense of agency and purpose.

Mental Health Impact: The Psychological Burden of Climate Change. An increasingly prominent theme in recent literature is the recognition of climate change as a significant mental health stressor for emerging adults. Studies consistently report that climate anxiety is commonly experienced among young people, with several investigations identifying direct links between climate worry and depressive symptoms (Kowalczewski & Klein, 2018; Sciberras & Fernando, 2022; Lewandowski et al., 2024).

The research reveals that climate-related psychological distress manifests in various forms, including generalized anxiety about future environmental conditions, feelings of helplessness regarding climate action, and depression related to perceived environmental degradation. Particularly concerning is the finding from longitudinal research that persistent high levels of climate worry are associated with increased depression symptoms over time, suggesting that climate anxiety may have lasting mental health implications for young people (Sciberras & Fernando, 2022).

These findings have prompted researchers to emphasize the critical need for developing effective coping strategies and support systems for young people experiencing climate-related psychological distress. The emerging focus on coping mechanisms represents a significant shift in climate change research, acknowledging that effective climate education must address not only cognitive understanding but also emotional well-being and psychological resilience.

Cultural Differences: Diverse Explanatory Frameworks for Climate Change. The reviewed studies reveal significant cultural variations in how youth understand and explain climate change, challenging assumptions about universal climate change perceptions. Perhaps most notably, research in Bangladesh found that 24% of university students attributed climate change to supernatural explanations, highlighting the importance of cultural and religious frameworks in shaping environmental understanding (Haq & Ahmed, 2020).

Political ideology emerges as a particularly powerful predictor of climate attitudes, with studies consistently demonstrating strong correlations between political views and climate change acceptance. This relationship appears especially pronounced in politically polarized contexts, where climate change has become associated with particular political positions (Carter & Wiles, 2014). The research suggests that political identity may serve as a lens through which young people interpret climate information, potentially overriding scientific evidence when it conflicts with political beliefs.

Direct experience with extreme weather events appears to influence climate beliefs significantly, with studies showing that young people who have experienced climate-related impacts are more likely to attribute climate change to human activities and express higher levels of concern (Haq & Ahmed, 2020). This finding suggests that experiential learning through direct environmental exposure may be more powerful than abstract scientific information in shaping climate understanding.

DISCUSSION

The Knowledge-Agency Paradox: A Central Challenge

This review reveals a fundamental contradiction at the heart of the youth climate change experience. While demonstrating remarkably very high awareness levels (80-99% across studies), this generation simultaneously faces persistent knowledge gaps, significant psychological distress, and constrained perceptions of personal agency. This paradox challenges traditional information-deficit models and suggests that cognitive understanding alone is insufficient for fostering climate engagement.

The universality of scientific misconceptions—particularly the confusion between climate change and ozone depletion documented across Sweden, England, Malta, Taiwan, and other contexts—indicates that current educational approaches fail to address fundamental conceptual difficulties. These knowledge gaps persist despite widespread exposure to climate information, suggesting that educational interventions require fundamental restructuring rather than mere information supplementation.

The Emergence of Climate Change as a Mental Health Crisis

The identification of climate anxiety as a significant mental health concern represents a paradigmatic shift in understanding climate impacts on emerging adults. The longitudinal evidence from Australia demonstrating links between persistent climate worry and depression symptoms at ages 18-19 establishes climate change as a legitimate mental health stressor requiring clinical attention. The prevalence of climate anxiety across diverse cultural contexts—from Indigenous Sámi youth in Norway to university students in Bangladesh—indicates this is not merely a Western phenomenon but a global mental health challenge.

The finding that a great majority (56%) of Indonesian adolescents report climate change impacts on their mental health, combined with evidence of climate-related psychological distress across multiple studies, suggests that traditional approaches to climate education and communication may inadvertently contribute to psychological burden without providing adequate support systems. This raises ethical questions about climate communication strategies that increase awareness without fostering agency or providing psychological resources.

Cultural Complexity and the Limits of Universal Approaches

The substantial variation in climate attribution across cultural contexts—from the 24% of Bangladeshi students citing supernatural explanations to the strong political polarization observed in Western contexts—challenges assumptions about universal climate understanding. These cultural differences extend beyond simple knowledge variations to encompass fundamentally different explanatory frameworks for environmental change.

Political ideology emerges as a particularly powerful predictor of climate attitudes, with studies consistently demonstrating correlations between political identity and climate acceptance. This relationship appears especially pronounced in politically polarized contexts, where climate change becomes associated with particular political positions, potentially overriding scientific evidence when it conflicts with political beliefs. The finding that direct experience with extreme weather events influences climate beliefs more powerfully than abstract scientific information suggests that experiential learning may be more effective than traditional educational approaches. This has implications for educational design, particularly in contexts where direct climate impacts may be less immediately visible.

The Efficacy of Collective Action: Pathways to Empowerment

The behavioral findings provide the most optimistic evidence in this review, demonstrating that interventions promoting collective efficacy can successfully transform feelings of helplessness into meaningful agency. The success of community-based projects—from women-led sustainability initiatives in South Africa to Native American youth filmmaking programs in the United States—illustrates that collective action serves dual purposes as both environmental intervention and mental health support.

These findings align with developmental theory regarding emerging adulthood as a period of civic identity formation. By embedding climate action within community contexts that foster shared purpose and tangible impact, interventions can address both environmental goals and developmental needs simultaneously.

Methodological Implications: The Need for Experiential Understanding

The predominance of quantitative methodologies (70.2% of studies) in current research represents a significant limitation in understanding the nuanced emotional experiences of climate-engaged youth. While surveys effectively measure prevalence of concern, they fail to capture the rich, textured, and deeply personal nature of climate-related emotions. The few qualitative studies in this review—such as the research with Sámi Indigenous youth exploring climate anxiety and health-seeking behaviors—provide crucial insights into the lived experiences that quantitative measures cannot access.

This methodological imbalance has implications for both research and practice. Without deeper understanding of how young people experience and make meaning of climate anxiety, interventions may remain superficial and potentially ineffective. The success of place-based, experiential educational approaches documented in this review suggests that research methodologies should similarly embrace experiential and participatory approaches.

The Evolution of Research Priorities: From Knowledge to Well-being

The temporal analysis reveals a significant evolution in research priorities, from early focus on knowledge assessment to contemporary emphasis on mental health, coping, and behavioral engagement. This evolution reflects growing recognition of climate change as a complex psychosocial phenomenon rather than simply an educational challenge.

The exponential growth in mental health research from 0% (2000-2005) to 67% (2021-2024) indicates field maturation and responsiveness to emerging societal needs. However, this evolution also suggests that earlier approaches may have been inadequate for addressing the full scope of climate impacts on emerging adults.

CONCLUSION

This review reveals a critical "knowledge-agency paradox" among youth: while most of them demonstrate climate change awareness, they simultaneously experience persistent knowledge gaps, psychological distress, and feelings of disempowerment. The temporal analysis (2000-2024) shows research evolution from cognitive assessment to recognizing climate change as a complex psychosocial phenomenon. Mental health research grew exponentially from 0% to 67% of studies, reflecting climate change's emergence as a significant stressor among the youth.

Cultural variations challenge universal approaches, from supernatural explanations to political polarization in Western contexts. However, community-based collective interventions successfully transform helplessness into meaningful agency, providing the most optimistic evidence for bridging awareness and action.

Climate change research among youth has evolved toward recognizing a complex psychosocial phenomenon requiring integrated approaches that simultaneously address cognitive understanding, emotional well-being, cultural sensitivity, and behavioral engagement.

Below are key recommendations to provide pathways to transform the knowledge-agency paradox, empowering youth to transition from awareness to meaningful climate action while maintaining psychological well-being and developmental health.

Research Methodologies

- Shift from 70.2% quantitative dominance to mixed methods approaches capturing emotional experiences
- Prioritize longitudinal qualitative studies and participatory action research
- Address Global North bias through culturally diverse inclusion

Educational Interventions

- Replace information-only models with place-based, experiential learning connected to local contexts
- Implement collective efficacy projects with tangible environmental impact
- Integrate coping strategy development as core curriculum components

Mental Health Support

- Establish specialized clinical protocols for climate anxiety as legitimate mental health concern
- Train educators in climate-specific psychological interventions
- Create peer support networks transforming distress into collective action

Policy Frameworks

- Mandate youth participation in climate policy decision-making
- Require climate psychology training for educators
- Fund youth-led climate initiatives demonstrating collective efficacy

These recommendations target the knowledge-agency paradox while supporting both intellectual development and emotional well-being of climate-engaged youth.

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Appendix A: Characteristics of Reviewed Studies (Ages 15 and 24)

Author/Year	Country	Study Aims	Concepts Studied	Methods	Population	Sample Size	Key Findings
Andersson & Wallin (2000)	Sweden	Explore students' understanding of the greenhouse effect and societal consequences of reducing CO ₂ emissions.	Alternative conceptions	Mixed methods	Ages 15-19, Secondary students	N=423	- Students confused the greenhouse effect with ozone layer depletion. - Students recommended a drastic reduction of CO₂ emissions.
Ballantyne et al. (2016)	Sweden	Investigate how young people interpret climate change messages presented via ICT-based visualization.	Preconceptions/ Perception (causes, impacts, solutions, responsibility)	Qualitative	Ages 16-19, Secondary students	N=18	- Frequent themes in perception were impacts (melting ice, disasters) and causes (carbon dioxide). - Participants projected responsibility onto parents, politicians, or other countries.
Burkholder et al. (2017)	USA	Determine if a climate change curriculum shifted student views and if shifts were retained 2.5 years later.	Perception/Views/Attitudes, Knowledge, Belief, Concern/Worry	Mixed methods, Longitudinal (2.5 years)	Ages 18-22, University students	N=17	The curriculum altered students' knowledge, certainty, concern, and urgency during the semester and two years after.
Carter & Wiles (2014)	USA	Investigate if changes in "nature of science" conceptions correlate with changes in	Conception of the Nature of Science (NOS),	Quantitative	Ages 18-22, University students	N=620	- Changes in climate change attitudes correlated with changes in NOS conceptions. - Political views were the strongest

		attitudes toward climate change.	Attitudes/Concern				correlate of climate change attitudes.
European Commission (2021)	EU countries	Measure the opinion of Europeans on the future of Europe, including the Green Deal.	Perception/Opinion	Quantitative	Ages 15-24	N=?	• 53% identified climate change as the main global challenge for the EU's future. • 91% agreed that tackling climate change could help improve their own health and well-being.
Freije et al. (2017)	Bahrain	Investigate the awareness of global warming among science students.	Knowledge/Awareness (Causes, Impacts, Solutions)	Quantitative	Ages 18-24, University students (93% Female)	N=143	• Most students (55%) answered questions correctly. • The study found a positive impact of university education on climate change knowledge.
García-Vinuesa et al. (2020)	Mozambique	Explore students' knowledge, beliefs, and perceptions about climate change.	Knowledge, Beliefs (occurrence, cause), Perception (responsibility, risk)	Quantitative	Ages 16-18, Secondary students	N=?	• Students declared limited knowledge and held erroneous beliefs. • Findings showed low levels of personal responsibility and risk perception.
García-Vinuesa et al. (2021)	Portugal	Assess adolescents' climate knowledge and perceptions.	Knowledge, Beliefs (occurrence, cause, consensus), Perception (responsibility, risk)	Quantitative	Ages 15-18, Secondary students	N=219	• 99% believed climate change is occurring, and 85% attributed it to human activities. • A low perception of personal responsibility was identified.

Grima et al. (2010)	Malta	Investigate students' perceptions and misconceptions.	Perceptions and Misconceptions	Mixed methods	Ages 17-18, Post-secondary students	N=280	- Students erroneously linked global warming to ozone depletion. - Most knew the Earth is warming and understood there would be consequences.
Haq & Ahmed (2020)	Bangladesh	Understand university students' climate change perceptions.	Perception (changes in temperature/rain fall), Causes (human-induced, supernatural)	Quantitative	Ages 22-24, University students	N=650	60% believed climate change was due to human activities; 24% cited supernatural explanations. - Students with experiences of extreme weather were more likely to perceive human activities as the cause.
Harker-Schuch & Bugge-Henriksen (2013)	Austria & Denmark	Investigate students' opinions and knowledge about climate change science.	Knowledge, Opinions (existence, cause, threat, responsibility)	Quantitative	Ages 16-17, Secondary students	N=188	The majority held the opinion that climate change is a threat (68%), is happening now (92%), and is caused by humans (79%).
Ignell et al. (2019)	Sweden	Determine if values, beliefs, and personal norms change over 1 year.	Values, Beliefs (efficacy of actions), Norms (consumption, responsibility)	Quantitative, Longitudinal (1 year)	Ages 17-18, Secondary students	N=212	- Biospheric values were positively associated with willingness to reduce consumption - Taxes and legislation were regarded as the most effective solutions.
Jamelske et al. (2013)	USA & China	Compare climate change public opinion among young adults in the	Perceptions/Public Opinion/Awareness,	Quantitative	Ages 18-24, University students	N=1602	US students were less likely to believe anthropogenic climate change is happening and less

		US and China.	Beliefs (existence, causes), Understanding of science				convinced of the scientific consensus.
Jamelsk e et al. (2015)	USA & China	Examine perceptions and beliefs regarding the scientific basis, impacts, and policy responses to climate change.	Public Opinion , Perception (threat), Concern , Belief (existence, human-caused), Understanding of science	Quantitative	Ages 18-24, University students	N=4005	• A higher proportion of Chinese students accepted the scientific consensus • A higher proportion of US students reported being unconcerned about climate change.
James (2014)	South Africa	Explore how female students were empowered through community projects on climate change.	Awareness/Empowerment, Engagement/Activism	Qualitative	Female university students	N=6	• Students showed an initial lack of knowledge but developed a strong commitment to establish women-led sustainable initiatives through community work.
Karpud ewan et al. (2015)	Malaysia	Compare student understanding when taught with an experimental vs. traditional curriculum.	Understanding, Misconceptions	Mixed methods	Ages 16-17, Secondary students	N=73	• Students in the experimental group exhibited significantly improved understandings and fewer misconceptions.
Karpud ewan & Khan (2017)	Malaysia	Integrate and evaluate experiential-based climate change activities.	Knowledge, Motivation	Quantitative	Ages 16, Secondary students	N=62	• Experiential-based teaching improved students' knowledge and increased their motivation toward the environment.

Keleş et al. (2016)	USA	Determine cognitive structures and knowledge retention about environmental concepts.	Conceptual Knowledge	Qualitative	Ages 18-21, University students	N=52	The most frequent word associations with climate change were "global warming," "greenhouse gases," and "ice cap melting".
Kilinc et al. (2008)	Turkey	Explore the prevalence of scientific ideas and misconceptions about global warming.	Knowledge, Misconceptions (causes, consequences, cures)	Quantitative	Ages 15-16, Secondary students	N=?	- Students confused global warming with ozone layer depletion - Most students were aware of physical consequences like rising temperatures.
Kowalczyński & Klein (2018)	Norway	Assess the impact of climate change on Sámi youth health and health-seeking behavior.	Perception (Health Impacts), Coping strategies, Behavior	Qualitative	Ages 16-19, Secondary students (Sámi Indigenous)	N=9	- Anxiety related to climate change was commonly described. - Participants first seek help from family and friends before medical aid.
Lehnert et al. (2020)	Czechia	Assess students' beliefs on the usefulness of actions and their willingness to act.	Beliefs (usefulness of actions), Willingness to Act	Quantitative	Ages 18-19, Secondary students	N=462	"Less car use" was considered the most useful direct action - Increased pro-environmental sensitivity was found among female students.
Lewandowski et al. (2024)	USA	Understand their climate change-related thoughts, emotions, and actions	Understanding/Knowledge, Emotions/Behavior (Civic engagement, Advocacy)	Quantitative-Cross-sectional descriptive survey	Ages 16-25	N=15,793	- Highlighted the link between climate change and adverse effects on youth mental health. - Political party identification and direct exposure to severe weather events are associated with climate-related thoughts and beliefs.

Li (2014)	Taiwan	Examine the relationship between fear appeals and students' attitudes and behavioral intentions toward global warming.	Attitudes, Behavioral Intentions, Perceived threat, Perceived efficacy	Quantitative	Ages 18-24, University students	N=263	In a high-threat condition, both high- and low-efficacy messages resulted in positive attitudes and behavioral intentions.
Li & Liu (2021)	Taiwan	Examine students' knowledge of and views on climate change and its teaching.	Perception, Knowledge, Concern/Worry, Social norms	Mixed methods	Ages 19-22, University students	N=146	97% believed global warming was happening, and 94% were worried - Knowledge about causes was poor (e.g., 73% think the ozone hole is a cause).
Littrell et al. (2020)	USA	Explore how participants connected with climate change in their community through a place-based approach.	Perception/Perspective, Engagement	Qualitative	Ages 15-17, Secondary students (Native American)	N=12	- Storytelling through film helped students find greater personal meaning. - The experience transformed how they think about the topic and led to behavior changes.
McNeill & Vaughn (2012)	USA	Investigate how a climate change curriculum supports students' understanding and ability to take action.	Understanding/Knowledge, Beliefs, Engagement/Actions	Mixed methods	Ages 16-18, Secondary students	N=75	By the end of the curriculum, students had a significant increase in their understanding of climate change and reported being engaged in more actions to limit their personal impact.

Nefat & Benazić (2019)	Croatia	Determine students' climate change knowledge, perceptions, and concern.	Knowledge (Existence, Causes, Consensus), Perception, Concern/Worry	Quantitative	Ages 19-24, University students	N=218	95% think climate change is happening, and 79% believe human activities are the main cause. - The majority consider it a very serious threat.
Ojala (2013)	Sweden	Explore how adolescents cope with climate change and how strategies are associated with well-being and engagement.	Coping strategies, Wellbeing-Worry, Pro-environmental behavior, Environmental efficacy	Quantitative	Ages 17.2, Secondary students	N=321	- Problem-focused and meaning-focused coping were positively related to pro-environmental behavior - Highly problem-focused adolescents worry more about climate change.
Ojala (2015a)	Sweden	Investigate factors that predict climate change skepticism among adolescents.	Skepticism, Environmental efficacy	Quantitative, Longitudinal (1 year)	Ages 16.6, Secondary students	N=?	- Perceiving parents as having climate-skeptical attitudes was significantly correlated with student skepticism - Skepticism was found to be quite stable over a 1-year period.
Ojala (2015b)	Sweden	Investigate types of hope ("constructive" vs. "denial") and their relation to environmental engagement.	Hope, Environmental engagement, Self-efficacy	Quantitative	Ages 18, Secondary students	N=624	- The study identified "constructive hope" and "hope based on denial" - Constructive hope was positively associated with engagement, while hope based on denial had a negative association.

Ojala & Bengtsson (2019)	Sweden	Examine how communication with parents/friends about climate change is related to coping and pro-environmental behavior.	Coping strategies, Pro-environmental behavior	Quantitative	Secondary students	N=?	• Positive, solution-oriented communication with parents and friends was associated with more meaningful and problem-focused coping.
Olander & Olander (2017)	Sweden	Articulate students' understandings of climate change.	Beliefs/Understanding	Mixed methods	Ages 16-17, Secondary students	N=51	• Students understood climate change as a system with various components. • Most frequent words used regarding causes were "pollution," "atmosphere," and "carbon dioxide".
Pandve & Raut (2011)	India	Assess awareness of climate change and its health hazards among medical students.	Awareness (causes, impacts, mitigation)	Quantitative	Ages 19-24, University students (Medical)	N=250	• 98% believed the global climate is changing and that human activities contribute to it • 65% said the physical hazards of extreme weather were the most important health impacts.
Parant et al. (2017)	France	Compare the impact of binding communication on climate change knowledge, attitudes, and behavior.	Attitudes, Knowledge, Pro-environmental behavior	Quantitative	Ages 16, Secondary students	N=270	• Attitudes and behavior were positively affected only in the binding communication condition (pairing a persuasive message with personal solution generation).
Patrick et al. (2021)	Australia	Report Australians' personal concerns	Concern	Quantitative	Ages 18-24	N=281	• 58% indicated that climate change was a more significant problem

		during the COVID-19 pandemic.					for them personally than COVID-19.
Rideout (2014)	USA	Explore student endorsement of an environmental worldview during college.	Knowledge/Awareness, Concern/Worry, Environmental Worldview attitude	Quantitative	Ages 17-22, University students	N=779	• Knowledge of the causes of global warming was at a relatively low level, partly due to confusion over the role of ozone loss. • Higher concern was found among students in more recent samples.
Schrot et al. (2020)	Austria	Examine if an educational intervention raises students' awareness and action knowledge.	Awareness, Action knowledge	Mixed methods	Ages 17-18, Secondary students	N=41	• Students were more aware of mitigation and adaptation behaviors and developed higher levels of action knowledge after the workshop.
Schrot et al. (2021)	Austria & Italy	Examine the influence of a 2-year educational program on students' cognitive adaptive capacity.	Cognitive adaptive capacity (Risk perception, Adaptation appraisal, Knowledge)	Mixed methods	Ages 16-18, Secondary students	N=231	• Qualitative data revealed that students in the intervention group demonstrated increased knowledge about climate-related risks and adaptation.
Sciberras & Fernando (2022)	Australia	Track climate-related worry and outcomes across adolescence.	Worry, Engagement (Politics, News)	Quantitative, Longitudinal (8 years)	Ages 18-19	N=2244	• A substantial number of adolescents experience high or increasing worry about climate change. • Those with high persistent worry had higher depression symptoms at age 18-19.

Stapleton (2015)	USA	Explore how practice, action, and recognition can facilitate environmental identity development.	Environmental Identity, Practice /Action	Qualitative	Ages 15-17	N=13	• Interaction with people affected by climate change and with peers encouraged environmental action.
Sternän g & Lundholm (2012)	China	Explore students' reasoning on the dilemma of economic development and climate change mitigation.	Decision-making, Knowledge, Values	Qualitative	Secondary students	N=12	• Students seemed to believe that environmental problems are inevitable and that economic development is necessary.
Sulistya wati et al. (2018)	Indonesia	Assess knowledge regarding climate change and health among adolescents.	Perception (Causes, Health Impacts, Importance)	Quantitative	Ages 17-18, Secondary students	N=?	• Participants had poor knowledge regarding the cause of climate change • 56% said climate change had impacted their mental health.
Tasquiere (2015)	Italy	Explore how epistemological knowledge on modeling influences students' engagement with climate change.	Knowledge, Behavior	Qualitative	Ages 16, Secondary students	N=5	• Epistemological knowledge can positively impact disciplinary engagement and personal involvement in climate change.
Tiller et al. (2021)	Australia	Survey youth perspectives on various issues, including the environment.	Perspectives/Views, Concern	Quantitative	Ages 15-19	N=20, 207	• 25.5% were extremely or very concerned about climate change, and 42.8% were somewhat or slightly concerned.
Tranter & Skrbis (2014)	Australia	Examine political and social divisions over climate change among youth.	Beliefs, Concern	Quantitative	Ages 16-17	N=2378	• Most young people believe climate change is occurring. • Young women are more concerned about the

							environment than young men.
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