The Journal of Climate Change and Health 3 (2021) 100047

Contents lists available at ScienceDirect

The Journal of Climate Change and Health

journal homepage: www.elsevier.com/joclim

Review

Understanding Eco-anxiety: A Systematic Scoping Review of Current Literature and Identified Knowledge Gaps

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ARTICLE INFO

Article History:
Received 4 June 2021
Accepted 31 August 2021
Available online 2 September 2021

Keywords:
Climate change
Eco-anxiety
Mental health
Climate anxiety
Scoping Review

ABSTRACT

Eco-anxiety is the distress caused by climate change where people are becoming anxious about their future. The present scoping reveiw critically evaluated and synthesized the scholarly literature on eco-anxiety and reported it using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses for scoping reviews (PRISMA-ScR) [1]. The study aims were twofold: (i) to understand how eco-anxiety was operationalized in the existing literature, and (ii) the key characteristics of eco-anxiety. Our review found that further research is needed to provide conceptual clarity of the term eco-anxiety. We found that most of the evidence comes from the Western countries, and future research is needed in the non-Western countries. Indigenous peoples, children and young people, and those connected to the natural world are most impacted by eco-anxiety and are identified as vulnerable. We recommend employing diverse methodologies to better understand their lived experiences of eco-anxiety.

Introduction

Climate change is widely recognized as one of the most serious global health threats of the 21st century, threatening public health worldwide [2], including the impacts of slow, gradual climate change and its effects on mental health, known as eco-anxiety [3]. The Australian Medical Association (2019) [4] has declared climate change as real and predicting it to have severe health consequences, especially for vulnerable populations worldwide. Many people report fearing for themselves, their children and future generations with deep feelings of loss, hopelessness, and anger as they witness the effects of climate change. It is important to understand the anxiety response evoked by the climate crisis, given its increased global awareness.

Although the term "eco-anxiety" has been gaining traction in the media and amongst experts, it remains a poorly understood concept. The operationalization of the term 'eco-anxiety' is still unclear, with a range of definitions and related terminology being used in the available literature. For example, Albrecht [5] coined the term 'eco-anxiety' to describe a chronic fear of environmental doom [6], but *eco-anxiety* is also defined as mental distress or anxiety associated with worsening environmental conditions [3] or anxiety experienced in response to the ecological crisis [7]. There are other terms used to understand environmentally-induced distress. For example, *ecological grief* explains grief felt in response to experienced or anticipated losses in the natural world [8]; *Solastalgia* is defined as the distress that is produced by environmental change impacting on people while they are directly connected to their home environment [9]; *eco-angst* is a feeling of despair at the fragile condition of the planet [10]; and *environmental distress* is due to people's lived experience of the desolation of their home and environment [11]. While there is existing literature exploring negative emotions associated with climate change, to our knowledge, there is limited comprehensive research on eco-anxiety in response to climate change-induced trauma. In addition, research has suggested that people experiencing eco-anxiety also report negative emotional responses, such as distress and a sense of despair [12]. Given there is no current synthesis of existing literature to understand emotional responses associated with eco-anxiety, a critical review of the available body of research is warranted.

The current study

We conducted a systematic scoping review[1] of existing literature describing eco-anxiety to examine its nature and associated

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[1] A scoping review is considered an appropriate review method to summarize and clarify key concepts of eco-anxiety as described in the existing literature. Scoping reviews are often performed to identify knowledge gaps, scope a body of literature, clarify key concepts and definitions, and inform a later systematic review [14] as well as identify and map the available evidence [15] offering insight for future research directions.

https://doi.org/10.1016/j.joclim.2021.100047

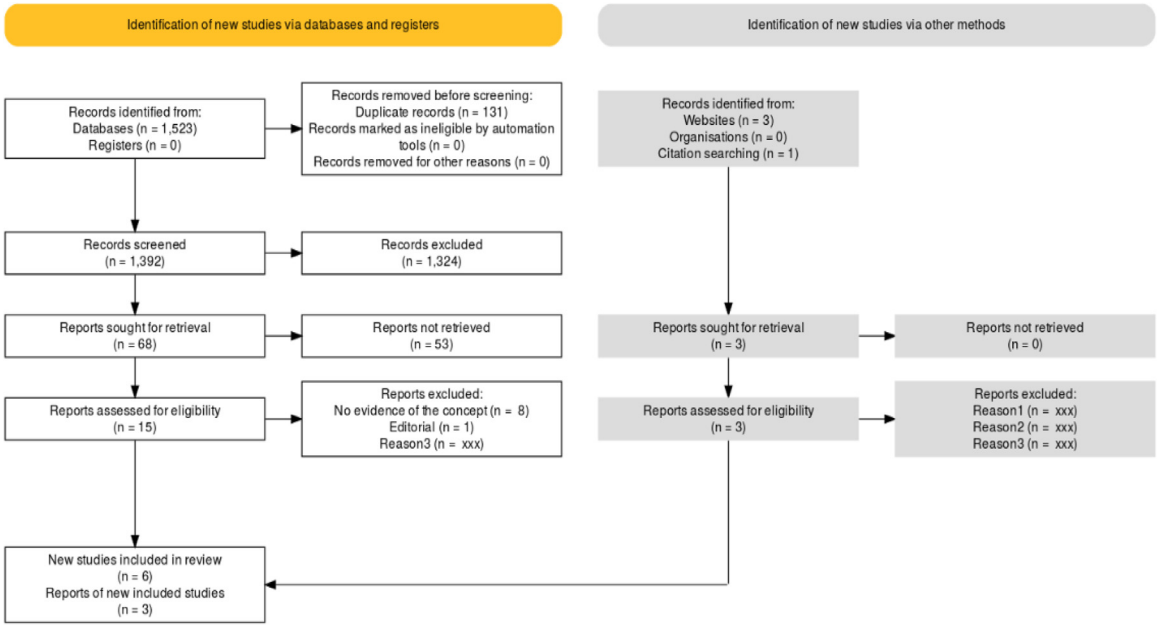

Fig 1. Adapted PRISMA diagram [44]. PRISMA: preferred reporting Items for systematic reviews and meta-analyses.

characteristics and provide a clear synthesis on the definition of the term eco-anxiety based on the available evidence. It aimed to answer two specific research questions: (1) how is eco-anxiety operationalized in the available literature, and, (2) what are the key characteristics related to eco-anxiety?

Methods

We developed a review protocol using a scoping review framework prior to the commencement of the study[2] [13]. The present scoping review was reported as per the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines for scoping reviews (PRISMA-ScR) [1].

Data sources and search strategy

A literature search was conducted in consultation with the University librarian using Academic Search Complete, CINHAL Complete, ProQuest, PsychINFO, Medline, and Web of Science in March 2021. The search terms used were: (eco* OR climate) AND (angst* OR anxi*) to include articles that specifically related to eco-anxiety. English language restrictions were applied to the databases with a search period from January 2010 to March 2021. No limits were placed on these searches as to include all countries and populations. A search in Google Scholar was also conducted in addition to a manual search of the reference lists of the included articles to identify additional relevant articles not captured in the electronic database searches. Citations retrieved through the searches of the electronic databases were imported into Endnote X9, and duplicates were removed.

Search outcomes

The database search identified a total of 1523 articles; after removing 131 duplicates, 1392 articles remained, which were subsequently screened for relevance by reviewing titles and abstracts. This process resulted in 1324 deemed as irrelevant and excluded. Relevance screening was conducted in two stages using inclusion criteria. First, titles and abstracts were screened on Endnote X9. Second, the full texts of potentially relevant articles were screened using the Joanna Briggs Institute System for the Unified Management of the Assessment and Review of Information (JBI SUMARI) [17] a web-based software to facilitate the screening. The reference lists of the 68 remaining articles were manually searched to identify any additional citations missed from the database search. A Google Scholar search and manual reference list search revealed an additional 3 articles for a total of 15 assessed for eligibility. The inclusion and exclusion criteria were applied to the set of 68 studies by reviewing abstracts and full text (see Appendix I in Supplementary Material). Two reviewers (YC and JD) independently assessed the eligibility of included studies at both stages. Uncertainty or disagreement was resolved through discussion with the third author (NB). Finally, nine articles that met the inclusion criteria were included in the data charting and synthesis process (see Fig. 1).

Data extraction

Using the data extraction form developed for the present study, we extracted data from the included studies for: definitions of eco-anxiety, alternative descriptors of eco-anxiety, emotions associated with eco-anxiety, sample characteristics, measures used, and gaps and recommendations for the future.

Results

Operationalization of eco-anxiety in the available literature

An overview of the available evidence related to eco-anxiety research is provided in Appendix II of Supplementry Material. We found that the term eco-anxiety has been operationalized as a broad range of negative emotions related to climate change and environmental threats. Common elements of the definitions of eco-anxiety include a description of the challenging emotions due to the awareness of climate change and environmental issues and threats (see Table 1).

[2] The protocol was not registered, as scoping reviews are currently ineligible for registration with PROSPERO - the international prospective register of systematic reviews administered by the University of York's Centre for Reviews and Dissemination database [16]. A copy of the protocol is available upon request from the corrsponding author.

Table 1
Operationalization of the term "eco-anxiety" in the included studies.

Author/s (year)	Operationalisation of eco-anxiety
Clayton (2020)	Anxiety associated with perceptions about climate change, even among people who have not personally experienced any direct impacts. Dread associated with negative environmental information more generally.
Clayton & Karazsia (2020)	Form of negative emotional response to climate change.
Doherty & Clayton (2011)	Indirect and vicarious impacts include intense emotions associated with observation of climate change effects worldwide and anxiety and uncertainty about the unprecedented scale of current and future risks to humans and other species. Environmental anxiety has been characterised as obsessive and potentially disabling worry about health risks that are actually not significant.
Gifford & Gifford (2016)	Severe and debilitating worry about risks that may be insignificant and is not associated with the more proactive behavior associated with habitual ecological worrying.
Helm et al. (2018)	A severe and debilitating worry related to a changing and uncertain natural environment.
Pihkala (2018)	Various difficult emotions and mental states arising from environmental conditions and knowledge about them. Eco-anxiety can result directly from an environmental problem, but most often it is an indirect impact. Linked with psychological and social defences when people find it too difficult to process the emotions and existential questions related to environmental problems, they tend to resort to various defences (and coping mechanisms).
Pihkala (2020)	Anxiety which is significantly related to the ecological crisis. A wide-scale reaction to the state of the planetary ecosystems. Social science scholars tend to define eco-anxiety and climate anxiety usually by using just the word anxiety—as related to uncomfortable changes in the social order of things. Deep existential anxieties. A chronic fear of environmental doom informed by Clayton (2017) The generalised sense that the ecological foundations of existence are in the process of collapse – informed by Albrecht (2012) A non-specific worry about our relationship to support environments – informed by Albrecht (2019). Constant and strong, form of fear, the typical form of eco-anxiety is sometimes seen more as related to worry and sometimes more as related to strong anxiety – informed by Clayton (2017). A threat to the existence of humans and societies – informed by Spratt (2019) or to capture a deeply felt questioning and angst as related to "ultimate concerns" informed by – Van Bruggen (2015) or "life's givens" – informed by Temple (2018).
Searle & Gow (2010)	Climate change distress. Excessive worry and anxiety about climate change. Response of individuals to the issues surrounding climate–change.
Stanley et al. (2021)	Anxiety experienced in response to the ecological crisis.

There are, however, inconsistencies in the use of the term eco-anxiety. For example, terms such as "climate change anxiety" [18] and "ecological stress" [19] have been used when discussing issues relating to eco-anxiety. "Eco-anxiety" is used to describe any anxiety which is related to the ecological crisis, and defines "climate anxiety" with a slight difference, referring to climate anxiety as significantly related to anthropogenic climate change [6]. Climate grief is sometimes used as a synonym for climate anxiety [6] and used interchangeably when describing solastalgia. Fig. 2 provides a word cloud highlighting the broad range of vocabulary and phrases in the existing literature to illustrate the various concepts relating to eco-anxiety.

Fig 2. Word cloud of vocabulary and phrases used to describe emotions related to eco-anxiety.

Emotions associated with eco-anxiety

Our review suggested that emotions associated with eco-anxiety link to general anxiety - a negative emotionality characterized by physical symptoms and future-oriented apprehension where eco-anxiety focuses on concerns for climate change [6,20]. While negative emotions are often associated with eco-anxiety, they can also be a healthy psychological adaptation and response to threat [6,20]. The studies highlighted the negative physical behaviors associated with climate change, such as being physically sick and experiencing panic attacks, and adverse emotional reactions such as irritability, weakness, sleeplessness, sadness, depression, numbness, helplessness, hopelessness, guilt, frustration or anger, and feeling scared or uncertain [6,19, 21, 22, 23]. Being in a state of paralysis that manifests as apathy was also highlighted [6,18]. The positive emotions or behaviors reported in the studies were feelings of hope, empowerment, and connection, particularly when associated with collective action [18]. These feelings can also be a source of motivation for active engagement and focus on mitigation efforts [18,19].

In addition to eco-anxiety, Stanley and colleagues [25] found two additional similar yet distinct eco-emotions (eco-depression and eco-anger) that showed different level of activation and responses to climate change. For example, eco-anger was associated with greater collective pro-climate behaviors, whereas eco-anxiety was less adaptive, predicting lower engagement in collective action. Those experiencing eco-depression, while less adaptive, were found to be more likely to participate in collective climate action.

Key characteristics

The scoping review also explored key characteristics of eco-anxiety as described below:

Demographic characteristics of vulnerable groups

Our findings found that four of the nine included studies focused on youth experiences and their emerging concerns for climate change [18,20,22,23]. Clayton [18] highlighted that children are more vulnerable to climate change's mental health effects as they have stronger responses to extreme weather events like PTSD, depression, and sleep disorders. Younger participants (18−35 years) reported higher scores than older adults when reporting on the degree of climate anxiety impacting their ability to function [20]. Similarly, females and those in younger age groups were more distressed overall about climate change than males and those over the age of 35 years [23]. Women have more significant stress and anxiety as they are more behaviorally engaged with higher rates of post-traumatic stress disorder (PTSD) following a disaster compared to men [22]. We also found that except one study [25] that used a nationally representative sample, all other empirical studies included in the present review used convenience samples of university students or recruited via MTurk panels.

None of the included studies specifically examined eco-anxiety from an Indigenous point of view. Two of the studies reported ethnicity of the study samples, with at least 75% of participants identified as Caucasian and less than 10% as African, Asian Latinx, or other [20], and 83% white, 11 American Indians, 18 Asian Americans, 38 Black or African Americans, and 5 other race-identified people [19]. Four of the nine articles [18,20,21] provided general descriptions of Indigenous cultural connection to land. It is noted that climate anxiety may become more prevalent among indigenous groups due to living in geographically vulnerable areas and the interdependence on the natural environment and cultural practices [18] due to irreparable loss of cultural and spiritual heritage connected to the natural world.

Those who care more about environmental issues [18] or feel more connected to the natural world for cultural or personal reasons [20], or who identify having a close personal relationship with nature [20] tend to be more vulnerable to developing eco-anxiety. Similarly, people who have experienced physical environmental changes due to climate change, such as injury or stress resulting from extreme weather events [21], made homeless or displaced by climate change impacts [19], or suffered the effects of rising sea levels, droughts or unpredictable weather [18], are more likely to experience greater levels of stress and vulnerability to developing anxiety related to climate change. Naturalists and climate scientists suffer from eco-anxiety because of their knowledge and emotional ties with the natural world [7].

Measurement characteristics

Of the nine included studies, four (44.4%) assessed eco-anxiety in their study samples with two studies focused on the US [19,20] and two on Australia [24,25]. The majority of the study samples were aged between 25− 34 years [20] and 18- 25 years [24] or reported a median age of 33.93 years [19] and 46 years [25].

In Helm et al. [19], eco-anxiety was assessed by a 4-item perceived ecological stress scale that asks participants how personally stressful they find environmental problems such as climate change. Cronbach's alpha (α) was 0.93. Results showed that perceived ecological stress was signficiantly associated with depressive symptoms. A newly developed 13-item scale [20] assessing climate change anxiety comprised eight items measuring cognitive-emotional impairment, including thoughts about climate change and its effects on concentration, sleep, nightmares and crying, and five items measuring functional impairment, including how climate change concerns affect relationships balance with family and friends or ability to complete work [20]. This scale was adapted from a combination of existing scales: the *Ruminative Responses Scale* [26], assessing whether people were thinking about climate change to an unhealthy extent; the *Weiss Functional Impairment Rating Scale* [27], evaluating whether the emotions associated with climate change were interfering with people's ability to function and; the *Drive for Muscularity Scale* [28] assessing whether engaging in pro-environmental behaviors was associated with climate change anxiety. Cronbach's αs for both subscales were >0.80. Results showed that both climate change anxiety subscales (cognitive-emotional impairment and functional impairment were signficiantly associated with depression and anxiety.

Another study [24] focused on climate change distress rather than eco-anxiety as such, investigating the psychological impact of climate change and what makes an individual vulnerable to distress. They used a climate change distress scale with two subscales: *anxiety and hopelessness, adapted from* the *Depression, Anxiety, Stress Scale* (DASS-21) [29] assessing mental health symptoms, the *Future Anxiety Scale* (FAS30) [30] measuring general states of apprehension, and The *Intolerance of Uncertainty Scale* (IUS-12) [31] to examine an individual's reaction to ambiguous situations. Cronbach's α was 0.92 for the overall climate change distress scale, and αs= 0.92 and 0.82 for the climate change anxiety and climate change hopelessness subscales, respectively. Results found signficiant relationship between climate change distress and sympoms of depression, anxiety and stress. Finally, a recent study [25] used a newly developed 6-item scale to measure three distinct eco-emotions: eco-anxiety, eco-depression and eco-anger. Internal reliabilities of these three eco-emotions were assessed using Spearman-Browne coefficient that ranged from 0.82 - 0.84. Results suggested that eco-anxiety was associated with symptoms of anxiety and stress, and less engagement in collective action.

Discussion

The present review explored how eco-anxiety was operationalized in the existing literature and the key characteristics of eco-anxiety: (i) demographic characteristics of vulnerable groups, and (ii) measurement of eco-anxiety. These findings are discussed in detail below, along with identified gaps in the literature and recommendations for future research.

Our review revealed a lack of clarity about the concept of eco-anxiety. For instance, there is a range of terms that overlap or are closely related between anxiety, dread, grief, worry, fear and despair. Some authors used other similar words such as climate change distress [24], climate change anxiety [7, 21] or environmental anxiety [21] rather than eco-anxiety or ecological anxiety. There were also differences regarding the severity of symptoms. There is a call for further work on defining the terms with the need to raise discussion about the various aspects of eco-anxiety to diminish misunderstandings [7]. The definition provided by the American Psychological Association [6], where eco-anxiety is described as “a chronic fear of environmental doom” was commonly cited in the scoping review articles and could provide a consistent definition.

Our findings suggested that specific vulnerable groups, including young people, Indigenous groups, and those connected to the natural world are most impacted by eco-anxiety. A growing body of research into the psychological effects on children relating to the indirect impacts of climate change demonstrates that children and young people may experience emotional, psychological, and spiritual health impacts due to climate change [32,33,34]. This aligns with conclusions drawn from childhood stressful events research, highlighting the lasting impact of early stressful life events or adverse experiences [35].

We also found that most regions of the world and Indigenous populations are underrepresented in the literature, with the current studies deriving from Australia, Finland, and the US. The only specific Indigenous communities discussed in the literature (e.g., Inuit communities in [36,37]. Future research could examine more diverse samples likely to experience climate anxiety with nationally

representative samples in different parts of the world, including members of indigenous communities [20]. This recommendation supports that, similar to evidence of children and youth, Indigenous peoples are among those who are most acutely experiencing the mental health impacts of climate change [34,37,38]. Global research efforts to engage Indigenous peoples on the topic should be taken to better plan and prepare for the mental health implications of climate change [37]. Our review also found that women are more vulnerable to eco-anxiety, consistent with previous research [39] that the females experience greater anxiety and worry than men, possibly due to hormonal influences, evolutionary influences or gender-specific trauma [40].

Finally, we found three climate change anxiety measures assessing negative emotions associated with climate change [19,20,25] as well as functional impairment [20], demonstrating that climate change anxiety can be reliably measured, and the scales used have shown sound reliability and validity properties.

Identified gaps and future research directions

All empirical studies examining eco-anxiety employed quantitative methods, specifically cross-sectional survey studies, with no studies attempting to incorporate mixed methods design to better understand the complexity of this ecological issue and its impact on emotional and mental wellbeing. Future research could employ various qualitative and quantitative methods using representative samples and understand the conceptual construct [41]. A possible opportunity is to use a Delphi study [42] to seek consensus on the key characteristics of eco-anxiety from experts currently researching in the field.

Despite evidence for the effects on youth and their concerns, there were no studies investigating young people's experiences of eco-anxiety. An opportunity to advance research is to understand feelings and experiences of eco-anxiety among children and young people. Stanley et al. [25] also developed a scale to measure three different eco-emotions: eco-anxiety, eco-depression and eco-anger and recommended future research to test the replicability of these associations using longitudinal and experimental research to better understand how eco-emotions causally relate to each other and climate action. The present review focused on one specific negative emotion related to climate change, i.e., eco-anxiety. Future research could explore a much broader construct of eco-emotions and climate change-related mental health impacts that could provide a valuable avenue for understanding the link between eco-emotions, including eco-anxiety and mental health outcomes as well as how the former differentially impacts climate action.

Limitations

The present review needs to be interpreted with caution as it only explored existing research published in peer-reviewed journals and was restricted to articles published in English language that may have led to the exclusion of relevant articles published in government reports, conference papers, or other languages – all of which could result in susceptibility to publication bias. The present findings are based on the studies conducted in developed countries and could not be generalized to different cultural contexts. We also found that the samples of all except one of the empirical studies included in the present review were not representative, thus limiting the generalizability of the findings. Unlike full systematic reviews, the quality of included articles was not appraised in the present scoping review – an approach consistent with guidance on scoping review methods [43]. Finally, we only used the term eco-anxiety as a search term for this review and did not consider the convergence between eco-anxiety and other related constructs. This could have resulted in the exclusion of articles examining the constructs related to eco-anxiety.

Conclusion

Eco-anxiety is a concept used for understanding the link between climate change and anxiety associated with perceptions about the negative impacts of climate change. The evidence suggests that further clarity and theoretical development of the concept is required to advance conceptual undestanding of eco-anxiety. Our review also showed that most of the evidence comes from the Western countries, and more research is needed in other parts of the world. Indigenous peoples, children and young people are identified as vulnerable where their lived experiences of eco-anxiety are unclear and require further research.

Declaration of Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.joclim.2021.100047.

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