University of Southampton

Faculty of Environmental and Life Sciences

School of Psychology

Emotions and distress related to the climate crisis

Volume 1 of 1

by

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Thesis for the degree of

Doctorate in Clinical Psychology

September 2025

ORCID iD: 0009-0009-2006-5091

Total word count: 18,810 (Excluding abstracts, tables, references and appendices)

Abstract

The mental health impacts of the climate crisis have recently gained recognition and attention. Eco-distress has been identified as a growing phenomenon and is defined as the distress caused by awareness of the climate crisis and its consequences. How eco-distress relates to mental health outcomes is unclear. There are arguments that eco-distress is functional and constructive, whereas others have argued the potential for detrimental outcomes.

This thesis contributes to our understanding about eco-distress and the potential constructive or unconstructive outcomes. The first chapter situates the research projects in relation to what is currently known and unknown about the relationship between the climate crisis and mental health outcomes.

The second chapter is a systematic review of the research to date, exploring what factors contribute to the development of eco-distress and its predictors. Predictors of eco-distress are multifaceted, including cognitive and environmental factors. Exposure to media, other forms of distress and connectedness to nature had the most evidence as potential predictors of eco-distress. However, the evidence base suffered from significant methodological inadequacies.

The final chapter then empirically explores what factors contribute to constructive outcomes of eco-distress (pro-environmental behaviours). The findings suggest that emotional responses differentially contribute to constructive outcomes in that eco-anger was associated with greater pro-environmental behaviours. Further, problem-focused coping mediated this relationship highlighting that how eco-distress is coped with influences the outcomes.

Keywords: Climate change; Eco-distress; Eco-anxiety; Psychological wellbeing; Sustainability

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DOI: https://doi.org/10.5258/SOTON/D3675

Research Thesis: Declaration of Authorship

Print name: Rebekah Bell-Wadsworth

Title of thesis: Emotions and distress in response to the climate crisis

I declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at this University;
2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
3. Where I have consulted the published work of others, this is always clearly attributed;
4. Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
5. I have acknowledged all main sources of help;
6. Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
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Acknowledgements

Thank you to all the people who gave up their time to share and complete the questionnaires. Thank you to Michael Forbes for being a willing expert by experience to advise on the project.

Thank you to my supervisory team – Alison Bennetts, Nicholas Kelley, Sarah Kirby and Nick Maguire. A special thanks to Ali for being my main supervisor and to Nick Kelley for the guidance in statistical analysis.

Thank you Daria for screening abstracts and full drafts along with the quality assessment checks.

And finally, thank you to my husband for being my consistent emotional support and cheerleader through this project along with my friends and family.

Definitions and Abbreviations

ACT ..... Acceptance and Commitment Therapy

CBT..... Cognitive Behavioural Therapy

CCAS ..... Climate Change Anxiety Scale

DBT ..... Dialectical Behavioural Therapy

HEAS ..... Hogg's Eco-Anxiety Scale

PEBs ..... Pro-environmental Behaviours

SES ..... Socio-economic Status

PFC..... Problem focused coping

EFC..... Emotion focused coping

MFC ..... Meaning focused coping

Chapter 1 – Introductory Chapter

Psychological and emotional responses to the climate crisis

Journal Specification: The following paper has been prepared for submission to the Journal of Environmental Psychology. The guidelines for authors are provided in Appendix A.

Word count: 2,498 (excluding figures and references)

1.1 Introduction: Mental health Impacts of the climate crisis

Climate change can negatively impact mental health through direct and indirect effects (Lawerence et al., 2021). Direct effects include the impact of increasing frequency and severity of natural disasters and adverse weather conditions (Lawrence et al., 2021). Mental health outcomes such as Post-Traumatic Stress Disorder (PTSD) (Fernandez et al., 2017), anxiety disorders (Cruz et al., 2020), depression (Heanoy & Brown, 2024) and suicide (Perceval et al., 2019) have been shown to be higher in populations impacted by these events. Thus, the increasing frequency of these events poses a risk of increasing poor mental health outcomes. Further, these events can have long-term impacts such as displacement, breakdown of communities and long-term health conditions, all factors associated with poor mental health (Lock et al., 2012).

The climate crisis has also been implicated in worsening physical and mental health symptoms of those already struggling with mental health difficulties (Butler et al., 2014; North & Pfefferbaum, 2013). People with mental disorders are more vulnerable to the impact of the climate crisis (Cianconi et al., 2020). For example, air pollution and heat exposure are linked to neuroinflammation (Costa et al., 2019; Lee et al., 2015) which may exacerbate conditions such as depression or schizophrenia. Extreme heat has been associated with increases in hospital admissions for mood disorders, schizophrenia, and mania (Thompson et al., 2023). Further, adverse weather conditions impact health system infrastructure and the accessibility of medications and treatments (Chan et al., 2018), which could exacerbate the gap between mental health needs and provision of quality care that is already evident (Lawrence et al., 2021).

Finally, the climate crisis has been associated with negative impacts on psychological wellbeing, through the distress caused by witnessing and being informed about the devastation of the climate crisis (Clayton, 2017), termed ‘eco-distress’ (Nezlek & Cypryańska, 2024). Eco-distress can occur without directly experiencing a climate change related event (Jarret et al., 2024). The climate crisis can elicit strong unpleasant emotional responses, worry and helplessness which may negatively impact a person’s daily life and functioning (Hickman et al., 2021). Eco-distress is not a mental health diagnosis, however, it has been related to poor mental health outcomes such as depression, anxiety and insomnia (McBride et al., 2021; Pitt et al., 2023).

The pathways from the climate crisis to poor mental health outcomes is complex, multifaceted and involves multiple psychological processes. There have been reviews into the direct effects of the climate crisis and natural disasters (Heanoy & Brown, 2024), but the relationship between eco-distress and poor mental health outcomes is particularly unclear (Hogg et al., 2024). This chapter will summarise what pathways have been suggested by theory and empirical findings

between the climate crisis and mental health outcomes (see Figure 1 for diagrammatic representation) and demonstrate how this thesis contributes to understanding these pathways.

1.2 Exploring conceptual pathways from emotional and psychological responses to the climate crisis to poor mental health outcomes

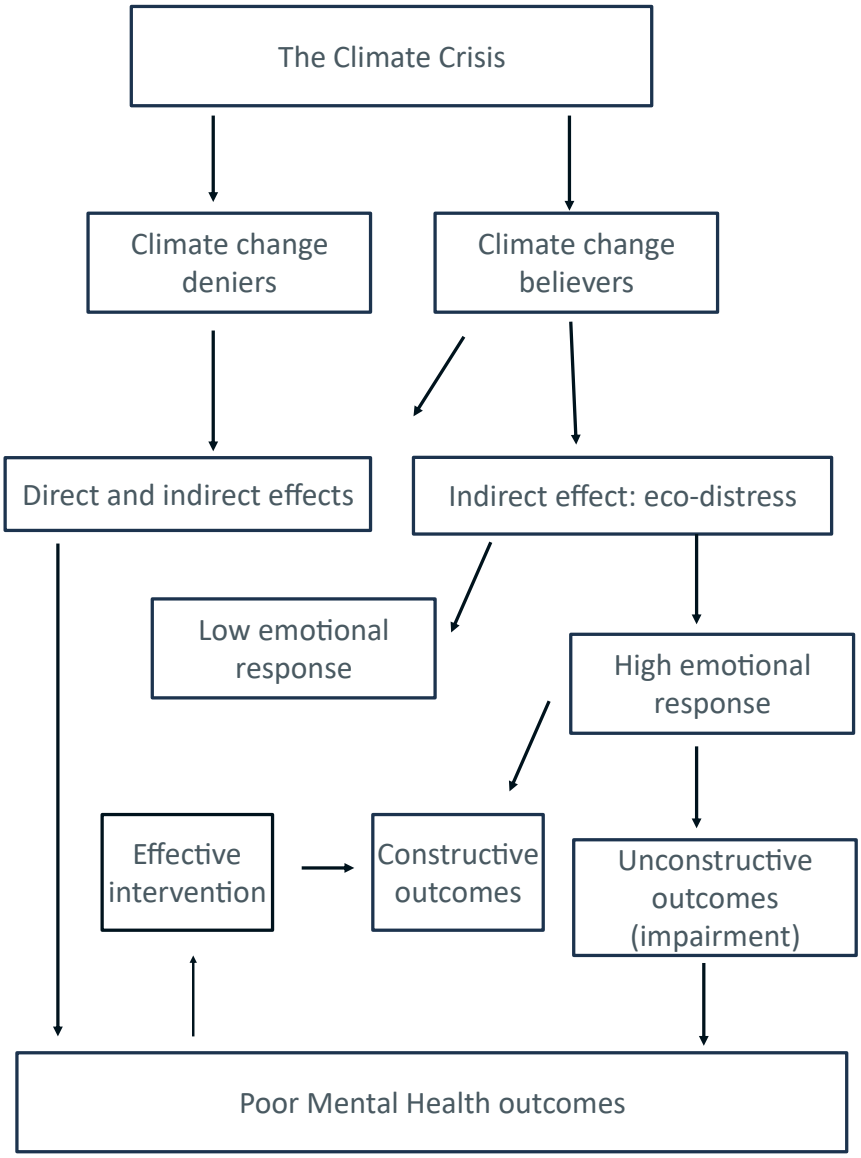
How individuals respond to situations cognitively, emotionally and behaviourally differ from person to person (Davidson & Kecinski, 2021). This is also evident in response to the climate crisis. In the first instance, some people believe that the climate crisis is a real threat, and some people do not (climate change deniers). In the UK only a small minority (7%) deny climate change (YouGov, 2023), however the percentages are higher in other countries (15% in the US; Gounaridis & Newell, 2024) and globally around 30% dispute that climate change is due to human activity (Ipos, 2023). Davidson and Kecinski (2021) outline theoretical emotional pathways to climate change denial as occurring when the threat is too overwhelming to acknowledge. In turn, alternative appraisals that are more manageable and do not disrupt one's sense of agency and/or control are accepted. The threat may be less about the climate crisis itself than what the mitigation efforts required would mean, such as redistribution of resources and minimizing consumption (Davidson & Kecinski, 2021).

Climate denial is not necessarily protective of poor mental health outcomes as regardless of the belief in the climate crisis, an individual's mental health may be negatively impacted by the direct effects outlined above. It is intuitive that if a person is biopsychosocially vulnerable to developing mental illness, the exposure to a natural disaster or its secondary impacts may trigger or exacerbate mental health symptoms. These events could impact a person's sense of safety and their sense of agency (Heanoy & Brown, 2024), whether the event experienced is attributed to climate change or not.

In contrast, eco-distress is only likely to occur for those who believe and recognise the climate crisis as real. Of those who acknowledge the climate crisis, some have strong emotional responses, and others have a low emotional response (Vercammen et al., 2023; Wullenkord et al., 2024). Davidson & Kecinski (2021) highlight a low emotional response can contribute to apathy, theorising that this occurs when there is a failure to perceive the threat or information that points to the climate crisis being a threat. They highlight that the psychological distance and abstractness of the consequences of the climate crisis can contribute to this failure of perception. While theoretical propositions have been suggested, this thesis aimed to explore what has been found empirically about what contributes to this difference in emotional response. The systematic review (Chapter 2) explores what contributes to strong unpleasant emotions in response to the climate crisis (eco-distress).

Figure 1

Conceptual pathways from the climate crisis to mental health outcomes



Although the aetiology of eco-distress is informative, eco-distress is not in and of itself a mental health problem. Therefore, the next logical question is: what factors are involved in leading eco-distress to become impairing and associated with poor mental health outcomes? This question is further complicated by the constructive and beneficial outcomes also associated with eco-distress.

1.3 Ethical dilemma: Eco-distress has both constructive and unconstructive outcomes

Eco-distress has been associated with both constructive and detrimental outcomes. Constructive outcomes include greater engagement in pro-environmental behaviours in terms of individual mitigation behaviours (Mathers-Jones & Todd, 2023), collective action (Landman & Rohmann, 2020), activism (Kovacs et al., 2024), support for green policies (Goldwert et al., 2023) and donations to organizations dedicated to tackling the climate crisis (Urbild et al., 2023), all of which

are needed to mitigate the threats and consequences of the climate crisis (Latkin et al., 2022). Further, these constructive outcomes have been associated with improved psychological wellbeing (Prinzing et al., 2024).

This poses an ethical dilemma: do we want to decrease eco-distress? Unpleasant emotions are expected given the gravity of the threat (Hogg et al., 2021). Indeed, a lack of emotional response could be conceptualised as more abnormal (Dodds, 2021). Therefore, emotional responses to the climate crisis should not be pathologised. Furthermore, the direct consequences of climate change on mental health, physical health and ultimately the destruction of the planet and human life necessitate emotional responses as emotions influence behaviour (Frijda, 1987). Emotional responses have an adaptive function allowing us to survive and thrive in our environments (Pacella et al., 2017), thus are needed to effectively respond to the changing planetary environment. Therefore, arguably, effective responses to the climate crisis necessitates some degree of eco-distress.

Conversely, there is evidence that eco-distress can lead to impairing outcomes. The Climate Change Anxiety Scale (Clayton & Karazsia, 2020) and Hogg's Eco-Anxiety Scale (HEAS; Hogg et al., 2021) were developed to measure impairing aspects of eco-anxiety. Studies that used these scales found that for a (albeit small) percentage of people, eco-distress impacts their daily functioning such as struggling to concentrate, sleep and experiencing nightmares (McBride et al., 2021). While these impairing symptoms still do not constitute a mental disorder, higher scores on these scales have been associated with generalised anxiety disorder and major depressive disorder (Hogg et al., 2024; Schwartz et al., 2022).

To resolve this ethical dilemma, it may help to conceptualise eco-distress as a spectrum from less severe to more severe, with only severe distress requiring intervention if it leads to impairment in daily functioning. Indeed, Nezlek and Cypryańska (2024) found evidence of this highlighting that, for a small percentage, eco-distress reached a level of severity akin to clinical impairment. However, it is unclear what contributes to the development of impairing eco-distress.

Further investigation of what contributes to the constructive outcomes of eco-distress (e.g. pro-environmental behaviours) and what contributes to the unconstructive outcomes (e.g. impairment in functioning, poor mental health outcomes) is needed. As constructive outcomes are important to climate mitigation efforts, any attempt to negate unconstructive outcomes requires the preservation of constructive outcomes.

1.4 Models of distress

To theoretically guide what factors might contribute to the impairing outcomes of eco-distress, treatment models of other forms of distress could be utilised. Each model outlines a

conceptual understanding of what distress is and what contributes to the distress becoming impairing and prolonging suffering. Therefore, although eco-distress is not a mental health disorder, these models can help inform what may contribute to the development of impairing outcomes.

Cognitive theory (Beck, 1964; 1979) outlines that beliefs and appraisals are important in shaping emotional and behaviours outcomes. Some studies have demonstrated that beliefs about the threat of the climate crisis and one's ability to take action influence emotional responses (Reese et al., 2023). Further, the cognitive model outlines that unhelpful behavioural responses maintain and worsen the distress. In the context of eco-distress, an example of this may be that someone worried about the climate crisis may seek information about it to feel more informed, however this keeps the worry going (Whitmarsh et al., 2022). Thus, in accordance with the cognitive model, appropriate appraisals and effective behavioural responses may contribute to constructive outcomes of eco-distress whereas ineffective behavioural responses and catastrophic misappraisals may contribute to unconstructive outcomes.

One limitation of this understanding of distress in the context of eco-distress is appraisals about climate crisis are not necessarily inaccurate. The risk is sizable and attempting to change this appraisal may lead to a decrease in constructive outcomes and invalidate feelings (Lewis et al., 2020). Third-wave CBT approaches that have moved away from challenging or changing maladaptive appraisals (Arch & Craske, 2008) may be more helpful. Theoretical underpinnings of Acceptance and Commitment Therapy outline that, rather than focusing on content of cognitive phenomena involved in distress, the way individuals relate to their inner experiences (thoughts, feelings, sensations, memories) is important in understanding when distress becomes impairing and lead to poorer mental health outcomes (Harris, 2019). If an individual becomes caught up in their thoughts and emotions (cognitive fusion), allowing them to dominate their behaviour, and if they go through great lengths to avoid unpleasant emotions (i.e. unpleasant emotions related to the climate crisis) then one is more likely to experience negative outcomes (Harris, 2019). Conversely, if one is accepting and makes room for these experiences (for example through mindfulness) negative outcomes are less likely to occur (Harris, 2019).

The Dialectical Behavioural Therapy (DBT; Linehan, 1993; 2015) treatment model also emphasises the importance of mindfulness for relating to emotional experiences and acceptance principles. However, the theory goes further by highlighting the role of emotional dysregulation in the development and maintenance of distress (Lynch et al., 2006). In other words, emotional experiences themselves are not the issue, it is the lack of skills in effectively regulating emotional experiences that lead to unconstructive outcomes. This is a helpful conceptualisation of determining when eco-distress becomes impairing, as this does not necessitate the reduction of emotional responses, instead promoting regulation of emotions.

These models of distress informed the empirical study (Chapter 3) which explores what contributes to constructive outcomes of eco-distress. The rationale for the focus on constructive outcomes are as follows: a) indicators of good mental health is not the absence of mental illness (Winefield et al., 2012), b) treatments purely aimed at reducing distress would be inappropriate in the context of eco-distress due to associated constructive outcomes, c) to understand what makes treatments effective without unintentionally reducing constructive outcomes, we need to know what contributes to constructive outcomes.

In accordance with the DBT model, and more general emotion theory (Frijda, 1987), Chapter 3 explores whether different emotional responses contribute to constructive outcomes in the context of climate crisis. Further, each of the models of distress outlined above emphasise the way emotional responses are coped with and responded to, determine whether outcomes are impairing or constructive. Therefore, whether coping influences the relationship between eco-distress and constructive outcomes is explored.

A limitation of these models is the emphasis on intrapersonal processes. There is potential to decontextualise the individual when eco-distress has a social aspect (Williams, 2023). Social and cultural factors influence emotional responses (Davidson & Kecinski, 2021). For example, in line with social identity theory, if those around us are concerned about the climate crisis, this may make it a more prevalent issue for us, increasing our own concern (Mackay et al., 2021). The climate crisis is a social issue, and thus other social issues are relevant and interact with it. Issues of power and privilege are particularly pertinent; those most disadvantaged in the global population are disproportionally impacted by the climate crisis despite contributing the least to human activities causing the changes (Levy & Patz, 2015). Further, they have the least power or influence in societal responses to the climate crisis (Levy & Patz, 2015). The intersection between social justice and the climate crisis led to the investigation into the role of socioeconomic status in influencing people's ability to effectively respond to eco-distress.

1.5 Ontological and epistemological position

I approach this thesis from a critical realist position. This position proposes that knowledge exists and can be measured, however our ability to accurately access and measure this reality is fallible and susceptible to bias (Koopmans & Schiller, 2022). Critical realism approaches adopt both qualitative and quantitative methodology, however, I adopt quantitative methodology as it best answers my research questions. Critical realism views causative processes as contextually determined and seeks to discover hidden mechanisms that explain empirical phenomena (Eastwood et al., 2016). My consideration of social context such as socio-economic status in being a potential mechanism explaining pro-environmental behaviours is aligned with contextual considerations and

the mediation analysis in my empirical study allows for exploration of the relationships between phenomena, another key feature of critical realism (Koopmans & Schiller, 2022). Attempts are made throughout to reduce the risk of bias, and limitations of methodology are highlighted, recognising the fallible nature of being able to accurately measure reality.

1.6 Conclusions

Understanding what contributes to the development of eco-distress is necessary to understand the potential pathways from the climate crisis to mental health outcomes. Further, what factors influence the relationship between eco-distress and subsequent outcomes further aids understanding this pathway. This highlights the link between the second chapter, exploring what predicts eco-distress, with my third chapter that explores what contributes to constructive outcomes of eco-distress or eco-emotions. Both inform part of the potential pathways from climate crisis to poor mental health outcomes. Without this understanding, the necessity for treatments for eco-distress would remain unclear and interventions for impairments related to eco-distress would be ill-informed.

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Chapter 2 – Systematic Review

What predicts eco-distress: A systematic review

Journal specification: The following paper has been prepared for submission to the Journal of Environmental Psychology. The guidelines for authors are provided in Appendix A.

Word count: 9,128 (excluding abstract, tables and references)

Abstract

Background

Unpleasant emotional responses to the climate crisis is termed ‘eco-distress.’ What contributes to the development of eco-distress is unclear. This review aims to identify factors that are associated with the development of eco-distress and what predicts it.

Methods

A comprehensive search of articles published between 2017-2025 was conducted using PsychInfo, MedLine, CINAHL, PubMed, Web of Science and Scopus databases. The review followed PRISMA guidelines. A quality assessment of the included studies was conducted. The findings are summarised using the narrative synthesis approach.

Results

Twenty-eight studies are included in the synthesis after screening 3,081 articles. The main form of eco-distress investigated in literature was anxiety responses (eco-anxiety), with only three studies exploring other forms of eco distress (eco-guilt and solastalgia). There was most evidence for media exposure, other forms of distress and connectedness to nature as potential predictors of eco-distress. The majority of studies had low to medium risk of bias, however most were cross-sectional precluding definitive conclusions from being drawn. Most of the studies were conducted in Europe or North America. South Asian and indigenous populations were underrepresented.

Conclusions

Factors associated with the development of eco-distress and factors that predict eco-distress are varied, ranging from cognitive, environmental and social factors. However, due to methodological limitations caution around these findings are warranted. Future research should prioritise exploring non anxiety emotional responses to the climate crisis, conceptual consistency of predictors that are grounded in theory as well as using longitudinal and robust methodology.

Keywords: Eco-distress; Eco-anxiety; Psychological well-being; Sustainability

1. Introduction

The climate crisis is currently the biggest threat to humanity (IPCC, 2023; UN Report, 2023) with human activity and unsustainable energy use causing global warming and rapid adverse changes to the atmosphere, ocean and land (IPCC, 2022). This is a threat to human survival and physical health, which is well-documented (Thomas et al., 2014). It is also a threat to mental health and psychological well-being, which has only recently been acknowledged (Lawarence et al., 2021). The climate crisis can impact mental health through direct and indirect effects (DCP, 2024). Direct effects include increasing the risk of poor mental health outcomes due to increases in the frequency and intensity of natural disasters, such events have been associated with increased risk of various mental health disorders (Fernandez et al., 2017; Cruz et al., 2020). Reviews of direct effects have been covered elsewhere (see Chen et al., 2020; Pourmotabbed et al., 2019). Another way in which psychological well-being is being negatively impacted is through witnessing and being informed of the devastation of the climate crisis (Clayton et al., 2017). This can elicit strong unpleasant emotions, and in turn, can negatively impact a person's functioning day to day (Clayton et al., 2017). This distress can occur without directly experiencing an adverse climate change event (Jarrett et al., 2024) therefore it is considered an indirect effect of the climate crisis on mental health.

1.1 Conceptualisation of eco-distress

The majority of research into the indirect effects of the climate crisis on mental health has focused on eco-anxiety (Ojala et al., 2021). While there has been growing interest in eco-anxiety there has been little consistency in the use of the term (Coffey et al., 2021). Some use the term to refer to anxiety-specific responses such as a sense of impending doom or worry about the climate crisis (e.g. APA, 2017) and others use it as an encompassing term for strong, unpleasant emotions that are elicited in response to the climate crisis and environmental degradation (e.g. Doherty & Clayton, 2011). There are issues with both of these definitions. The use of eco-anxiety as an all-encompassing term is misleading and obscures the nuance of the different emotional responses to the climate crisis. There is emerging evidence that different emotional responses may differentially contribute to determining whether a person experiences detrimental mental health outcomes. Stanley et al. (2021) found that sadness in relation to the climate crisis predicted higher depression scores, whereas anger related to the climate crisis was associated with lower scores on the depression scale. This highlights the need to explore emotional responses beyond eco-anxiety.

Eco-anxiety being defined as anxiety in response to the climate crisis is more accurate and recognises the potential for distinct effects of varying emotions. However, this has led to a disproportionate focus on anxiety in literature and research, which does not fully capture the range of emotional responses to the climate crisis (Pitt et al., 2023). Research has demonstrated that there

are a range of emotions reported by the general population in response to the climate crisis. Galway & Beery (2022) found that along with worry, frustration was the most reported emotion in relation to the climate crisis. Iniguez-Gallardo and colleagues (2021) found that guilt, powerlessness and anger were frequently reported in relation to the climate crisis. Further solastalgia, defined as '*the isolation caused by the gradual removal of solace from the present state of one's home environment*' (Albrect, 2011, p. 43), has been found to be detrimental to mental health (Caceres et al., 2022). As a result, more researchers are recommending the exploration of a range of emotions related to the climate crisis rather than just anxiety (Pihkala, 2022).

An alternative term is 'eco-emotions' (Cinanconi et al., 2023), however this also encompasses pleasant emotions related to the climate crisis such as hope (Betro, 2023). Positive emotional responses may protect against impacts on psychological well-being and mental health, and have received less research comparatively to unpleasant emotions in response to the climate crisis (Betro, 2024). Therefore, it has been postulated that a more meaningful encompassing term of the unpleasant emotional responses to the climate crisis is 'eco-distress' (Nezlek & Cypryańska, 2024).

1.2 The development of eco-distress and subsequent outcomes

What contributes to the development of eco-distress is unclear. Understanding the factors that contribute to the development of eco-distress could help to build an understanding of the phenomenon as it is a new concept, and research in its infancy (Bauden & Jachens, 2021). Understanding eco-distress is a research priority in the field due to the associated outcomes. Whilst there is the potential negative impact on mental health, eco-distress has also been associated with constructive outcomes (Mathers-Jones & Todd, 2023). Eco-distress does not necessarily result in the development of poor mental health, as unpleasant emotions are functional, and it could be argued it is a rational response to the climate crisis (Hogg et al., 2021). Eco-distress has also been found to contribute to adaptive actions such as pro-environmental behaviours (Pavani et al., 2023), highlighting the constructive potential of eco-distress. Further, pro-environmental behaviours have been found to be associated with improved psychological well-being (Prinzing et al., 2024). Therefore, understanding what contributes to the development of eco-distress may inform how to promote pro-environmental behaviours and, in turn, may promote psychological well-being. Good psychological well-being is protective of mental illness (Chida & Steptoe, 2008).

Conversely, experiencing eco-distress has also been associated with negatively impacting psychological well-being (Hogg et al., 2024). Further, through a diathesis-stress lens (Ingram & Luxton, 2005; Monroe & Simmons, 2015), the psychological burden of the climate crisis can be a vulnerability factor, especially for those with a predisposition to mental health difficulties. Eco-distress has been found to be associated with poorer mental health outcomes such as depression, anxiety and insomnia (McBride et al., 2021; Pitt et al., 2023). Eco-distress therefore has the potential

to further exacerbate the mental health crisis by contributing to poorer mental health for some individuals. Mental health disorders are the third leading cause of disability globally (James et al., 2018) and the cost of mental illness in the UK is estimated to be around £119 billion per year (O'Shea & Bell, 2020) highlighting the high personal, public health and economic cost of the mental health crisis. Therefore, exploring potential factors related to poorer mental health outcomes is a global health priority.

As the impacts of the climate crisis are worsening (Lawrence et al., 2021), it is likely that unpleasant emotional responses to the climate crisis will also increase. Therefore, there is a risk that detrimental outcomes of eco-distress may increase if steps are not taken to prevent this. Indeed, eco-distress seems to be an increasing phenomenon. Swim and colleagues (2022), conducted a longitudinal study and found that eco-anxiety increased in the general population between 2010 and 2019. Further, there are growing numbers of people presenting with eco-distress in clinical settings (Budzisewska & Jonsson, 2022). Understanding what contributes to the development of eco-distress could inform interventions for those seeking help for existing mental health disorder who have eco-distress as part of their presentation. Indeed, there is little guidance on the best intervention for who have eco-distress as part of their presentation (Budzisewska & Jonsson, 2022). Understanding what contributes to the development of eco-distress may therefore provide helpful indicators of what to target in treatment and inform prevention efforts.

Indeed, the HCPC standards (2023) have recently emphasised the role of clinical psychologists in the promotion of health, health education and the prevention of ill-health. As the climate change is having, and will continue to have, impacts on health outcomes, informing and educating the public and policy about the mental health impacts of climate change and eco-distress thus comes under the remit of clinical psychologists. Understanding eco-distress through understanding what contributes to the development of it and what predicts it will therefore aid this endeavour.

1.3 Predictors of eco-distress

Due to the relationship between eco-distress and psychological wellbeing and mental health, there has been an increase in research into understanding eco-distress (Pihkala, 2020), including what factors predict eco-distress. However, to be able to meaningfully understand what contributes to the development and predicts eco-distress, and in turn inform prevention and intervention efforts to the associated outcomes, single studies are not sufficient as they only reflect the influence of a factor in one sample. Systematic reviews of research allow for investigation and an overview of what predictors have the most evidence across different studies, identify and explore any conflicting results and identify research gaps (Munn et al., 2018) such as what potential predictors have been

neglected by research. Therefore, although there has been an increase in research into the predictors of eco-distress a review is required to guide understanding, future research and practice.

There has been a recent review of the predictors of eco-anxiety by Quiroga and colleagues (2024). They found that age, gender and exposure to information about the climate change were predictors of eco-anxiety. However, as highlighted above, eco-anxiety does not encapsulate the extent of emotional responses to the climate crisis. Further, as there is little conceptual consistency of eco-anxiety in literature, the review included papers of concepts related to eco-anxiety such as concern or attitudes (for example, Casson et al., 2023; Pickering & Dale, 2022) rather than measures of unpleasant emotional responses. The review adopted a wide definition of the term 'predictors' meaning studies were included that had not used statistical methods in which variables could be established as a predictor (for example, Clayton et al., 2023). Finally, the paper did not include a critique of the quality of research through quality assessment, meaning it is difficult to establish whether the conclusions were based on high quality studies. The current paper aims to overcome these limitations by exploring eco-distress rather than solely eco-anxiety, specifying eco-distress as unpleasant emotional responses rather than related concepts, limits predictors to its statistical meaning (i.e. factors that have been explored as predictor variables in statistical analyses), and conducts a quality assessment of the studies included in the review.

1.4 The current review

This systematic review aims to synthesise studies that have explored what factors contribute to the development of eco-distress and what factors predict eco-distress. The secondary aims are to critique and assess the qualities of these studies. The research questions are as follows:

(1) What contributes to the development of eco-distress?

(2) What predicts eco-distress?

The first research question explores factors that contribute to the development of eco-distress over time, and the second research question explores factors that have been demonstrated to statistically predict eco-distress without necessarily being demonstrated over time.

2. Methods

This review has followed the PRISMA (Preferred Reporting Items for Systematic review and Meta-Analysis) methodology guidelines (Page et al., 2021). A review protocol was developed prior to the commencement of the review which was pre-registered on Prospero: https://www.crd.york.ac.uk/PROSPERO/display_record.php?RecordID=596915

2.1 Search strategy

A literature search was conducted using the following databases EBSCO Host (PsychInfo, MedLine, CINAHL), PubMed, Web of Science and Scopus. Searches were initially conducted in October 2024 and re-run in March 2025.

Table 1 displays the search terms. The search terms were piloted prior to the final search to see which terms were used most in literature and which resulted in the most relevant papers. The final search terms were approved by a librarian from the University of Southampton. For the full search strategy see Appendix B.

Date limits were used in the search filters, with searches only including articles after 2017. Due to the search terms including terms with multiple meanings (for example, climate refers to the weather conditions in the planet but also prevailing trend in public opinion such as political climate) a date limit was placed to reduce the number of irrelevant papers. In 2017, Clayton and colleagues presented a report at the American Psychological Association conference summarising the impact of the climate crisis on mental health outcomes. As a result of this, there was an increase in the research into the psychological impact of the climate and ecological crisis (Pihkala, 2020). Therefore, the majority of relevant literature for this review has been conducted after this report in 2017, so a date restriction was set. A small pilot and examination of related reviews was conducted to explore whether this date restriction excluded any relevant papers, and the results indicated the majority of the relevant papers were after 2017.

Table 1

Search terms

Concept: eco-distress	Research Q1	Research Q2
climate / eco / environmental anxiety	Association	Predict*
climate / eco grief	Associated	
climate / eco guilt		
Climate / eco sadness		
Climate / eco depression		
Climate / eco anger		

2.2 Inclusion and exclusion criteria

Studies were in included if they:

(a) Were published or translated into English.
(b) Reported on factors associated with the development of eco-distress or predictors of eco-distress, where eco-distress was the dependent variable.
(c) Were quantitative studies using methodology to enable inferences regarding predictive relationships. In other words, were longitudinal studies (to establish association with the development of eco-distress) or were non-longitudinal but used appropriate statistical methods to make inferences about predictive relationships (e.g. regression, structural equation modelling, etc.)

Studies were excluded if they:

(a) Were published in a language other than English and had not been translated to English.
(b) Did not allow for inferences of predictive relationships such as qualitative studies or case studies. Mixed method studies were also excluded. Quantitative studies that had explored association with eco-distress through correlation analysis only were also excluded, as these factors are associated with eco-distress rather than suggestive of contributing to the development of it.
(c) Had a dependent variable other than unpleasant emotional responses to the climate crisis. Studies with related constructs (such as beliefs or behaviours) as dependent variables were excluded. Mediation and moderation studies in which eco-distress was the mediator or moderator variable rather than the dependent variable were excluded.

2.3 Screening and selection process

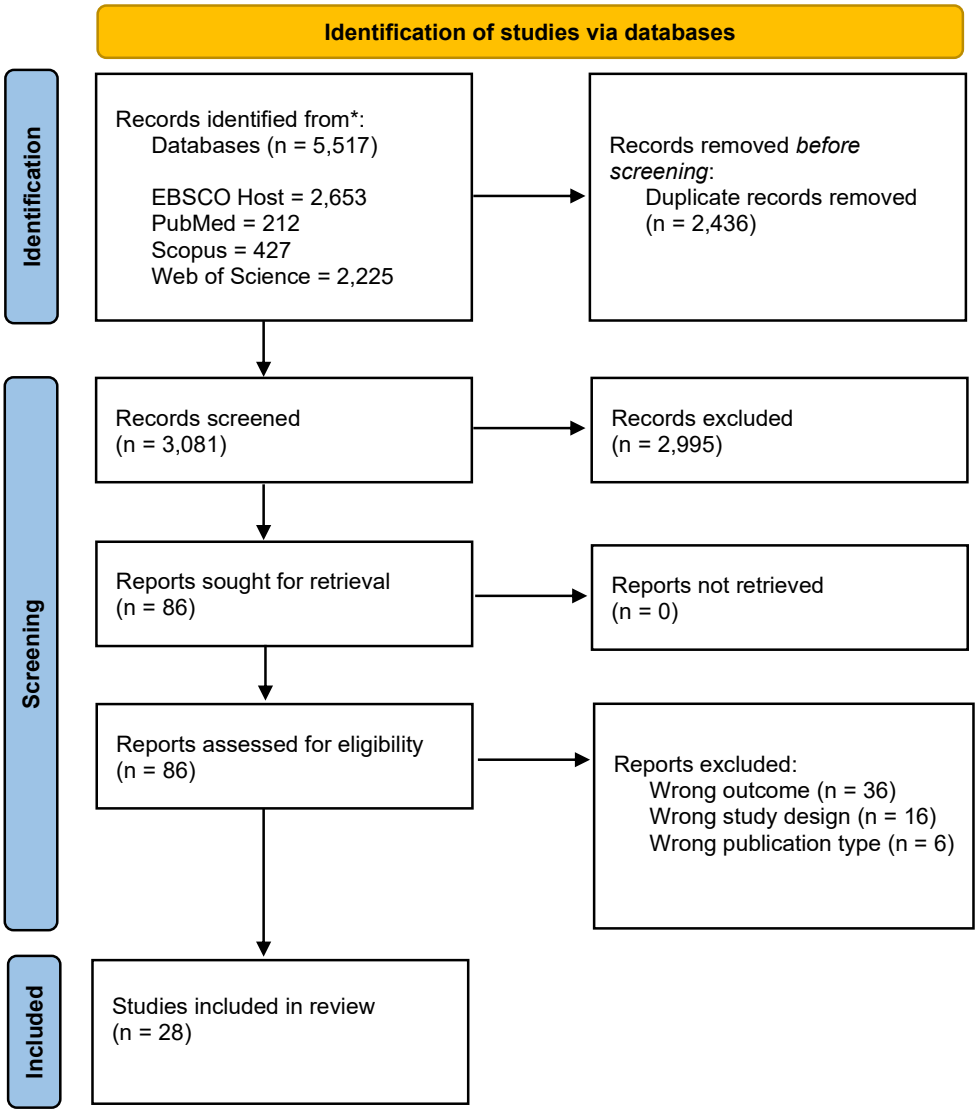
The comprehensive database search yielded 5,517 results. Duplicates (n = 2,436) were removed after initial searches using Endnote software (EndNote™ Version 20; 2013). Figure 2 presents the PRISMA Flowchart. The remaining articles were transferred to Raayan (https://www.raayan.ai/), to aid the first phase of screening. Titles and abstracts were screened by the main researcher. A second researcher screened 10% independently, a kappa score of 0.85 was obtained indicating a very good consensus between the researchers (McHugh, 2012). Full text screening was conducted by the main researcher, and 10% were screened by the second researcher (k = 0.89). Any disagreements regarding inclusion or exclusion at both screening phases were resolved through discussion and consultation of the research team.

2.4 Quality assessment

The majority of the studies included in the review were evaluated on methodological quality using the Appraisal tool for Cross-Sectional Studies (AXIS; Downs et al., 2016), as they were cross-sectional. AXIS contains a checklist of twenty items related to common biases and pitfalls in scientific studies using cross-sectional methodology. For the studies that were not cross-sectional, the Quality Assessment with Diverse Studies (QuADS; Harrison et al., 2021) was used. The quality assessment was not used to exclude studies, rather to inform the synthesis and discussion of findings. The main researcher conducted the quality assessment, with the second researcher independently assessing 10% of the papers to review consistency which was in the acceptable range (k = 0.6).

Figure 2

PRISMA flowchart outlining study selection process



2.5 Narrative synthesis

Substantial variability in the predictor variables prevented meta-analysis of the included studies to be conducted. Meta-analyses are used to synthesise the magnitude and direction of an effect or relationship (Haidich, 2010). There were few predictors which have been explored by an appropriate number of studies within the review with enough conceptual homogeneity to meaningfully explore a combined magnitude of effect through meta-analysis (Schulzke, 2021). Further, the data precluded a meta-analysis due to the majority of the studies only reporting the effect size of the overall regression model rather than individual predictors. While beta coefficients can be converted, in the context of multiple regression analyses this is unreliable as this would assume the beta coefficients were part of a similar model across studies (Roth et al., 2018). However, the models varied considerably across studies and were a combination of various possible predictors. Further, due to research into psychological and emotional responses to the climate crisis being in its infancy (Bauden & Jachens, 2021), it would be premature to explore the effect of any one predictor through either meta-analysis or other statistical pooling methods. Rather, this review aimed to synthesise research of all potential predictors. Therefore, a narrative synthesis was conducted to best answer the research questions.

In line with guidance outlined by Popay et al. (2006), the narrative synthesis was carried out in four stages; (1) A preliminary synthesis which grouped predictors from individual studies. (2) Within each grouping, the relationship between studies were explored, comparing and contrasting findings. This included exploring the possible reasons for any differences in findings. (3) Quality of studies were reviewed and (4) overall conclusions were inferred with recommendations

3. Results

3.1 Overview of studies

Twenty-eight studies were included in the final review, with full characteristics of each study displayed in Table 2. Of the final twenty-eight, only four studies allowed a predictive relationship over time to be investigated. A natural experiment (Bratu et al., 2022), a prospective study (Anneser et al., 2024) and two time-lagged longitudinal studies (Kühner et al., 2024; Zacher & Rudolph, 2023). The remaining studies were cross-sectional (n = 24) but adopted statistical methods that explored factors are predictor variables that allowed for inference regarding predictive relationships. Only three studies explored non-anxiety related distress as dependent variables; Prencipe et al (2023) explored eco-distress generally, Smith et al (2023) explored solastalgia and Jaskiewicz et al (2023) developed a 4-item eco-guilt measure. Tucholska et al (2024) used the Climate Emotion Scale (Searle & Gow, 2010) but did not use this measure in analyses relevant to this review. The majority of studies (n = 20) used the Climate Change Anxiety Scale (CCAS; Clayton & Karazsia, 2020). Most of the

studies were conducted in Europe and North America (n = 20), and all studies with the exception of Prencipe et al (2023), were adult populations. The total sample size in this review is 38,187 (accounting for the studies that had used the same samples).

Table 2

Study characteristics

Author	Country	Participants	Recruitment method	Study design	Statistical analysis
Anneser et al (2024)	US	N = 1071 Age = 18+	National survey	Prospective	Logistic regression
Asgarizadeh et al (2023)	US and Canada	N = 323 Age: 19-87	Online survey Recruitment platform (Cloud research prime panel)	Cross-sectional	Structural Equation Modelling
Baskaya et al (2024)	Turkey	N = 978 Age = 18-49 Female only	Online survey Snowball sampling via social media	Cross sectional	Multiple Linear Regression
Bratu et al (2022)	Canada	N = 859 Age = 18-65	Online survey – adverts on social media	Natural/Quasi-experiment	Gaussian Regression Modelling
Cameron & Kegee (2025)	South Africa	N = 343 Age = 18-23	Emailed survey	Cross-sectional	Hierarchical Linear Regression
Chan et al (2024)	US and China	N = 1004 / 1009 Age = +18+	Online survey Market research company	Cross sectional	Multiple Linear Regression and Structural Equation Modelling
Eren & Yildiz (2024)	Turkey	N = 419 Age = 18-40 Nursing students	Emailed survey to university students	Cross-sectional	Linear Regression
Feather & Williams (2022)	Australia and New Zealand	N = 779 Age = 18-89	Online survey Recruitment platform (Prolific)	Cross-sectional	Multiple Log-linear Regression
Hajek & Konig (2022) (a) and (20204) (b)	Germany	N = 3091 Age = 18-74	Online survey Market research firm (Bilendi & Respondi)	Cross sectional	Multiple Log-linear Regression
Jalin et al (2024)	France	N = 522 Age = 18-73	In person survey at a climate activism workshop	Cross sectional	Multi-variable Regression

Jaśkiewicz et al. (2023a)	Poland	N = 245 Age = 18+	Online survey Recruitment platform (SONA)	Cross-sectional	Multiple Linear Regression
Jaśkiewicz et al. (2023b)	Poland	N = 199 Age = 18+	Online survey – snowball sampling	Cross sectional	Multiple Linear Regression
Kotera et al (2024)	UK	N = 126 Age = 18-65	Online survey	Cross sectional	Multiple Linear Regression
Kühner et al (2024)	Germany	N = 1355 Age = 18-85	Online survey	Longitudinal	Path Analysis
Li et al (2025)	China	N = 653 Age = 18+	Online survey (social media groups)	Cross-sectional	Structural Equation Modelling
Maduneme (2024)	US	N = 440 College students	Survey emailed to college students	Cross-sectional	Iterative Reweighted Least Squares Regression
Mat & Yilmaz (2024)	Turkey	N = 437 Age = 18+	Paper based survey distributed at a university	Cross-sectional	Linear Regression
Ogunbode et al (2022)	32 different countries	N = 12,246 Age = 18+	Survey (online and in person depending on country) Recruitment platforms (various) and sending links to universities	Cross-sectional	Hierarchical Linear Regression
Parmentier et al (2024)	France	N = 431 Age = 18-78	Online survey French social media networks that focused on eco-anxiety Personal networks of authors	Cross-sectional	Multiple Linear Regression
Patrick et al (2023)	Australia	N = 5,483 Age = 18-75	Online survey (Social media and TV advert)	Cross-sectional	Logistic regression
Prencipe et al (2023)	Tanzania	N = 2,053 Age = 18-23	In person survey	Cross-sectional	Generalised Linear Modelling
Ramírez-López et al (2023)	Mexico	N = 461 College students	Online survey	Cross-sectional	Generalised Linear Modelling
Reese et al (2023)	Germany	N = 204 Age = 18+	Online survey (social media)	Cross-sectional	Multiple Linear Regression
Smith et al (2023)	Australia	N = 415	Online survey (social media and adverts)	Cross-sectional	Structural Equation Modelling

		Age = 18-76			
Tucholska (2024)	Poland	N = 333 Age = 18-80	Online survey Snowball sampling from university students	Cross-sectional	Stepwise Regression
Whitmarsh et al (2022)	UK	N = 1,338 Age = 18-85	Online survey Recruitment platform (Prolific)	Cross-sectional	Multiple Linear Regression
Wullenkord et al (2024)	Germany	N = 2053 Age = 18-82	Online survey Recruitment platform (Bilendi GmbH)	Cross-sectional	Multinomial Logistic Regression
Zacher & Rudolph (2023)	Germany	N = 2,066 Age = 18-85	Online survey	Longitudinal	Ordinary Least Squares Regression

3.2 Quality Assessment

Overall, the studies scored between low and medium risk of bias. See Appendix C for quality assessment scores for each study in detail. In addition to the limitation of cross-sectional methodology preventing causal inferences being made, another major limitation in the quality of the studies was that most of the studies were non-representative samples or used methods that bias the sample. A notable exception is Anneser et al (2024) who used a nationally representative sample. Some studies highlighted that the sample was comparable to consensus data to overcome this (e.g. Bratu et al., 2022; Chan et al., 2024; Whitmarsh et al., 2022) and some studies used stratification to obtain a more representative sample (Patrick et al., 2023; Wullenkord et al., 2024). Many samples were from recruitment platforms (n = 8), from which respondents may differ from the general population (Leach et al., 2017).

The other main source of recruitment was social media (n = 6), a notable exception to this was Prencipe et al. (2023) who adopted a paper-based survey with a non-randomised cluster approach to sampling. Finally, a number of studies only used university samples (Eren & Yildiz, 2024; Maduneme, 2024; Mat & Yilmaz, 2024; Ramirez-Lopez et al, 2023).

Another pitfall in study quality was the absence of sample size justification. Only seven studies (Baskaya et al., 2024; Bratu et al., 2022; Feather & Williams, 2022; Jaskiewicz et al., 2023; Reese et al., 2023; Wullenkord et al., 2024) provided a power analysis to justify their sample size. Most studies had large samples (over 300; Boon and Tompson, 2020), however, given the number of predictors can influence the power required, a power calculation is needed.

Finally, there was some variation in quality of replicability with some studies. Some studies lacked detail and transparency in procedures (Chan et al., 2024; Hajek & Konig, 2022; Jaskiewicz et al., 2023; Kotera et al. 2024; Maduneme 2024; Patrick et al., 2023; Prencipe et al., 2023; Reese et al 2023; Smith et al., 2023; Tucholska, 2024). There was also variability in the measures used, with some studies using measures only using one or two items that had not been validated by previous research (Anneser et al., 2024; Prencipe et al., 2023).

3.3 Narrative Synthesis

Sixty-six predictor variables were identified across the individual studies (Appendix D). These were grouped into the following: (1) Exposure to climate related events, (2) Beliefs, perceptions and values, (3) Relationship to nature, (4) Other forms of distress, (5) Media exposure, (6) Knowledge and awareness of the climate crisis, (7) Personality traits and (8) Demographics. Table 3 summarises study findings.

Table 3

Summary of studies

Author(s)	Predictor variables	Measure of eco-distress	Findings
Anneser et al (2024)	**Air pollution** - annual average fine particulate matter (PM2.5), **Greenness** - normalized difference vegetation index (NDVI) **Toxic release** - US Environmental Protection Agency Toxic Release Inventory (US EPA, O, 2013). **Number of heatwaves –** Number of days that the temperature exceeded the 95th percentile for the warm season maximum temperature between 1999–2018	**Eco- Anxiety & Stress:** Two item measure; Likert rating of how stressed they were about climate change	The environmental exposures were not significant predictors of climate stress/anxiety. Political beliefs was a significant predictor in the model.
Asgarizadeh et al (2023)	**Climate change knowledge** - 11 correct/incorrect questions in four subscales (adapted from Tobler et al., 2012) **Personal experience with climate change impacts** (three-item questions Likert scale, Clayton & Karazsia, 2020) **General anxiety** - GAD-7 (Spitzer et al., 2006)	**Eco- Anxiety:** Climate change anxiety Scale (CCAS) (Clayton & Karazsia, 2020)	Climate change knowledge was a significant predictor of eco-anxiety (β= -0.1, $p < .05$); greater knowledge predicted decreased eco-anxiety. Experience of climate change was a significant positive predictor of eco-anxiety (β = 0.16, $p < .001$). GAD was a positive predictor eco- anxiety (β = 0.41, $p < .001$). Climate change worry was a positive predictor of eco- anxiety (β = 0.25, $p <.001$).

	Climate Change Worry – 10 item likert scale rating how often they worry about possible impacts of climate change adapted from Verplanken et al (2020) **Climate change risk perception** - eight items based on van der Linden's (2015) model **Media exposure to climate change information** - 1 item measure from Ogunbode et al 2019		Media exposure was a significant predictor variable associated with eco-anxiety (β = 0.21, p < .001).
Baskaya et al (2024)	Age; Education; Martial status; Environmental pollution (self-report); Air pollution (self-report); region; allergy status	**Eco-Anxiety -** Climate Change Anxiety Scale for Women's Health (Sagut et al., 2022)	Perceived environmental pollution and presence of an allergy predicted greater eco-anxiety. Age, education, marital status, perceived air pollution and region were not significant predictor variables.
Bratu et al (2022)	**Environmental exposure:** 2021 Heat dome	**Eco- Anxiety:** Climate change anxiety Scale (CCAS) (Clayton & Karazsia, 2020)	The heat dome was associated with the development of eco-distress, in that eco-anxiety increased following the Heat dome (β = 0.057, p <.001).
Cameron & Kagee (2025)	**General Anxiety:** GAD-7 (Spitzer et al., 2006) **Depression:** PHQ-9 **Climate change concern –** 1 item **Environmental Values** (New Environmental Paradigm scale) Dunlap et al., 2000) **Nature relatedness** (NR-6; Nisbet & Zelenski, 2013) **Visits to green spaces** (in the last 7 days)	**Eco-Anxiety** Climate Change Anxiety Scale (CCAS) (Clayton & Karazsia, 2020)	GAD scores, environmental concern, environmental values, nature relatedness and information seeking (β = 0.296, p < .001) were positive predictors of eco-anxiety. In the final model, depression scores, experience of climate impacts, information exposure and visits to green space were not significant predictor variables.

	Information exposure: self-report of how often they have come across information about climate change **Information seeking:** self-report of how often they seek information about climate change **Climate impact:** In the last 5 years have you experienced any form of flood damage (including your home and garden)?		
Chan, Tam & Clayton (2024)	**Experience of climate change-related weather events** - flooding, heat wave, and an extreme precipitation event **Perceived realistic and symbolic threats of climate change** – adapted Kachanoff et al. (2021) threat scale to relate to climate change **Perceived vulnerability of climate change threat** (two items) **Perceived psychological distance of climate change** - A six-item measure of psychological distance based on past studies (e.g., Chu & Yang, 2020; Spence et al., 2012) **Self-efficacy beliefs** - three items (Chan & Tam, 2021) **Collective efficacy beliefs** – three items (Chan & Tam, 2021) **Climate change beliefs** - 8 item measure (Whitmarsh, 2011)	**Eco-Anxiety:** Symptom based anxiety - Climate change anxiety Scale (CCAS) (Clayton & Karazsia, 2020) Affect based climate anxiety – 7 items based on the state-trait inventory (Ogunbode et al., 2022; Spielberger, 1983)	Experience of climate change and perceived realistic threat were consistent predictor variables associated with eco-anxiety across the two subtypes of eco-anxiety and across the two countries. The remainder had inconsistent findings across the two measures of eco-anxiety and two countries with very small effects or were non-significant.

	Personal values - 16 item measure (Steg et al., 2014), includes biospheric values, socio-altruistic values, egoistic values, hedonic values		
Eren & Yildiz (2024)	**Climate change Awareness** - Global Climate Change Awareness Scale (GCCAS) (Deniz et al., 2021)	**Eco-Anxiety:** Climate change anxiety Scale (CCAS) (Clayton & Karazsia, 2020)	Climate change awareness was a positive predictor of eco-anxiety ($\beta = 0.304$, $P < 0.001$)
Feather & Williams (2022)	**Climate change concern** - The climate change concern index - three items from a Gallup questionnaire reported in McCright (2010). **Psychological flexibility** - The Multidimensional Psychological Flexibility Inventory (MPFI; Rolffs et al., 2016)	**Eco-Anxiety:** Climate change anxiety Scale (CCAS) (Clayton & Karazsia, 2020)	Concern about climate change was a positive predictor of eco-anxiety. Psychological inflexibility positively moderated the relationship been climate concern and eco-anxiety.
Hajek & Konig (a) (2022)	**Demographics:** Age; gender; parental status; marital status; migration status; education; employment status **Health status:** Covid vaccination (yes/no); self-rated health (from very poor to very good); presence of chronic disease **Corona virus anxiety** – Coronavirus Anxiety Scale 5-item tool, with higher scores indicating higher coronavirus anxiety **Fear of a conventional war** - single item ranging from 0 = not at all worried to 4 = extremely worried)	**Eco-Anxiety:** Climate change anxiety Scale (CCAS) (Clayton & Karazsia, 2020)	Age, employment status, chronic disease status, vaccination status, coronavirus anxiety and fear of a conventional war predicted eco-anxiety. Younger individuals, those in full time employment (compared to those who are retired), individuals without chronic conditions and individuals vaccinated against COVID-19 had higher levels of eco-anxiety. Marital status, parental status, gender, migration status and education were non-significant predictor variables.
Hajek & Konig (b) (2024)	**Belief in Science -** Belief in Science Scale (BISS) (Farias et al. 2013)	**Eco-Anxiety:**	Belief in science was a positive predictor of eco-anxiety. However, when exploring different

		Climate change anxiety Scale (CCAS) (Clayton & Karazsia, 2020)	generations belief in science, it only remained a predictor for the 18-29 age group.
Jalin et al (2024)	**Environmental affect traits -** Environmental trait affect questionnaire (ETA-Q; Hahnel and Brosch, 2018) **Connectedness to nature** – 1 item measure (Schultz, 2002) **Demographics –** age, gender, education, parental status **Media exposure** - two item measure about frequency and proportion of media relating to climate change **General Anxiety** - GAD-7 (Spitzer et al., 2006) **Depression** - PHQ-9 Kroenke et al. (2001)	**Eco- Anxiety** - Eco-Anxiety Measurement Scale (EMEA; Jalin et al., 2023)	Negative affect from the ETA-Q was a positive predicter of eco-anxiety. Anxiety and depression were positive predictors of eco-anxiety. Exposure to media and Nature connectedness were positive predictors of eco-anxiety. Gender, parental status, and education also predicted eco-anxiety. Females, those with higher levels of education and who did not have children were more likely to have higher levels of eco-anxiety. Age was non-significant.
Jaśkiewicz et al. (2023a)	**Connectedness to Nature Scale** (CNS; Mayer & Frantz 2004) **Social dominance –** Social dominance orientation scale (Pratto, 1994) **Demographic variables** – Age & gender	**Eco- Guilt** - 4-item Likert scale (‘*I feel responsible for the progressive degradation of the environment.*’; ‘*I feel guilty when I don't care about the environment.*’; ‘*I feel responsible for future generations when I think about climate change.*’; ‘*I cannot bear the thought that, among other things, it is because of me that future generations will live in deteriorating environmental conditions.*’).	Nature connectedness ($\beta = 0.44$, $p < 0.001$), and social dominance orientation ($\beta = -0.17$, $p = 0.03$) were significant predictors of eco-guilt. Higher connectedness to nature predicted higher eco-guilt. Higher social dominance predicted less eco-guilt. Gender and age were non-significant predictor variables.

Jaśkiewicz et al. (2023b)	**Environmental locus of control -** shortened version of the scale created by Kalamis et al. (2014) with the following subscales; government responsibility, Natural earth cycle; corporate responsibility. **Demographic variables** – Age & gender	**Eco- Guilt** - 4-item Likert scale – same as in study 1.	Gender (β = .16, p = .004) predicted eco-guilt in that women experienced more eco-distress. Ascribing responsibility for climate crisis to politicians (β = .35, p < .001) predicted greater eco-guilt Locating the cause of climate crisis in the natural earth cycle (β = -.19, p = .001) predicted less eco-guilt. Environmental nostalgia (β = .44, p < .001) positively predicted eco-guilt. Age and corporate responsibility were not significant predictor variables.
Kotera et al (2024)	**The Experience of Climate Change Scale (ECCS)** (Clayton & Karazsia, 2020) **Demographic variables:** Number of children, age **Behavioural Engagement Scale** (Clayton & Karazsia, 2020)	**Eco- Anxiety:** Climate change anxiety Scale (CCAS) (Clayton & Karazsia, 2020)	Experience of climate change and behavioural engagement were positive predictors of cognitive-emotional aspects of eco-anxiety. Experience of climate change was also a positive predictor of functional impairment. Number of children and age were non-significant predictor variables.
Kühner et al (2024)	**Values:** Hedonic, egoistic, altruistic, biospheric values **Pro-environmental behaviours** **Demographic variables:** Age, gender, education	**Eco-Anxiety:** Climate change anxiety Scale (CCAS) (Clayton & Karazsia, 2020)	Pro-environmental behaviours (β = .16, p < .001), hedonic values (β -.05, p =.03) and age (β -.05, p = .02) predicted eco-anxiety. Pro-environmental behaviours predicted greater ego distress. Those who were younger experienced more eco-anxiety and stronger hedonic values predicted less eco-anxiety.

			No other values predicted eco-anxiety. Gender and education were non-significant predictor variables.
Li et al (2025)	**Green space** - Normalised difference vegetation Index (NDVI), forest cover, perceived green space and tree visibility from windows. **Green physical activity** - walking or leisurely activity in green space in the last month **Extreme weather events** – perception of frequency **Environmental comfort** – **1 item**	**Eco-Anxiety:** Climate change anxiety Scale (CCAS) (Clayton & Karazsia, 2020)	Environmental comfort negatively predicted eco-anxiety (less comfort predicted greater eco-anxiety). Extreme weather perception positively predicted functional impairment. No other predictor variables were significant.
Maduneme (2024)	**Attention to climate change news** – 1 item "*Typically, how attentive or inattentive are you to information about climate change?"* **Frequency of exposure to climate change news** - a 13-item scale of different media mediums	**Eco- Anxiety:** Climate change anxiety Scale (CCAS) (Clayton & Karazsia, 2020)	Frequency of media use (β =.05, $p < .01$) and attention given to climate change news (β =.29, $p < .01$) were positive predictors of climate anxiety. Political affiliation, level of education, and gender were significant covariates in the model. Left wing affiliation, women and lower levels of education predicted greater eco-anxiety.
Mat & Yilmaz (2024)	**University Students' Awareness for Global Climate Change Scale (USAGCC) –** 21 item measure developed by authors.	**Eco-Anxiety:** Hogg Eco-Anxiety Scale (Hogg et al., 2021)	Climate change awareness was a positive predictor of eco-anxiety ($\beta = 0.23$, $p < 0.001$).
Ogunbode et al (2022)	**Descriptive norms -** four items measuring perception of norms related to climate change responses (e.g., "most people close to me are worried about the future effects of climate change") **Experience of flooding** – within the last 5 years	**Eco-Anxiety:** Climate state anxiety - a 7-item scale based on the state anxiety component of the State-Trait Anxiety Inventory (Spielberger, 1983).	Exposure to media about climate change impacts, attention to media and descriptive norms were positive predictors of eco-anxiety.

	Media exposure - frequency of reading/hearing about climate change impacts solutions **Attention to Climate related media** - 4-point scale ranging from 'none' to 'a lot' **Demographic variables -** Age and gender		Age and gender were predictors of eco-anxiety in that being younger and female predicted higher levels of eco-anxiety. Experience of flooding and exposure to media about climate change solutions were not significant predictor variables.
Parmentier et al (2024)	**Eco-worry –** Eco-Worry Scale, 5 item measure developed by authors **Environmental Crisis perceptions -** Environmental Crisis Perception Scale (EC perception scale), a 9-item scale developed by authors **Trait anxiety -** 20-item Spielberger Trait Anxiety Scale (STAI-Y) Spielberger et al., 1983)	**Eco- Anxiety:** Climate change anxiety Scale (CCAS) (Clayton & Karazsia, 2020)	Worry about the environment and trait anxiety were positive predictors of eco-anxiety. Environmental crisis perception was not a significant predictor variable.
Patrick et al (2023)	**Demographic variables -** Gender; Age; Location – location provided was then mapped onto the Australian Bureau of Statistics remoteness areas (Modified Monash Model MMM–ABS, 2019) and socio-economic index for areas (SEIFA–ABS, 2016). **Experience of a climate change**–1 item with bushfire, flood and heat waves as examples. Yes/no response.	**Eco- Anxiety:** Climate change anxiety Scale (CCAS) (Clayton & Karazsia, 2020)	Age, exposure to climate change and level of social disadvantage in an area predicted eco-anxiety, with younger age groups, those who had been exposed to climate change (compared to those who hadn't) and more disadvantaged areas being more likely to experience eco-anxiety. Regional areas was not a significant predictor variable and gender was non-significant when controlling for other variables.
Prencipe et al (2023)	**Demographic variables -** Age, Gender, region **Socio-cultural variables -** Education; Marital status and frequency of attending a religious service.	**Eco-Distress**; 1 item measure - "*How distressed, if at all, are you about changing weather patterns (eg, increases in heat, rain) or changing*	Climate change awareness and working in extreme temperatures were positive predictors of eco-distress. Climate change distress was higher among those who were higher educated and females, however,

	Awareness of climate change - a Gallup World Poll survey item;"How much do you know about global warming or climate change?" **Climate-sensitive risk factors:** Livelihood activities (e.g. farming, working in extreme temperatures) in the last 7 days. Exposures to floods, droughts and crop/livestock disease in the last 12 months. **Water insecurity** - four-item Household Water Insecurity Experiences (HWISE-4) (Young et al., 2021) **Food insecurity** - Household Food Insecurity Access Scale (HFIAS) (Coates et al., 2007) and number of meals usually eaten per day.	*seasons (eg, length of agricultural season)*?"	when adjusting for other variables, these became non-significant. After controlling for climate change awareness, region and religiosity remained salient predictors. Other climate sensitive risk factors, water insecurity and food insecurity were not significant predictor variables.
Ramírez-López et al (2023)	**Demographic variables** – Age and gender **Media exposure** - how much time per day participants spend on social media and news. **Climate Change Knowledge –** a selection of questions from The Washington Post quiz (2020; 2019). **Pro-sociality Scale** (Wilson et al, 2009) **Altruism** - Dichotomic Altruism Game - Participants make hypothetical donations with five levels of familiarity	**Eco- Anxiety:** Climate change anxiety Scale (CCAS) (Clayton & Karazsia, 2020)	Gender, exposure to news, knowledge about climate change, pro-sociality and altruism positive predictors of eco-anxiety. Age and exposure to social media were not significant predictor variables.
Reese et al (2023)	**Climate risk perception** - a nine-item risk perception scale (Leiserowitz, 2006)	**Eco- Anxiety:** Climate change anxiety Scale (CCAS) (Clayton & Karazsia, 2020)	Climate risk perception ($\beta = .3$, $p < 0.001$), and age ($\beta = -.16$, $p < 0.05$) predicted eco-anxiety, in that greater risk perception predicted increased eco-anxiety and younger age predicted higher eco-anxiety.

	Connectedness to nature – 12 item measure (Mayer et al.,2009) **Self-efficacy** - 4 item measure (Heath and Gifford, 2006) **Political orientation** - left–right dimension measure (Wullenkord et al., 2021), using a slider-bar ranging from 0 (left) to 100 (right).		Connectedness to nature, self-efficacy beliefs and political orientation were not significant.
Smith et al (2023)	**Nature relatedness** - Nature relatedness scale. NRS (Nisbet et al., 2009) with three subscales: NR-self, NR-perspective and NR-experience. **Connectedness to nature -** Connectedness to Nature Scale (Mayer & Frantz, 2004), 17 item measure of the extent to which an individual feels a part of the natural world **Pro-environmental self-identity** -Pro-Environmental Self-Identity Scale (PESI; Whitmarsh & O'Neill, 2010) is a 6-item measure	**Eco- Anxiety:** Climate change anxiety Scale (CCAS) (Clayton & Karazsia, 2020) **Solastalgia** - The solastalgia subscale of the Environmental Distress Scale (Higginbotham et al., 2006), 9-item self-report measure	NR-perspective, connectedness to nature, Pro-environmental self-identity positively predicted the cognitive-emotional impairment subscale of eco-anxiety scores and NR-experience negatively predicted it. Pro-environmental identity positively predicted the functional impairment subscale of eco-anxiety scores. NR-self and NR-experience negatively predicted functional impairment. NR-self, NR-perspective, connectedness to nature and pro-environmental self-identity positively predicted solastalgia.
Tucholska (2024)	**Personality traits -** Big Five Inventory–short version (BFI-S) **Time perspective** - Zimbardo Time Perspective Inventory (ZTPI) - Zimbardo and Boyd (1999) a15-item measure.	**Eco- Anxiety:** Climate change anxiety Scale (CCAS) (Clayton & Karazsia, 2020) **Eco-Distress:** Climate emotion scale (CES) based on Climate Change Distress by Searle and Gow (2010)	Traits in openness and present hedonistic time perspective positively predicted eco-anxiety. Conscientiousness negatively predicted eco-anxiety. Past positive time perspective was negatively predictive of functional impairment. Neuroticism positively predicted cognitive-emotional impairment.

Whitmarsh et al (2022)	**Climate change concern** – 1 item (Poortinga et al., 2018) **General anxiety -** GAD-7 (Spitzer et al., 2006) **Mindfulness -** FFMQ-18 (Medvedev et al., 2018) **Environmental values -** Short version of the New Environmental Paradigm (NEP) scale (Dunlap et al., 2000) **Nature relatedness -** NR-6 (Nisbet & Zelenski, 2013) **Visits to green space** – frequency in the last week **Experience of climate impacts –** Flooding in the past 5 years **Information exposure -** '*How often do you come across information about climate change'* from a list of sources. **Information seeking -** frequency in a week	**Eco- Anxiety:** Climate change anxiety Scale (CCAS) (Clayton & Karazsia, 2020)	Climate change concern (β = .19, p < .001), GAD (β = .11, p < .001), Nature relatedness (β = .14, p .001), information exposure (β = .06, p = .02) and information seeking (β = .28, p <.001) positively predicted eco-anxiety. Mindfulness scores (β = -.12, p < .001), environmental values (β = -.25, p < .001) and age (β = -.07, p = .04) negatively predicted eco-anxiety. Visits to green space and exposure to flooding were not significant predictors.
Wullenkord et al (2024)	**Nature connectedness –** 1 item (Schultz, 2001) **Cumulative social stressors –** perceived greenery in the area, location, low education, unemployment and low income **Demographic variables** – age and gender	**Eco-Anxiety:** A combination of the these three measures were used: **Climate-anxious affect** – measure based on State-Trait Anxiety Inventory (Spielberger, 1983) German version of **CCAS** (Clayton & Karazsia, 2020; Wullenkord et al., 2021) **Climate-anxious appraisal** – three item measure developed by authors	Higher nature connectedness predicted greater eco-anxiety. Gender and age also predicted eco-anxiety, in that males and younger individuals were more likely to experience higher levels of eco-anxiety. Cumulative stressors did not predict eco-anxiety.

Zacher & Rudolph (2023)	**Environmental Knowledge -** A 35-item multiple-choice environmental knowledge test (Geiger et al., 2019) **Personality traits -** 21-item Big Five Inventory (Rammstedt and John 2005) **Environmental attitudes** – Environmental Attitudes Scale (Bamberg 2003) **Demographic variables** (control) – age, gender, education	**Eco- Anxiety:** Climate change anxiety Scale (CCAS) (Clayton & Karazsia, 2020)	Environmental knowledge negatively predicted eco-anxiety in that more knowledge predicted less eco-anxiety. Consciousness and neuroticism negatively predicted eco-anxiety, whereas openness positively predicted eco-anxiety Environmental attitudes, age, gender and education predicted eco-anxiety. Males, young and highly educated individuals were more likely to have higher levels of eco-anxiety.

Notes. Where authors reported standardised coefficients, these were included in the table. Hajek and Konig used the same sample across the two papers which is indicated with (a) and (b), Jaśkiewicz (2023) had two studies with different predictors which is denoted by 2023a and 2023b

3.3.1 Exposure to climate change events

Twelve studies explored whether experience of climate change related events predicted eco-distress (Table 4). Eight studies found that experience of climate change events was a significant predictor variable, however findings tended to vary according to which type of event was explored or how it was measured.

Five studies found that exposure to climate related events was a significant positive predictor of eco-distress when measured with questions asking about experience of climate events generally (Asgarizadeh et al., 2023; Chan et al., 2024; Kotera et al., 2024; Li et al., 2025; Patrick et al., 2023). However, one did not (Cameron & Kagee, 2025).

Two studies investigated pollution and found different results; Anneser et al. (2024) measured objective levels of pollution exposure, finding this did not predict eco-anxiety, whereas Baskaya et al. (2024) measured perceived pollution levels and found this did predict eco-anxiety.

Three studies looked at heatwaves specifically, with two finding that heatwaves were a predictor (Bratu et al., 2022; Prencipe et al., 2023) and one did not (Anneser et al., 2024).

Three studies explored flooding, however none of these studies found that flooding was a significant predictor variable (Ogunbode et al., 2022; Prencipe et al., 2023; Whitmarsh et al., 2022).

There is some evidence that exposure to climate related events may predict eco-distress, especially when measured generally. The general finding was that experience of climate change events increased eco-distress. However, there is less evidence for flooding or pollution as potential predictors.

Table 4

Exposure to climate change events as a potential predictor of eco-distress

Study	Study design	Eco-distress	Bias
General climate change events			
Asgarizadeh et al. (2023)	Cross-sectional	▲	33%
Cameron & Kagee (2025)	Cross-sectional	▲	27%
Chan et al. (2024)	Cross-sectional	▲	25%
Kotera et al. (2024)	Cross-sectional	▲	28%
Li et al. (2025)	Cross-sectional	▲	32%
Patrick et al (2023)	Cross-sectional	▲	17%
Pollution			
Anneser et al. (2024)	Prospective	▲	12%
Baskaya et al (2024)	Cross-sectional	▲	17%
Heatwaves			
Anneser et al (2024)	Prospective	▲	12%
Bratu et al. (2022)	Natural experiment	▲	17%
Prencipe et al. (2023)	Cross-sectional	▲	22%
Flooding			
Ogunbode et al (2022)	Cross-sectional	▼	19%
Prencipe et al. (2023)	Cross-sectional	▲	22%
Whitmarsh et al. (2022)	Cross-sectional	▲	19%

Notes. Grey indicates non-significance.

Effect direction: upward arrow ▲= increases eco-distress, downward arrow ▼= decreases eco-distress.

Sample size: Final sample size: Large arrow ▲ >500; medium arrow ▲ 250-500; small arrow ▲ <250.

Quality assessment: between 0 and 33% indicates low bias; between 33 and 66% indicates moderate bias; and between 66 and 100% indicates high bias.

3.3.2 Beliefs, perceptions and values

Ten studies investigated the role of beliefs and perceptions about the climate crisis as potential predictors of eco-distress (Table 5). Nine of the ten studies found that at least one measure of belief, perception or values predicted eco-distress. However, the beliefs and perceptions that were explored varied across studies.

Four studies explored whether climate risk perception (i.e. beliefs that the climate crisis is happening and is a threat) predicted eco-distress. Three studies found that this was a predictor of eco-distress (Chan et al., 2024; Hajek & Konig, 2024; Reese et al., 2023), however one did not (Paramentier et al., 2024).

The impact that climate risk perception has on distress may be mitigated by a belief of being able to effectively respond (efficacy beliefs). However, two studies explored efficacy beliefs as predictors of eco-distress and neither found they were consistent predictor variables (Chan et al., 2024; Jackiewicz et al. 2023).

Perceptions of responsibility in relation to the cause of the climate crisis, and whose responsibility it is to respond to the climate crisis, were also explored as potential predictors of eco-distress. Jackiewicz et al (2023b) found that perceiving the climate crisis as the responsibility of politicians predicted greater eco-distress, perceiving the climate crisis as part of the natural earth cycle predicted less eco-distress, and the perception of climate crisis being a collective responsibility was not associated with eco-distress. Seeing the climate crisis as the responsibility of politicians is shaped by political beliefs (Cruz, 2017). Political beliefs were explored by two studies; Maduneme (2024) and Anneser et al. (2024) found that political beliefs were a positive predictor of eco-distress, whereas Reese et al (2023) did not find it was a significant predictor variable.

Beliefs are shaped by values, which are trans-situational guiding principles of one's life (Schwartz et al., 2022). Four studies explored whether values predicted eco-distress and all found that at least one measure of values was a significant predictor variable (Cameron & Kagee, 2025; Chan et al., 2024; Kühner et al., 2024; Whitmarsh et al., 2022). Whitmarsh et al (2022) found that environmental values were inversely related to eco-distress whereas Cameron & Kagee (2025) found the opposite effect. Chan et al (2024) and Kühner et al (2024) both found that hedonistic values predicted less eco-distress, however, did not find that egoistic values, social-altruistic values or biospheric values were consistent predictors of eco-distress.

Overall, beliefs, perceptions and values seem to be potential predictors of eco-distress, although it appears to depend on the beliefs or values explored.

Table 5

Beliefs, perceptions and values as potential predictors of eco-distress

Study	Study design	Eco-distress	Bias
Climate risk perception			
Chan et al. (2024)	Cross-sectional	▲	25%
Hajek & Konig (2024)	Cross-sectional	▲	25%
Reese et al. (2023)	Cross-sectional	▲	33%
Parimentier et al. (2024)	Cross-sectional	▼	22%
Efficacy beliefs			
Chan et al. (2024)	Cross-sectional	◀▶	25%
Reese et al (2023)	Cross-sectional	▼	33%
Political beliefs (left wing)			
Jackiewicz et al. (2023b) †	Cross-sectional	▲	36%
Anneser et al. (2024)	Prospective	▲	12%
Maduneme (2024)	Cross-sectional	▲	17%
Reese et al. (2023)	Cross-sectional	▲	33%
Values			
Cameron & Kagee (2025)	Cross-sectional	▲	27%
Chan et al (2024)	Cross-sectional	▼	25%
Kühner et al (2024)	Longitudinal	▼	12%
Whitmarsh et al. (2022)	Cross-sectional	▼	19%

Note. Grey indicates non-significance
Effect direction: upward arrow ▲= Increases eco-distress, downward arrow ▼= decreases eco-distress, sideways arrow ◀▶= no change/mixed effects/conflicting findings.

Sample size: Final sample size: Large arrow ▲ >500; medium arrow ▲ 250-500; small arrow ▲ <250
Quality assessment: between 0 and 33% indicates low bias; between 33 and 66% indicates moderate bias; and between 66 and 100% indicates high bias.
†Beliefs around politician's responsibility rather than left-right orientation

3.3.3. Relationship to nature

Eight studies explored relationship to nature either in terms of attitudes, exposure or connection to nature. Six studies found that the relationship to nature was a significant predictor variable (Table 6).

Connectedness to nature was the most explored (n =6). Five found that connectedness to nature was a predictor of eco-distress (Eco-anxiety – Cameron & Kagee, 2025; Whitmarsh et al.,

2022; Wullenkord et al, 2024; Eco-guilt - Jaśkiewicz et al. 2023a; solastalgia – Smith et al., 2023). Reese et al (2023) did not find that connectedness to nature was a significant predictor.

Four studies explored access to greenness or visits to green spaces as a predictor of eco-distress (Anneser et al., 2024; Cameron & Kagee, 2025; Li et al., 2025; Whitmarsh et al., 2022) and none of the studies found it was a significant predictor.

Jaskiewicz et al. (2023) explored whether social dominance orientation predicted eco-distress, if you are high in social dominance orientation you perceive nature as something to dominate. They found that social dominance orientation was a predictor of eco-distress in that higher scores in social dominance predicted less eco-distress.

Overall, these findings suggest that the relationship to nature may be a predictor of eco-distress with the most evidence for connectedness to nature rather than exposure to nature.

Table 6

Relationship to nature as a potential predictor of eco-distress

Study	Study design	Eco-distress	Bias
Connectedness to Nature			
Cameron & Kagee (2025)	Cross-sectional	▲	27%
Jaśkiewicz et al. (2023a)	Cross-sectional	▲	36%
Reese et al (2023)	Cross-sectional	▲	33%
Smith et al. (2023)	Cross-sectional	▲	25%
Whitmarsh et al. (2022)	Cross-sectional	▲	19%
Wullenkord et al (2024)	Cross-sectional	▲	8%
Exposure to nature/greenness			
Anneser et al. (2024)	Prospective	▼	12%
Cameron & Kagee (2025)	Cross-sectional	▲	27%
Li et al. (2025)	Cross-sectional	▼	32%
Whitmarsh et al. (2022)	Cross-sectional	▲	19%
Social dominance orientation			
Jaśkiewicz et al. (2023a)	Cross-sectional	▼	36%

Note. Grey indicates non-significance

Effect direction: upward arrow ▲= Increases eco-distress, downward arrow ▼= decreases eco-distress

Sample size: Final sample size: Large arrow ▲ >500; medium arrow ▲ 250-500; small arrow ▲ <250

Quality assessment: between 0 and 33% indicates low bias; between 33 and 66% indicates moderate bias; and between 66 and 100% indicates high bias.

3.3.4 Other forms of distress

Seven studies explored other forms of distress as predictors of eco-distress. All studies found that the other forms of distress were predictors of eco-distress however the studies explored different types of distress as predictors (Table 7).

Six of the seven studies explored whether other forms of anxiety predicted eco-distress, and found anxiety was a positive predictor of eco-distress (Generalised Anxiety Disorder - Asgarizadeh et al., 2023; Cameron & Kagee, 2025; Jalin et al., 2024; Whitmarsh et al., 2022; trait anxiety - Parmentier et al., 2024; anxiety about covid and war – Hajek & Konig, 2022)

Similarly, four studies explored concepts related to eco-anxiety, and found they were predictors of eco-distress. Two studies found that concern about environmental issues was a positive predictor (Feather & Williams, 2022; Whitmarsh et al., 2022) and two studies found eco-worry was also a positive predictor (Asgarizadeh et al. 2023; Parmentier et al., 2024).

Two of the studies explored whether low mood was a predictor of eco-distress, with one study finding it was a positive predictor (Jalin et al., 2023) and another study finding it was not a significant predictor variable (Cameron & Kagee, 2025).

Two of the studies found that transdiagnostic processes that have been found to impact distress generally, predicted eco-distress (Mindfulness – Whitmarsh et al., 2022; Psychological inflexibility – Feather and Williams, 2022).

Together these findings suggest that other forms of distress may be potential predictors of eco-distress. There is most evidence for other forms of anxiety predicting greater eco-distress.

Table 7

Other forms of distress as potential predictors of eco-distress

Study	Eco-distress	Bias
Other forms of anxiety		
Asgarizadeh et al. (2023)	▲	33%
Cameron & Kagee (2025)	▲	27%
Hajek & Konig (2022)	▲	25%
Jalin et al. (2024)	▲	28%
Parmentier et al. (2024)	▲	22%
Whitmarsh et al. (2022)	▲	19%
Environmental concern/eco-worry		
Asgarizadeh et al. (2023)	▲	33%
Cameron & Kagee (2025)	▲	27%
Feather & Williams (2022)	▲	19%
Jalin et al. (2024)	▲	28%
Parmentier et al., 2024	▲	22%
Whitmarsh et al. (2022)	▲	19%
Low mood		
Cameron & Kagee (2025)	▼	28%
Jalin et al. (2024)	▲	27%
Transdiagnostic processes		
Feather and Williams (2022)	▲	19%
Whitmarsh et al. (2022)	▼	19%

Note. Grey indicates non-significance. All studies were cross-sectional

Effect direction: upward arrow ▲= Increases eco-distress, downward arrow ▼= decreases eco-distress

Sample size: Final sample size: Large arrow ▲ >500; medium arrow ▲ 250-500; small arrow ▲ <250

Quality assessment: between 0 and 33% indicates low bias; between 33 and 66% indicates moderate bias; and between 66 and 100% indicates high bias.

3.3.5 Media exposure

Seven studies explored media exposure to information about the climate crisis as a predictor of eco-distress. All seven found that some aspect of media exposure was a significant predictor of eco-distress (Table 8). Different aspects of media exposure that were explored included frequency, level of attention and information seeking.

Five studies found that more frequent media exposure to information about the climate crisis predicted greater eco-distress (Jalin et al., 2024; Maduneme, 2024; Ogunbode et al., 2022;

Ramirez-Lopez, 2023; Whitmarsh et al., 2022). However, Cameron & Kagee (2025) did not find media exposure frequency was a significant predictor variable.

Two studies found that information seeking behaviour was a positive predictor of eco-distress, with greater information seeking behaviours leading to greater eco-distress (Cameron & Kagee, 2025; Whitmarsh et al., 2022).

In addition to actively seeking information through media, another factor that may be important to consider is the level of attention an individual pays to the content they are exposed to. Two studies found that attention to media was a predictor of eco-distress (Maduneme, 2024; Ogunbode et al., 2022).

These findings suggest information exposure through media is a potential predictor of eco-distress. There appear to be different aspects of exposure that are important such as the frequency of exposure, the level of attention and how actively a person seeks this information.

Table 8

Media exposure as a predictor variable

Study	Eco-distress	Bias
Asgarizadeh et al. (2023)	▲	33%
Cameron & Kagee (2025)	▲	27%
Jalin et al. (2024)	▲	28%
Maduneme (2024)	▲	17%
Ogunbode et al. (2022)	▲	19%
Ramirez-Lopez (2023)	▲	22%
Whitmarsh et al. (2022)	▲	19%
Cameron & Kagee (2025)	▲	27%
Whitmarsh et al. (2022)	▲	19%
Maduneme (2024)	▲	17%
Ogunbode et al. (2022)	▲	19%

Note. Grey indicates non-significance. All studies were cross-sectional

Effect direction: upward arrow ▲= Increases eco-distress, downward arrow ▼= decreases eco-distress

Sample size: Final sample size: Large arrow ▲ >500; medium arrow ▲ 250-500; small arrow ▲ <250

Quality assessment: between 0 and 33% indicates low bias; between 33 and 66% indicates moderate bias; and between 66 and 100% indicates high bias.

3.3.6 Knowledge and awareness of the climate crisis

Six studies investigated knowledge or awareness of climate change as a potential predictor of eco-distress (Table 9). All six studies found these factors predicted eco-distress, however there was a difference in the direction of the effects.

Three studies (Eren & Yildiz, 2024; Mat & Yilmaz, 2024; Prencipe et al, 2023) found that climate change awareness was a positive predictor of eco-distress; the more aware of climate change people are, the more distressed they become.

These studies all used subjective measures with participants rating their awareness rather than objective measures of knowledge. Three studies explored knowledge about climate change measured by the number of correct answers on a quiz about climate change and found it was a predictor of eco-distress. Asgarizadeh et al (2023) and Zacher and Rudolph (2023) found that knowledge was inversely related to eco-distress. As knowledge increased, eco-distress decreased. Conversely, Ramírez-López et al (2023) found the opposite effect in that knowledge of climate change predicted higher levels of eco-distress.

Together these findings suggest that awareness and knowledge about climate change are potential predictors of eco-distress. However, there are mixed findings in terms of whether it increases or decreases eco-distress.

Table 9

Awareness and knowledge of climate change as a potential predictor of eco-distress

Study	Study design	Eco-distress	Bias
Awareness of climate change			
Eren & Yildiz (2024)	Cross-sectional	▲	17%
Mat & Yilmaz (2024)	Cross-sectional	▲	14%
Prencipe et al (2023)	Cross-sectional	▲	22%
Knowledge of climate change			
Asgarizadeh et al (2023)	Cross-sectional	▼	33%
Ramírez-López et al (2023)	Cross-sectional	▲	28%
Zacher and Rudolph (2023)	Longitudinal	▼	19%

Notes. Grey indicates non-significance.

Effect direction: upward arrow ▲= increases eco-distress, downward arrow ▼= decreases eco-distress. Sample size: Final sample size: Large arrow ▲ >500; medium arrow ▲ 250-500; small arrow ▲ <250. Quality assessment: between 0 and 33% indicates low bias; between 33 and 66% indicates moderate bias; and between 66 and 100% indicates high bias.

3.3.7 Character and personality traits

Three studies explored the role of character or personality traits in predicting vulnerability to eco-distress (Ramirez-Lopez et al., 2023; Tucholska, 2024; Zacher & Rudolph, 2023). All three studies found that some personality traits were a significant predictor of eco-distress (Table 10). However, there was variance in the direction of the effect of some personality traits, such as neuroticism. Taken together, there is some evidence, albeit limited, that personality traits may predict eco-distress.

Table 10

Character and personality traits as potential predictors of eco-distress

Study	Study design	Predictor Variable	Eco-distress	Bias
Ramirez-Lopez et al (2023)	Cross-sectional	Pro-sociality	▼	22%
		Altruism	▲	
Tucholska (2024)	Cross-sectional	Openness	▲	39%
		Neuroticism	▲	
		Conscientiousness	▼	
Zacher and Rudolph (2023)	Longitudinal	Extraversion	▲	19%
		Agreeableness	▼	
		Conscientiousness	▼	
		Neuroticism	▼	
		Openness	▲	

Notes. Grey indicates non-significance. Effect direction: upward arrow ▲= increases eco-distress, downward arrow ▼= decreases eco-distress. Sample size: Final sample size: Large arrow ▲ >500; medium arrow ▲ 250-500; small arrow ▲ <250. Quality assessment: between 0 and 33% indicates low bias; between 33 and 66% indicates moderate bias; and between 66 and 100% indicates high bias.

3.3.8 Demographics

Although this review was not focusing on group differences, over half of the included studies explored demographic variables as predictor variables (n = 14). The most common demographic variables reported on were gender and age.

Gender. Twelve studies explored gender as a predictor variable. Six studies found that gender was a significant predictor variable. Of these studies, four found that women were more vulnerable to eco-distress (Jalin et al., 2024; Jaśkiewicz et al. 2023b; Ogunbode et al., 2022; Ramírez-López et al., 2023). Two found the opposite effect that men had more eco-anxiety in their sample (Wullenkord et al., 2024; Zapher & Rudolph, 2023). However, six studies also found gender was a not

a significant predictor variable (Hajek & Konig, 2022; Kotera et al., 2024; Patrick et al., 2023; Prencipe et al., 2023; Reese et al., 2023; Whitmarsh et al., 2022) when controlling for other variables.

Age. Thirteen studies explored age as a predictor of eco-distress. Age was found to be a significant predictor variable in eight studies (Hajek & Konig, 2022; Kühner et al., 2024; Ogunbode et al., 2022; Patrick et al., 2023; Reese et al., 2023; Whitmarsh et al., 2022; Wullenkord et al., 2024; Zacher & Rudolph, 2023). They all found that those who were younger in age had greater eco-distress. However, five studies did not find age was a significant predictor (Baskaya et al., 2024; Jaśkiewicz et al., 2023b; Kotera et al., 2024; Ramírez-López et al., 2023).

Socioeconomic status. Nine studies investigated socio-economic status as a predictor of eco distress. Five found proxies of socioeconomic status were significant predictor variables (Education - Jalin et al., 2024; Prencipe et al., 2023; Zacher & Rudolph, 2023, Employment status - Hajek & Konig, 2022, Living in a disadvantaged area – Patrick et al., 2023) with higher education, those in employment and living in a disadvantaged area being more vulnerable to eco-distress. However, five studies did not find an association between proxies of socio-economic status and eco-distress (Education - Baskaya et al., 2024; Hajek & Konig, 2022, Kühner et al., 2024; Income – Whitmarsh et al., 2022; Social/Financial stressors – Wullenkord et al., 2024).

Health status. Two studies found that health status was a predictor of eco distress. Baskaya et al (2024) found that allergy status predicted lower levels of eco-distress. Hajek and Konig (2022) found that those without a chronic health condition were more likely to experience eco-distress.

Geographical factors. Ogunbode et al (2022) and Chan et al (2024) explored eco-distress in different countries, they both found some effect of country though the study by Chan and colleagues also found similarities across countries. For studies that were conducted within a single country, region was explored (rural/remoteness vs city). Two studies found region remoteness versus city was not a significant predictor (Baskaya et al., 2024; Patrick et al., 2023) however Prencipe et al. (2023) found it was a significant predictor variable.

Family composition. Four studies found that family composition (marital status, parental status) was not a predictor of eco-distress (Baskaya et al., 2024; Hajek & Konig, 2022; Kotera et al., 2024; Prencipe et al., 2023), however Jalin et al (2024) found that parental status was a significant predictor of eco-distress.

Taken together, the evidence for demographic factors as predictors is largely inconsistent, meaning it is difficult to identify who may be a vulnerable group based on demographic factors alone.

4. Discussion

This review aimed to examine what factors contributed to the development of eco-distress and the potential predictors. The review highlights that eco-distress is a complex phenomenon with a range of multifaceted influencing factors. The potential predictors of eco-distress that have been explored ranged from exposure to climate events, beliefs about the climate crisis, relationship to nature, other forms of distress, media exposure, knowledge and awareness of climate change, personality traits and demographic variables. However methodological limitations mean these findings should be interpreted with caution and preclude definitive conclusions about the predictive validity of these factors over time.

4.1 Summary of findings

There was some evidence that exposure to climate related events could be a predictor of eco-distress. However, it seemed to depend on the type of event explored, whether the study used subjective or objective measures of the events and whether measures explicitly related these events to the climate crisis. Studies that used subjective measures that asked specifically about climate change such as 'I have been directly impacted by climate change' (Asgarizadeh et al., 2023; Chan et al., 2024; Kotera et al., 2024) found it was associated with greater eco-distress. Whereas objective measures did not (Anneser et al., 2024).

When exploring exposure to specific climate events without reference to climate change, findings varied. For example, there was evidence that heatwaves increased eco-distress regardless of whether it was explicitly related to climate change (Bratu et al., 2022), whereas flooding was not found to be a predictor (Ogunbode et al., 2022; Prencipe et al., 2023; Whitmarsh et al., 2022). Whether people associate these experiences with the climate crisis may be why there are different findings. This fits with the cognitive model of distress (Beck et al., 1985; Clarke & Beck, 2010), that conceptualises that it is the meaning attributed to an event that heightens distress and highlights the potential role of beliefs about climate change in predicting eco-distress.

The influence of beliefs on eco-distress was further highlighted by studies that explored beliefs, perceptions or values as predictors of eco-distress. While most studies found evidence of beliefs or values as predictors of eco-distress, the beliefs explored varied, and there were only a few studies that explored the same beliefs or values, with the exception to this was climate risk perception. Even then, this was conceptualised differently across studies with Hajek & Konig (2024) measuring belief in science generally rather than belief in the legitimacy of climate change. However, the studies do suggest further research into the role of specific beliefs is warranted.

Similarly, although overall the studies suggest that values may be a potential predictor of eco-distress, there was variety in the values explored. Some value systems did predict eco-distress,

such as hedonic values predicting less eco-distress. The lack of evidence for biospheric and social-altruistic values is surprising, however these studies didn't measure the extent to which people were behaving or living according to their values. As values-based living has been associated with better psychological well-being (Gregoire et al., 2021), if those with biospheric or social-altruistic values are behaving in line with their values, such as engaging in pro-environmental beliefs, this may mitigate distress. Indeed, pro-environmental behaviour has been found to be a buffer to eco-distress (Schwartz et al., 2022). This highlights that another helpful research endeavour would be to explore circumstances in which beliefs and values contribute to eco-distress. Indeed, as beliefs and values are shaped by culture (Tam & Chan, 2017) it may be that in some cultures beliefs and values are less likely to contribute to distress. For example, in one of the papers in the review some of the inconsistent findings was due to the difference in cultures explored (Chan et al., 2024).

In addition to beliefs and values, there is evidence for the relationship to nature as a potential predictor of eco-distress, although there was more evidence for connectedness to nature than exposure to nature. Of the studies that explored connectedness to nature, most found greater connection to nature increased eco-distress (Cameron & Kagee, 2025; Jaśkiewicz et al. 2023a; Smith et al., 2023; Whitmarsh et al., 2022; Wullenkord et al., 2024). With only one study finding no association (Reese et al., 2023). This is particularly striking considering that increasing nature connectedness and interaction with nature has been found to decrease distress more generally (Chavaly & Naachimatheen, 2020; Yao et al., 2021). However, it is perhaps unsurprising that connection to nature would increase eco-distress as the thing one has a meaningful connection with is undergoing a process of degradation. These findings are at odds with suggestions of encouraging engagement with nature in constructively managing eco-distress (Baudon & Jachens, 2021).

Other forms of distress was a fairly consistent predictor across studies, especially measures of other forms of anxiety (Asgarizadeh et al., 2023; Cameron & Kagee, 2025; Hajek & Konig, 2022; Jalin et al., 2024; Parmentier et al., 2024; Whitmarsh et al., 2022). Findings that psychological inflexibility was associated with greater eco-distress (Feather & Williams, 2022) and mindfulness was inversely associated with eco-distress (Whitmarsh et al., 2022) complement each other as mindfulness is a way to increase psychological flexibility (Russ, 2019). However, Feather and Williams (2022) found that psychological flexibility did not moderate the relationship between concern and eco-distress meaning it is unclear whether psychological flexibility lessens eco-distress. All of the studies exploring other forms of distress as a predictor variable only investigated this in relation to eco-anxiety meaning it is unclear whether these predictors relate to other forms of eco-distress. However, as transdiagnostic processes are theorised and evidenced to be involved in multiple manifestations of distress (Schaeuffele et al., 2021), it may be that these factors are important in contributing to the development of other forms of eco-distress too. However, further research would be needed to verify this.

Exposure to information about the climate crisis through media emerged as a consistent potential predictor of eco-distress in terms of frequency of exposure, actively seeking information through media, and the level of attention, with only one study finding that frequency of exposure was not a predictor (Cameron & Kagee, 2025). However, this was only in their final model, when exploring experiential factors alone they found it was a significant predictor. Again, all the studies investigating the role of media exposure only used measures of eco-anxiety, so it is unclear whether media exposure is a predictor of other forms of distress. Further, it is unclear is whether the impact of media exposure on eco-distress is due to emotive and sensationalizing nature of the media or the information about climate change. The form of media may influence how the information is communicated which in turn may influence the level of distress (Loll et al., 2023). Of the studies in the review, only Ramirez-Lopez et al (2023) explored type of media and found exposure to the news was a predictor, but exposure to social media was not. However, the study explored exposure to media generally rather than exposure to media about the climate crisis specifically. Further research could explore whether the type of media influences eco-distress and whether it is how the information is communicated or the information itself that is distressing.

The studies in this review did provide some insight into the role of information or knowledge on eco-distress. The findings suggest that subjective ratings of awareness of climate change were associated with higher eco-distress (Eren & Yildiz 2024; Mat & Yilmaz, 2024; Prencipe et al., 2023). Conversely, accurate knowledge was inversely related to eco-distress (Asgarizadeh et al., 2023; Zacher & Rudolph, 2023). Having accurate information may help people feel prepared or give a realistic account of the threat, providing a sense of cognitive control (Clayton, 2022). However, there was some discrepancy in the findings, as Ramirez-Lopez et al (2023) found that knowledge was positively associated with eco-distress. The difference may be due to the study by Ramirez-Lopez and colleagues using a college student sample so participants may have received similar levels of information about climate change from their college institution, increasing the risk of ceiling effects. As the study by Zacher and Rudolph (2023) was time-lagged and longitudinal (over 3 months) this adds more credence to the hypothesis that increasing knowledge may decrease eco-distress. At what point awareness and knowledge increases or decreases eco-distress warrants further investigation.

Only three studies explored personality traits as a potential predictor of eco-distress. Although all three found evidence of some personality traits, one of the studies was poor in quality with higher risk of bias (Tucholska, 2024). That being said, the longitudinal design of the study by Zacher & Rudolph (2023) adds credence that personality traits may be potential predictor. However, due to the limited number of studies exploring this, further research is needed.

Demographic variables as predictors had largely inconsistent findings. There is most evidence for age being a significant predictor variable. Although a few studies did not find that did not find age was a predictor, these studies tended to be poorer in quality. Kotera et al (2024) was a very small

sample, Jalin et al (2024) was a limited sample from an environmentalist workshop and Baskaya et al (2024) only represent a smaller age range (up to 45). This suggests these results should be interpreted with caution. Furthermore, all except one study (Prencipe et al., 2023) only included participants above the age of eighteen. Those aged younger than eighteen (adolescents) may have higher levels of eco distress (Sciberras & Fernando, 2022). If adolescents were included in analyses, age may be a more consistent predictor variable. Gender as a predictor variable had mixed results. While generally indicating that women experience more eco-distress, it often did not remain significant when other factors were included. This contrasts with the review by Quiroga et al (2024) that found gender was a predictor. There was less evidence for the remaining predictors explored, either due to inconsistent findings or the predictor only being explored in two studies. Socio-economic status had mixed findings, with the most support for higher education predicting higher eco-distress. The mixed findings may be due to socio-economic status being a multifaceted construct (Dutton & Levine, 1989) so that individual facets alone do not independently predict eco-distress. However, Wullenkord et al (2024) explored a collation of social stressors and still did not find this was a predictor. Health status and geographical factors warrant further research but due to only being explored in two studies it precludes definitive conclusions.

4.2 Strengths and limitations of included studies

A strength of the studies was that most had large samples (over 300; n = 23) and the risk of bias ranged from low to medium. However, the type of methodology used is very limiting for conclusions to be drawn regarding predictors of eco-distress or what is associated with the development of eco-distress. Predictors are informative of future events (Agras, 2021), however, to fully establish a factor as a predictor, there needs to be evidence of influence over time which is lacking in the research to date. There is little research in the way of prospective and longitudinal data. This highlights that the next step in research into eco-distress requires more robust methodology and design. Further, some studies did not include demographic variables as controls (n = 5, Chan et al., 2024; Mat & Yilmaz, 2024; Parmentier et al., 2024; Smith et al., 2023; Tucholska, 2024) limiting the inferences that can be made. Another way in which research could improve is having adequate control variables when exploring potential predictors.

Conceptualisations of potential predictors included in this review were varied. The same predictor was rarely investigated by the same measure by more than one study, infringing adequate replication standards (Vachon et al., 2021). A notable exception is the study by Cameron & Kagee (2025) who replicated the study by Whitmarsh et al (2022). Conversely, sometimes the same predictor was conceptualised differently. For example, the New Environmental Paradigm (Dunlap et al., 2000) which was used in the study by Whitmarsh et al (2022) to measure values about the environment. The tool includes items that could be conceptualised as risk perceptions (e.g. '*if things continue on their present course, we will soon experience a major ecological catastrophe'*) and others

that could be conceptualised as the relationship to nature or social dominance orientation (e.g. '*Humans were meant to rule over the rest of nature'*), meaning it is difficult to make conclusions without conceptual consistency across studies.

There has been some limited progress in widening the geography of investigation in that four studies in the review included countries outside of WEIRD (Western, Educated, Industrialized, Rich and Democratic; Henrich et al., 2010) countries. However, overall countries from South Asia were underrepresented. Further, the overuse of online surveys excluded those without internet access, which may include important populations such as indigenous groups who have reported being particularly impacted and distressed by the deterioration of the natural world (Middleton et al., 2021). Therefore, there are limitations in the generalisability of the findings in the review. There are significant people groups underrepresented when it has been found that culture may impact experiences of eco-distress (Tam et al., 2021).

This review highlights an overemphasis on anxiety related emotional responses in literature. Many predictors were only investigated in their relationship with eco-anxiety, meaning findings cannot be generalised to other forms of eco-distress. Grief and sadness related to the climate crisis were not captured by this review, despite being conceptualized in literature (Comtesse et al., 2021). What predicts these emotional responses as opposed to anxiety related responses, and their potential consequent mental health implications, remains unclear. As different emotions have differential behavioural outcomes (Linehan, 2015) it is important to understand all potential manifestations of eco-distress as the consequences of different manifestations may vary (Stanley et al., 2021).

The overemphasis on eco-anxiety is perhaps due to their being valid and reliable measures that have been fairly widely used; the Climate Change Anxiety Scale (CCAS; Clayton & Karazsia, 2020) and the Hogg Eco-Anxiety Scale (Hogg et al., 2021). Measures of other forms of eco-distress are needed. The measures of other forms of distress in this review were limited as they had only one or a few items (eco-guilt in in Jaśkiewicz et al., 2023; climate-distress in Prencipe et al., 2023) with the exception of measures of solastalgia. Measures have started to be developed such as the Eco-guilt questionnaire (Agaston et al., 2022) and the Inventory of Climate Emotions (ICE; Marczak et al., 2023), however further validation and reliability studies are needed (Owczarek et al., 2025).

4.3 Strengths and limitations of this review

A strength of the review is the comprehensive search including a wide range of interdisciplinary databases. Further, the review was not limited to anxiety related emotional responses to the climate crisis. However, there were a number of limitations. The review may be subject to bias due to the second researcher only reviewing a small percentage of papers at each stage. The inclusion criteria was limited to studies in which eco-distress was the dependent variable,

which means the review may have missed some important predictors of eco-distress that were included in studies exploring complex relationships with other related concepts such as behaviours in response to the climate crisis.

4.5 Implications for future research

Given the limitations of the studies included in the review, longitudinal studies are needed to establish predictive validity of the potential predictors highlighted in this review. An exploration of other aspects of eco-distress beyond anxiety are needed. While there may be multiple emotional responses and individual experiences, the type of distress experience may influence whether the person has adaptive or detrimental outcomes (Stanley et al., 2021). Research into the predictors of eco-distress would also benefit from conceptual consistency across studies, and replication studies to help understand the potential role of any given potential predictor. Conceptual clarity across studies may be more robust if grounded in theory.

This review also highlighted gaps in the types of predictors that have been explored. The social-ecological perspective on climate distress outlines that eco-distress is a result of the interplay between individual factors, micro factors (e.g. family and peers), meso factors (e.g. community, local environment), exo factors (e.g. the government, media, global environment) and macro factors (e.g. culture) (Crandon et al., 2022). The studies included in this review cover individual factors such as personality, exo factors such as media exposure and perceptions of the local and global environment, but there has been little exploration into meso factors such as the influence of peers and community in predicting eco-distress, with the exception of social norms being explored (Ogunbode et al., 2022). Future research should address this gap.

The emphasis on the interplay between factors in the socio-ecological perspective is another helpful guide for future research. Research into whether the factors associated with eco-distress in this review influence each other could be explored with mediation or moderation analyses. For example, exploring whether media exposure influences knowledge about the climate crisis, which in turn, contributes to eco-distress, could inform what the mechanisms explain the relationship between media exposure and eco-distress. Indeed, while exposure to nature was not generally found to be a predictor of eco-distress in this review, it may be that those who score highly on connectedness to nature may find time in nature more distressing. Therefore, exploring interacting connections between variables will aid understanding in what contributes to the development of eco-distress.

4.6 Clinical and policy implications

As the review found that other forms of distress were associated with eco-distress, this highlights that mental health clinicians should be aware of eco-distress and explore this in

assessment of individuals' mental health and needs. It may be that those with mental health struggles may be more prone to eco-distress or may have eco-distress as part of their clinical presentation. This corresponds with findings that eco-distress is being increasingly featured in clinical settings (Budzisewska & Jonsson, 2022). Particular attention to the person's subjective beliefs could aid assessment as beliefs seemed to impact the effect of exposure to climate events as well as the specific impact of beliefs on eco-distress.

However, the relationship between eco-distress and other forms of clinically significant distress needs to be further explored and established. The relationship between eco-distress and mental health outcomes remains unclear. The studies included in this review were of the general population. Research into the prevalence of eco-distress in the clinical population would help establish whether eco-distress can become impairing or interact with other mental health outcomes. Nezlek and Cypryańska (2024) found evidence that eco-distress is not impairing for the majority of their participants, although a subsection experienced an impairing form of eco-distress that negatively impacted their daily functioning (e.g. loss of appetite, sleeping, concentration). Whether the potential predictors highlighted in this review contribute to the impairing level of eco-distress or associated negative mental health outcomes is unclear. Following the further establishment of these potential predictors, an exploration of their role in contributing to negative outcomes should be researched. This would inform interventions for those who have impairing outcomes from eco-distress.

As transdiagnostic processes of distress, such as psychological inflexibility, were associated with greater eco-distress this warrants further research to inform whether this would be a useful treatment target for those with impairing forms of eco-distress. Relatedly, mindfulness was found to be inversely related to eco-distress demonstrating its potential as a treatment tool for impairing eco-distress. However, longitudinal and experimental research would be needed to establish this as an effective mechanism of change for those whom eco-distress is a feature of their clinical presentation.

Media exposure contributing to eco-distress also highlights that policy makers and communicators about the climate crisis should consider the impact of their communication on the emotional well-being of their audience. The goal of communication about the climate crisis is often to promote positive climate change behaviors (e.g., green energy, recycling). However, it appears greater exposure to climate change communication also increases eco-anxiety. Eco-anxiety has the potential to make people feel powerless to act and, as a result, counteract the intended good of climate change communication efforts (Innocenti et al., 2021). On the other hand, the relationship between eco-anxiety and pro-environmental behaviours is inconsistent (Geiger et al., 2021). Exploring the relationship between eco-distress and pro-environmental behaviours warrants further investigation, which would aid understanding of whether the effectiveness of climate change communications is undermined by the impact of eco-distress.

5. Conclusions

This review explored the potential predictors and factors associated with the development of eco-distress. Although a range of factors have been explored, the research to date precludes drawing conclusions about predictors over time and rather highlights predictor variables associated with eco-distress. The factors with the most evidence as a potential predictor is exposure to media about the climate crisis and other forms of distress. There is some evidence for exposure to climate related events, beliefs/perceptions in relation to climate change and connectedness to nature. However, overall, there is too great variation in the measures and conceptualisations of the predictors to draw definitive conclusions. Due to the methodological limitations of the included studies these findings should be interpreted with caution. Recommendations from this review are for research into predictors of eco-distress to focus on conceptual consistency across studies that are theoretically grounded and using longitudinal methodology to establish predictive validity.

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Chapter 3 Empirical study

Eco-emotions and pro-environmental behaviours: the role of coping and socio-economic status

Journal specification: The following paper has been prepared for submission to the Journal of Environmental Psychology. The guidelines for authors are provided in Appendix A.

Word count: 7,184 (excluding abstract, tables and references)

Abstract

Background

There is mixed evidence about the relationship between eco-anxiety and pro-environmental behaviours. The inconsistencies may be due to different emotional responses being conflated rather than exploring distinct emotions related to the climate crisis (eco-emotions). Further, there is little understanding about the factors that influence the relationship between eco-emotions and pro-environmental behaviours. This study explored the unique contribution of different eco-emotions on pro-environmental behaviours and whether coping styles and socio-economic status influence this relationship.

Method

Participants (*N* = 536) recruited from Prolific and social media reported on their emotions in response to climate change (i.e., anger, anxiety, fear, sadness, hope and guilt), coping strategies and pro-environmental behaviours.

Results

Only anger was directly associated with pro-environmental behaviours. Both anger and hope were indirectly associated with pro-environmental behaviours via problem-focused coping. Socioeconomic status did not moderate either indirect effect. Socioeconomic status did not moderate the relationship between eco-emotions and pro-environmental behaviours.

Conclusions

Anger and hope may lead to more constructive outcomes compared to other emotional responses to climate change. By engaging the approach motivational system, emotions like anger and hope may foster problem-focused strategies which in turn facilitate adaptive, pro-environmental behaviours.

Keywords: Eco-emotions; eco-anxiety; eco-distress; coping; pro-environmental behaviours; socio-economic status

1. Introduction

It is largely undisputed that human activity has been a significant cause of the climate crisis, with devastating impacts on our planet that are potentially irreversible without effective global action (Hayes et al., 2018). The climate crisis poses an urgent public health threat (IPCC, 2022) given the increasing frequency, duration, and intensity of extreme weather events (heat waves, floods, droughts), but also due to secondary psychosocial impacts such as food and water insecurity, displacement and ecosystem degradation (Lawrence et al., 2021). Uncertainty about the exact future impacts and what actions will effectively mitigate them, contributes to increasing anxiety (Nezlek & Cypryańska, 2024). Indeed, there has been growing research investigating the emotional responses to the climate crisis (Clayton et al., 2023). Most research has investigated 'climate anxiety' or 'eco-anxiety' defined as "*a chronic fear of environmental doom*" (Clayton et al., 2017, pg 68;) and there is evidence of this phenomenon globally (Ogunbode et al., 2022).

Given the scientific reality of the climate crisis, it has been argued that anxiety is a rational response and should not be pathologised (Hickman et al., 2021). There appears to be beneficial aspects of eco-anxiety, with it being associated with greater pro-environmental behaviours (Pavani et al., 2023) and climate activism (Kovacs et al., 2024). However, a plethora of research has found that eco-anxiety is associated with mental health difficulties, such as depression (McBride et al., 2021), anxiety disorders (Nezlek & Cypryańska, 2020) and insomnia (Ogunbode et al., 2021). This suggests there are two trajectories for those who experience eco-anxiety – a constructive trajectory resulting in positive action, and an unconstructive trajectory contributing to impairment in daily life and mental health difficulties (Nezlek & Cypryańska, 2024). It is unclear which factors contribute to these differing trajectories. Clarifying this could aid prevention of unconstructive outcomes, inform how to support those experiencing impairing distress, while promoting constructive outcomes needed to address the climate crisis. To begin to clarify what factors contribute to the different trajectories, this study focuses on what factors contribute to constructive outcomes, specifically pro-environmental behaviours (PEBs).

The rationale for the focus is on constructive outcomes, specifically PEBs, is based on the recognition that indicators of good mental health is not simply the absence of mental illness or symptoms (Winefield et al, 2012). Further, there is a great need for individual mitigation behaviours for the sake of human and planetary health (Latkin et al., 2022) so understanding what contributes to these constructive outcomes is needed. Finally, to understand what would make treatments for impairing levels of eco-distress effective, without unintentionally reducing constructive outcomes such as PEBs, we need to know what contributes to these constructive outcomes.

1.1 Emotional responses to the climate crisis (eco-emotions)

The type and intensity of emotional response to the climate crisis may influence outcomes. Most research has focused on eco-anxiety (Ojala et al., 2021), however this does not fully capture the emotional responses to climate crisis (Pikhala, 2022). Findings on the relationship between eco-anxiety and PEBs are mixed: some report a positive association (Pavani et al., 2023), others found no association (Goldwert et al., 2023), some even suggest a negative relationship (Innocenti et al., 2023). These inconsistencies may be due to many studies using measures of eco-anxiety that conflate emotional responses. A commonly utilised tool is the Climate Change Anxiety Scale (CCAS; Clayton and Karazsia, 2020) which includes items that may be measuring other emotions, yet define the outcomes as anxiety. For example, the item '*I find myself crying because of climate change'* may relate to sadness rather than anxiety. Differential eco-emotions are likely to co-occur, as often a range of emotions are reported in relation to the climate crisis (Galaway & Beery, 2022). If other emotional responses are not controlled for when measuring eco-anxiety, the relationship between eco-anxiety and PEBs may be disguising the influence of other emotional responses.

Conflation of emotional responses is an issue as emotional theorists have highlighted different emotions have differential action tendencies and behavioural responses (Frijda, 1987). Activating emotions, such as anger, lead to action (Harmon-Jones, 2003), whereas deactivating emotions, such as sadness, are less likely to (Carver & Harmon-Jones, 2009). Anxiety can be motivational, however anxiety is also associated with avoidance (Hoffman & Hay, 2018) which may decrease engagement in constructive outcomes such as PEBs. Some studies show eco-anger is more predictive of PEBs than eco-anxiety, whereas eco-sadness is related to poorer mental health outcomes (Stanley et al., 2021). This illustrates that differential emotional responses may be important in determining whether a person has constructive outcomes or unconstructive outcomes.

Although Stanley et al. (2021) illustrated that different emotional responses to the climate crisis contribute to different outcomes, the study only explored three emotional responses when there is a large range of emotional responses (Galaway & Beery, 2021). Therefore, investigation of the unique contributions of a range of different emotional responses to the climate crisis, 'eco-emotions' (Cianconi et al., 2023), is needed. While it would be difficult to explore all possible emotional responses, the eco-emotions most endorsed by literature to have a role in contributing to either constructive or unconstructive outcomes are anxiety (Hogg et al., 2024), fear (Chen, 2015), guilt (Moore & Yang, 2020), sadness (Stanley et al., 2021), anger (Gregerson et al., 2023) and hope (Geiger et al., 2021). These are the eco-emotions included in the current study.

The first aim of this study was to answer the following research question: What eco-emotions lead to pro-environmental behaviours? It was hypothesised that there will be differential associations between individual eco-emotions and pro-environmental behaviours (H1).

1.2 Factors that influence the relationship between eco-emotions and PEBs

Whilst studies have explored whether eco-emotions impact PEBs, there has been little exploration of the circumstances in which this happens (Mathers-Jones & Todd, 2023). As eco-emotions do not always contribute to PEBs, it may be that other factors explain this gap between emotion and behaviour.

1.2.1 Coping

Whether someone with intense eco-emotions has constructive or unconstructive outcomes may be influenced by how they cope with the emotional responses and distress (Pikala, 2022). According to the transactional model of coping theory (Folkman, 2008; Lazarus & Folkman, 1984) there are different types of coping; emotion-focused, problem-focused and meaning-focused. Emotion-focused coping includes behaviours oriented towards alleviating or preventing unpleasant emotions. Problem-focused coping is where an individual behaves in ways to solve the problem. Meaning-focused coping is where an individual, rather than avoiding unpleasant emotions, attempts to elicit pleasant emotions. For example, by positively re-appraising the situation or turning to spiritual beliefs. In relation to eco-distress, Ojala (2012a; 2013) found evidence for emotion-focused coping in young people; distancing themselves from the problem, distraction, avoidance, de-emphasizing the problem and rumination. Meaning-focused coping included reframing the problem; recognising that awareness of the climate crisis has increased in society, emphasising the importance of hope and trusting organisations to make changes. Problem-focused coping included searching for things they could do and talking to others about these actions.

Whether these coping strategies contribute to constructive or unconstructive outcomes has yet to be determined. Ojala and Bengtsson (2019) found that de-emphasising, a form of emotion-focused coping, was inversely related to PEBs whereas problem-focused and meaning-focused coping styles were positively associated with PEBs. Wullenkord and Ojala (2023) found that meaning-focused and problem-focused coping mediated the relationship between worry and PEBs. However, this study did not explore the role of other emotions. As different emotions have different behavioural responses, it may be that different coping strategies are adopted for different emotions, or different coping strategies may be more effective for different emotions.

The second aim of the study was to address the research question: what influences the relationship between eco-emotions and pro-environmental behaviours? It was hypothesized that there will be differential associations between individual eco-emotions and coping styles (H2) and that coping styles will mediate the relationship between eco-emotions and pro-environmental behaviours (H3).

1.2.2 Socio-economic status and socio-demographic factors

Emotions elicited by the climate crisis are shaped by cultural and societal factors (Davidson & Kecinski, 2021) suggesting that socio-demographic and socio-economic factors may be important in understanding the relationship between eco-emotions and PEBs. Some literature highlights that women are more likely to experience stronger eco-emotions (Clayton et al., 2023) and engage in more PEBs (Whitmarsh et al., 2022), as are younger generations (Whitmarsh et al., 2022). Parental status has also been found to be associated with stronger eco-emotions (Jalin et al., 2024; ONS, 2022) highlighting that socio-demographic factors may influence eco-emotions and outcomes.

Relatedly, socio-economic factors may influence eco-emotions and subsequent outcomes. Firstly, as those poorer in the global population are most impacted by the climate crisis (Hayes et al., 2018), this could plausibly cause more unpleasant emotions and distress in those lower in socio-economic status (SES) and promote more PEBs. Alternatively, due to the inherent stressors of lower income (Pedron et al., 2021), there may be more pressing stressors so environmental concerns are less dominant. This could suggest that those lower in SES have less strong eco-emotions and subsequently engage in less PEBs. The issue with both hypotheses is that there is little empirical evidence to suggest differences in SES regarding emotional experiences related to the climate crisis (Whitmarsh et al., 2022; Wullenkord et al., 2024). Despite a lack of evidence of differences in emotional responses, several studies have found that higher SES is associated with more engagement in pro-environmental behaviors (Grandin et al., 2022; Zhong et al., 2024).

SES may also shape the relationship between eco-emotions and PEBs by influencing access to coping strategies. Individuals experiencing strong eco-emotions may be limited in their ability to respond effectively depending on their resources. Those with a lower SES may be less able to engage in PEBs as some actions are costly (e.g. installation of solar panels, electric vehicles). While monetary reasons may account for differences in PEBs, these differences appear to remain when PEBs are low cost (Zhong et al., 2024). This could be explained by socio-economic factors influencing a person's perception of their ability to respond to threats, in this case the climate crisis. Lower SES has been associated with lower scores in locus of control (Daganzo et al., 2018) and low self-efficacy beliefs (Lei et al., 2019).

Eom et al (2018) found no difference in beliefs about the climate crisis between those high or low SES. However, SES moderated the relationship between beliefs and PEBs. The relationship was stronger in those higher in SES. Similarly, as beliefs about the climate crisis impact eco-emotions (Reese et al., 2023), there may be no differences in the eco-emotions experienced according to SES, but the relationship between eco-emotions and PEBs may be influenced by SES.

Therefore, the final aim of the current study was to answer the research question; What sociodemographic and socioeconomic factors influence the association between eco-emotions and

pro-environmental behaviours? It was hypothesized that socio-economic status would moderate the relationship between eco-emotions and pro-environmental behaviours (H4).

In summary, the current study investigated which eco-emotions are associated with pro-environmental behaviours and what factors influence this relationship. Six key emotions were examined: anxiety, fear, anger, sadness, guilt and hope. We explored coping strategies as a potential mechanism linking eco-emotions to behaviour, and whether sociodemographic and socioeconomic factors influence this relationship.

2. Methods

2.1 Participants and procedure

An a priori power analysis in G*Power 3.1.9.2 (Faul et al., 2009) was conducted, using a small-to-moderate association between eco-anxiety and PEBs (Whitmarsh et al., 2022) and 80% power. Based on these parameters, 320 participants were required. To safeguard against possible attrition and to provide more power for more complex exploratory analyses (e.g., moderation), 613 participants were recruited.

Of the 613 participants, 311 were recruited from social media (Facebook, Instagram, X) and 312 from Prolific. Of the initial 312 Prolific participants, eight did not consent and two participants timed out before completion, so were excluded. Of the 302 remaining participants, fifteen were excluded because they failed the attention check[1] and two participants were excluded because they gave the same response to every item. Of the initial 311 social media participants, 36 provided no data (i.e., they completed the consent form and nothing else), eight were excluded for excessive missing data (i.e. only completed one relevant questionnaire), and seventeen were excluded for failing the attention check. Thus, after exclusions, 535 participants (285 Prolific, 250 social media) remained for the analyses reported below.

To hedge against recruitment biases with survey research on social media (Lehdonvirta et al., 2020) we implicated quota sampling on Prolific. Specifically, environmental concerns[2] and socioeconomic status[3] because both are related to PEBs (Tam & Chan, 2017; Zhong et al., 2024).

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[1] Participants were asked to select a particular answer with the following prompt 'if you are paying attention, please select…'

[2] Generally speaking, how concerned are you about environmental issues?" Ranging from 1 (not at all concerned) and 5 (very concerned). The proportion of each category was 20%. In other words, 20% of the sample were participants who have rated 1 on the question, 20% of the sample were participants who rated 2 on this question and so on.

[3] Where would you put yourself on the socioeconomic ladder?" (ranging from 1-10) (MacArthur Scale of Subjective Social Status developed by Adler et al., 2000). The proportion of each category for this question was 10%.

Besides this, typical social media samples tend to skew higher in socioeconomic status (Chang & Krosnick, 2009).

The study was approved by the University of Southampton Faculty Research Ethics Committee (Ethics Number: 90860). The study was developed, and completed by all participants on, Qualtrics (Qualtrics, Provo, UT). Participants accessed the study through a link on the advertisement or Prolific platform. The survey was piloted prior to data collection. The study was a cross-sectional design.

Data was collected between mid-November 2024 and January 2025. Informed consent was obtained prior to starting the study and participants were provided with a debrief sheet following the study. Participants completed a demographic questionnaire, measures of emotions related to climate change, coping related to climate change, and PEBs in random order. Questionnaire items were also randomized within each measure. After completing these measures participants were debriefed and compensated with either £0.60 (Prolific) or entry into a £50 E-voucher prize draw (social media) for a 6-minute study.

2.2. Measures

Demographics. Participants provided their age, gender, ethnicity, parental status and socioeconomic status. Socio-economic status was measured as a composite of education and household income following the procedure used by Eom et al (2018).

Eco-Emotions. Emotions related to climate change were measured using an adapted version of the Discrete Emotions Questionnaire (DEQ; Harmon-Jones et al., 2016), a 32-item questionnaire assessing participants emotional reactions using four emotional adjectives linked to anger (e.g., pissed off), sadness (e.g., grief), anxiety (e.g., nervous), fear (e.g., scared), disgust (e.g., nausea), desire (e.g., longing), relaxation (e.g., chilled out), and happiness (e.g., enjoyment). It was designed to be adaptable, and researchers are encouraged to modify the questionnaire instructions to map onto their study's context (Harmon-Jones et al., 2016). Accordingly, participants were asked to report their emotional responses using the following prompt: "*When it comes to climate change and everything you associate with it, to what extent did you experience these emotions*?' We administered the Fear, Anxiety, Anger and Sadness subscales of the DEQ. Additionally, we included two items (Guilt and Hope) because both emotions have been associated with PEBs (Geiger et al., 2021; Moore & Yang, 2020). The DEQ has been demonstrated to be valid (Harmon-jones et al., 2016), have good internal consistency and test-re-test reliability (Yilmaz & Bekaroglu, 2020). The reliability of this questionnaire in the current study was excellent, with a Cronbach's alpha of 0.97.

Coping. Participants also completed a measure of coping in response to the climate crisis. The six item meaning-focused subscale (e.g., *I have faith in humanity we can fix all kinds of problems*) (Cronbach's alpha = 0.75) was derived from Ojala and Bengtsson (2019), as was the three item problem-focused coping subscale (e.g., *I search for information about what I can do*) (Cronbach's alpha = 0.86). The two item emotion-focused coping subscale, (e.g., *I try to think of something else*) was derived from Ojala (2012) measuring distraction as a form of emotion-focused coping. (Cronbach's alpha = 0.8).

Pro-environmental Behaviours. To assess PEBs an adapted measure by Whitmarsh and colleagues (2022) was used. Participants were asked how often they engage in the following behaviours: eat organic, locally-grown or in season food; encourage other people to save energy; buy products with less packaging; recycle household waste (e.g. glass); avoid wasting food (e.g. by using leftovers); borrow or rent items (e.g. tools, toys) and eat red meat (e.g. lamb, beef) (reversed scored). Participants rated the frequency per month. Cronbach's alpha was 0.67 which was the same as the original study.

2.3 Statistical analysis

IBM SPSS (version 27) was the software package used to analyse the data. Preliminary tests were correlational analysis between variables, or t-tests. Multiple Linear Regression analyses were used to examine the differential impacts of eco-emotions. For the mediation and moderation analysis for examining the relationships between eco-emotions, coping, SES and PEBs, PROCESS Marco (Hayes, 2018) software was used.

3. Results

3.1 Preliminary findings

3.1.1 Demographic information

The majority of participants were White British (69%), female (61%), were not parents (59.9%) with a mean age of 38 (age range 16-84) (Table 11).

Women scored significantly higher (M= 3.07, SD =1.4) on unpleasant emotions (aggregation of guilt, anger, sadness, anxiety and fear) than men (M = 2.54, SD = 1.34), $t(486) = -3.99$, $p < .001$. Women reported engaging in more PEBs (M = 11.73, SD = 4.78) than men (M = 9.67, SD = 4.71), $t(486) = -4.51$, $p < .001$. Younger participants were more likely to experience higher unpleasant

emotions (r = -.33, p <.001) however age was not correlated with PEBs (r = -.07, p = .09). Socio-economic index was not correlated with unpleasant emotions (r = .01, p = .75) or PEBs (r = .08, p = .08). Non-parents had stronger negative emotions (M = 3.3, SD = 1.49) compared to parents (M = 2.68, SD = 1.49) and this difference was significant t(532) = 4.89, p < .001. There were no differences in pro-environmental behaviors between parents (M = 11.08, SD = 4.88) and non-parents (M = 11.38, SD = 5.05), t(532) = 0.66, p = .25.

Social media participants reported higher unpleasant emotions, t(532)=12.044, p <.001 and reported engaging with more PEBs, t(532) = 8.31, p <.001, than prolific participants. This is unsurprising given that the recruitment of prolific participants used quota sampling to provide a range in levels of environmental concern and SES represented in the sample, as this was not possible with social media participants it is likely those concerned with the environment were more likely to complete the survey and therefore have stronger emotional responses to the climate crisis and subsequent PEBs. Inclusion of recruitment type in the regression analysis did not change the results (see supplementary materials).

Table 11

Descriptive statistics for analytic sample

	M (SD)	N (%)
Demographic characteristics		
Gender		
Male		162 (30%)
Female		327 (61%)
Non-binary or other		40 (7.5%)
Parental status		
Non-parent		316 (59%)
Parent		175 (33%)
Parent and grandparent		44 (8%)
Ethnicity		
White British		370 (69%)
White European		93 (17%)
Other ethnic background		70 (13%)
Age	38 (14.23)	
Pro-environmental behaviour	11.26 (4.98)	
Coping styles		
Problem-focused coping	2.77 (0.91)	
Emotion-focused coping	2.8 (1.01)	
Meaning-focused coping	2.77 (0.66)	
Eco-emotions		
Anger	3.18 (1.75)	
Anxiety	3.31 (1.76)	
Fear	2.77 (1.65)	
Sadness	1.74(1.37)	
Guilt	2.93 (1.64)	
Hope	2.87(1.52)	

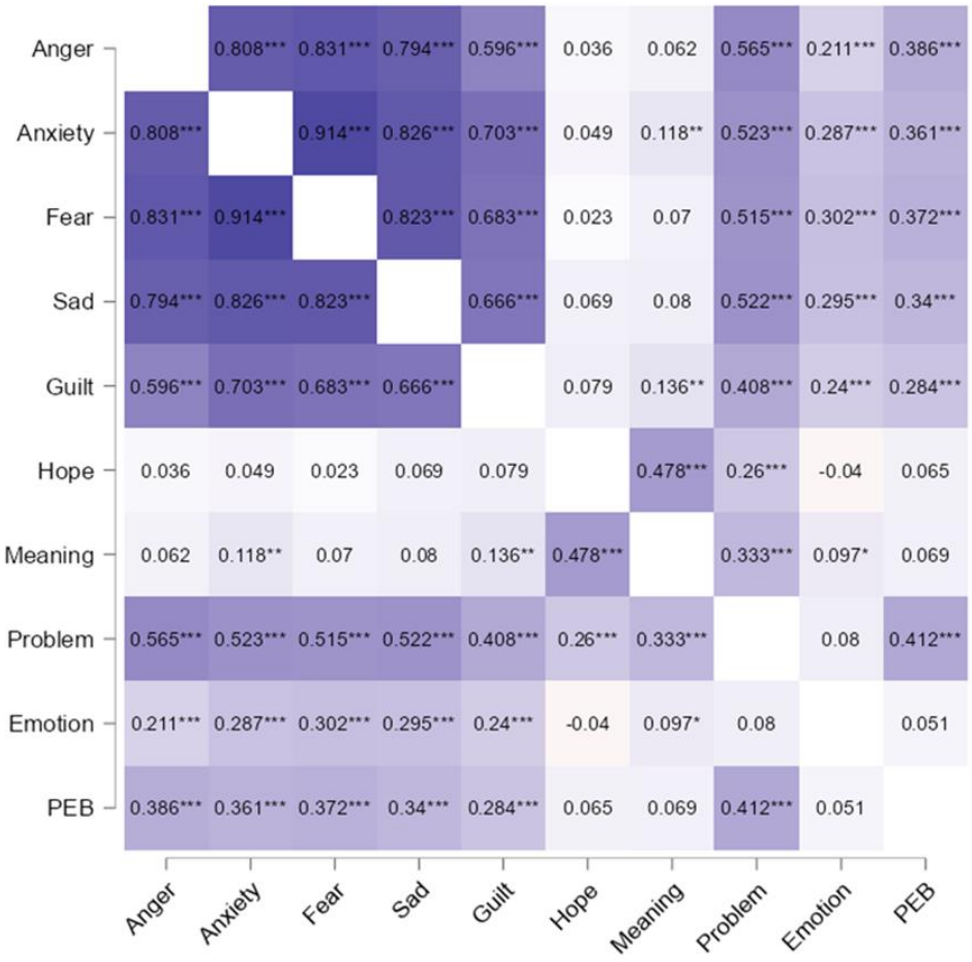
Note. M = mean, SD = standard deviation

3.1.2 Bivariate correlations

Bivariate correlations between eco-emotions, coping, and PEBs are reported in Figure 3. As expected, all unpleasant emotions were related to each other (*r*s > .59, *p*s < .001) and were all significantly associated with problem and emotion focused coping (*r*s > .21, *p*s < .001). Of the unpleasant emotions, only anxiety (*r* = .12, *p* =.007) and guilt (*r* = .14, *p* =.002) were related to meaning-focused coping. All unpleasant emotions were positively associated with PEBs (*r* > .28, *p*s < .001). Hope was unrelated to all other emotions, emotion-focused coping, and PEBs (*r*s <.10, *p*s > .10), but was positively associated with meaning-focused (*r* = .48, *p* < .001) and problem-focused coping (*r* = .26, *p* <.001).

Figure 3

Correlations between study variables



Note. Meaning = meaning focused coping, Emotion = emotion-focused coping, Problem = problem focused coping, PEB = pro-environmental behaviours, *p <.05, **p <.01, ***p <.00, darker shades denote stronger relationships

3.2 Eco-emotions and PEBs

To assess the unique contribution of the different eco-emotions, multiple linear regression was performed, with anger, anxiety, fear, sadness, hope and guilt as predictor variables. When controlling for the impact of the other emotions, eco-anger was the only significant predictor of PEBs (Table 12). This finding remained when significant demographic correlates with PEBs were controlled for (see supplementary materials).

Table 12

Regression outcomes exploring the relationship between eco-emotions and pro-environmental behaviours

	B	*SE*	*Beta*	*t*	*p*	*95% CI*
Anger	0.68	0.22	.24	3.10	**.002**	**[0.25, 1.11]**
Anxiety	0.09	0.3	.03	0.31	.76	[-0.5, 0.69]
Fear	0.37	0.33	.12	1.11	.26	[-0.28, 1.02]
Sadness	-0.01	0.29	-.003	-0.04	.97	[-0.57, 0.56]
Guilt	0.1	0.18	.03	0.56	.57	[-0.25, 0.45]
Hope	0.16	0.13	.05	1.19	.23	[-0.01, 0.42]

Note. *B* = unstandardized coefficients, SE = standard error of B, Beta = standardised coefficient, Boldness indicates significance

3.3 Mediational analysis

Next, a series of mediational analyses were conducted using the SPSS Process Macro (Model 4; Hayes, 2018) to examine the extent to which coping strategies mediated the associations between eco-emotions and PEBs. In each mediational analysis reported below we include all other emotions as covariates.

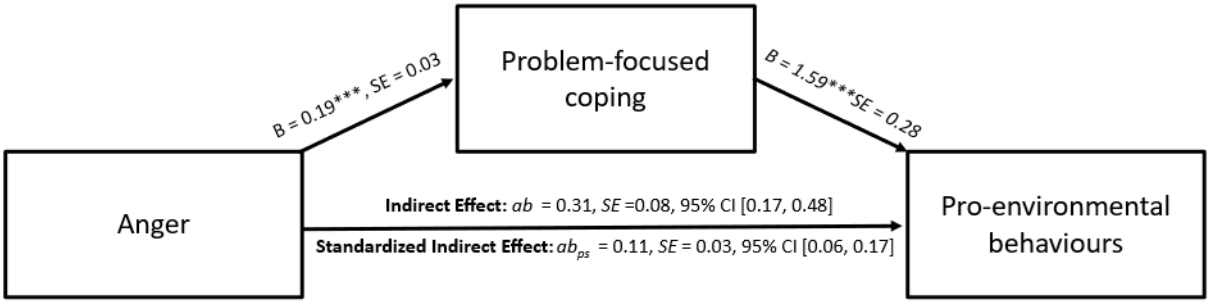
3.3.1 Anger. Anger was associated with increased PEBs (i.e., the total effect or c path), *b* = 0.68, *SE* = 0.22, *t* =3.08, *p* = .002, 95% CI [0.25, 1.11]. Anger was also associated with increased problem-focused coping (i.e., the a_1 path), *b* = 0.19, *SE* = 0.03, *t* = 5.67, *p* < .001, 95% CI [0.13, 0.26], decreased emotion-focused coping (i.e., the a_2 path), *b* = -0.12, *SE* = 0.05, *t* = -2.62, *p* =.009, 95% CI [-0.21, -0.03], and unrelated to meaning-focused coping (i.e., the a_3 path), *b* = -0.01, *SE* = 0.03, *t* = -0.41, *p* = .685, 95% CI [-0.07, 0.04]. Moreover, problem-focused coping (i.e., the b_1 path) was associated with greater PEBs, *b* = 1.59, *SE* = 0.28, *t* = 5.59, *p* < .001, 95% CI [1.03, 2.15]. Emotion-focused coping (i.e., the b_2 path) was not associated with PEBs, *b* = -0.18, *SE* = 0.21, *t* = -0.85, *p* =.356, 95% CI [-0.58, 0.23], nor was meaning-focused coping (i.e., the b_3 path), *b* = -0.33, *SE* = 0.35, *t* = -0.95, *p* =.342, 95% CI [-1.02, 0.36.

Furthermore, the indirect effect of anger on PEBs through problem-focused coping (ab_1) was significant, *ab* = 0.31, *SE* = 0.08, 95% CI [0.17, 0.48] (Figure 4). Finally, the completely standardised indirect effect of anger on PEBs through problem-focused coping was moderately sized, ab_1 = 0.11,

SE = 0.03, 95% CI = [0.06, 0.17]. The indirect effect of emotion-focused coping (ab_2) was not significant, *ab* = 0.02, *SE* = 0.03, 95% CI [-0.02, 0.04], nor was the indirect effect meaning-focused coping (ab_3) *ab* = 0.00, *SE* = 0.01, 95% CI [-0.03, 0.09].

Figure 4

Associations between anger, problem-focused coping and pro-environmental behaviours



Notes. Parameter estimates are unstandardized. Standard errors and 95% confidence intervals for the indirect effect were calculated with the percentile bootstrap approach based on 10,000 bootstrap samples (Hayes, 2018). The following schema indicates significance: *p < .05; **p < .01; ***p < .001.

3.3.2 Anxiety. Anxiety was not associated with PEBs (i.e., the total effect or c path), b = 0.08, SE = 0.3, t =0.28, p = .78, 95% CI [-0.51, 0.68], or problem-focused coping (i.e., the a1 path), b = 0.06, SE = 0.05, t = 1.19, p = .23, 95% CI [-0.04, 0.15] or emotion-focused coping (i.e. a2 path) b = 0.02, SE = 0.06, t = 0.28, p = .78, 95% CI [-0.22, 0.14]. However, anxiety was associated with meaning-focused coping (i.e. a3 path) b = 0.09, SE = 0.04, t =2.45, p = .01, 95% CI [0.02, 0.17]. There was no indirect effect of anxiety on PEBs through problem-focused coping (ab_1 = 0.09, SE = 0.08, 95% CI [-0.06, 0.26]), emotion-focused coping (ab_2 = -0.003, SE = 0.02, 95% CI [-0.04, 0.04]) or meaning-focused coping (ab_3 = -0.03, SE = 0.04, 95% CI [-0.12, 0.04]).

3.3.3 Fear. Fear was not associated with pro-environmental behaviors (i.e., the total effect or c path), *b* = 0.37, *SE* = 0.33, *t* =1.12, *p* = .26, 95% CI [-0.28, 1.02], or problem-focused coping (i.e., the a_1 path), *b* = 0.001 , *SE* = 0.05, *t* = -0.16, *p* = .98, 95% CI [-0.1, 0.1]. or meaning-focused coping (i.e. a_3 path) *b* = -0.06, *SE* = 0.04, *t* =-1.37, *p* = .17, 95% CI [-0.14, 0.03]. However, fear was associated with greater emotion-focused coping (i.e. a_2 path) *b* = 0.16, *SE* = 0.07, *t* = 2.28, *p* = .02, 95% CI [0.02, 0.29]. There was no indirect effect of fear on PEBs through problem-focused coping (ab_1 = -0.001, *SE* = 0.08, 95% CI [-0.18, 0.15]), emotion focused coping (ab_2 = -0.03, *SE* = 0.04, 95% CI [-0.12, 0.04]) or meaning focused coping (ab_3 = 0.02, *SE* = 0.03, 95% CI [-0.02, 0.17]).

3.3.4 Sadness. Sadness was not associated with pro-environmental behaviors (i.e., the total effect or c path), *b* = 0.02, SE = 0.29, *t* = 0.06, *p* = .96, 95% CI [-0.55, 0.58], or problem-focused coping

(i.e., the a_1 path), b = 0.07, SE = 0.05, t = 1.59, p = .11, 95% CI [-0.2, 0.16] or meaning-focused coping (i.e. a_3 path) b = -0.04, SE = 0.04, t = -1.04, p = .29, 95% CI [-0.11, 0.04]. However, sadness was associated with greater emotion-focused coping (i.e. a_2 path) b = 0.15, SE = 0.06, t = 2.49, p < .001, 95% CI [0.03, 0.27]. There was no indirect effect of fear on PEBs through problem focused coping (ab_1 = 0.11, SE = 0.08, 95% CI [-0.02, 0.28]), emotion focused coping (ab_2 = -0.03, SE = 0.04, 95% CI [-0.11, 0.04]) or meaning focused coping (ab_3 = 0.12, SE = 0.09, 95% CI [-0.07, 0.29]).

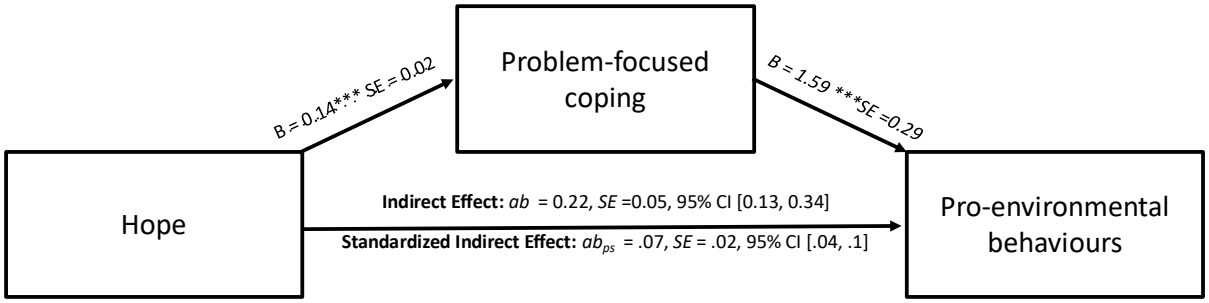
3.3.5. Guilt. Guilt was not associated with pro-environmental behaviors (i.e., the total effect or c path), b = 0.09, SE = 0.18, t = 0.057, p = .57, 95% CI [-0.25, 0.45], problem focused coping (i.e., the a_1 path) b = 0.01 , SE = 0.03, t = 0.38, p = .71, 95% CI [-0.04, 0.06], emotion focused coping (i.e. a_2 path) b = 0.02, SE = 0.04, t = 0.64, p = .52, 95% CI [-0.05, 0.095] or meaning-focused coping (i.e. a_3 path) b = 0.04, SE = 0.03, t =1.62, p = .11, 95% CI [-0.008, 0.08]. There was no indirect effect of fear on PEBs through problem focused coping (ab_1 = 0.02, SE = 0.05, 95% CI [-0.07, 0.11]), emotion focused coping (ab_2 = -0.004, SE = 0.01, 95% CI [-0.03, 0.02]) or meaning focused coping (ab_3 = -0.01, SE = 0.02, 95% CI [-0.05, 0.02]).

3.3.6 Hope. Hope was not associated with pro-environmental behaviors (i.e., the total effect or c path), b = 0.16, SE = 0.13, t = 1.24, p = .22, 95% CI [-0.1, 0.42]. However, hope was associated with increased problem-focused coping (i.e., the a_1 path) b = 0.14, SE = 0.02, t = 6.85, p < .001, 95% CI [0.1, 0.18] and meaning-focused coping (i.e. a_3 path) b = 0.2, SE = 0.02, t = 12.26, p < .001, 95% CI [0.17, 0.24] but was not associated with emotion-focused coping (i.e., the a_2 path), b = -0.04, SE = 0.03, t = -1.41, p =.16, 95% CI [-0.09, 0.02].

The indirect effect of hope on pro-environmental behaviors through problem-focused coping (ab_1) was significant, ab = 0.22, SE = 0.05, 95% CI [0.13, 0.34] (Figure 5). The completely standardised indirect effect of hope on pro-environmental behaviors through problem-focused coping was a smaller effect, ab_1 = 0.07, SE = 0.02, 95% CI = [0.04, 0.1]. The indirect effect emotion-focused coping (ab_2) was not significant, ab = 0.006, SE = 0.01, 95% CI [-0.01, 0.04]. Neither was the indirect effect meaning-focused coping (ab_3), ab = -0.07, SE = 0.08, 95% CI [-0.22, 0.08].

Figure 5

Associations between hope, problem-focused coping and pro-environmental behaviours



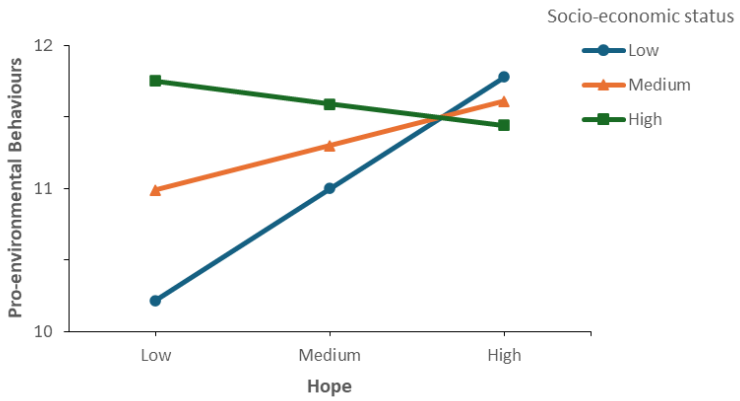
Notes. Parameter estimates are unstandardized. Standard errors and 95% confidence intervals for the indirect effect were calculated with the percentile bootstrap approach based on 10,000 bootstrap samples (Hayes, 2018). The following schema indicates significance: *p < .05; **p < .01; ***p < .001.

3.4 Moderation analysis

To explore the role of SES on the relationship between eco-emotions and PEBs a moderation analysis was conducted using SPSS Process Macro (Model 1; Hayes et al., 2018). There was no significant interaction effect between unpleasant eco-emotions and socioeconomic status in influencing PEBs, b = .07, SE = 0.08, p = .43, 95% CI [-0.1, 0.23]. However, SES did moderate the relationship between hope and PEBs, as there was a significant interaction effect, b = -0.19, SE = 0.09, t = 2.08, p = 0.04, 95% CI [-0.36, -0.1]. For those who were low on the socioeconomic status index, if there were low levels of hope, the less they engaged in PEBs, however as hope increased so did PEBs. This effect was not observed for those higher on the SES index. See figure 6 for the interaction effect. However, the interaction effect was no longer significant when covariates were entered into the model.

Figure 6

Interaction between hope and socio-economic status on pro-environmental behaviours



Note. Low = -1 standard deviation below the mean, middle = the mean high = +1 standard deviation above the mean for socio-economic status and hope

3.5 Moderated mediation

In the analyses above, hope was associated with greater PEBs via problem-focused coping. Given that SES moderated the relationship between hope and PEBs, whether SES moderated the mediated relationship between eco-emotions, coping styles and PEBs was explored using the SPSS Process Macro (Model 59; Hayes, 2018).

SES did not moderate the relationship between hope, problem-focused coping and PEBs. There was not an interaction effect of hope x SES on problem focused coping (b = 0.01, SE = 0.01, t = 0.65, p = .52, 95% CI = [-0.02, 0.04]) nor an interaction effect of problem-focused coping x socioeconomic status on PEBs (b = 0.19, SE = 0.15, t = 1.26, p = .21, 95% CI = [-0.11, 0.49].

Other demographic variables were also explored as moderators to the mediation pathways and moderators were explored with all eco-emotions however none were significant (see supplementary materials).

4. Discussion

The aim of this study was to explore what factors contributed to constructive outcomes of emotional responses to the climate crisis. Whether different eco-emotions (sadness, anxiety, fear, anger, guilt and hope) had differential impacts on PEBs was explored. Further, whether coping styles and socio-economic factors influenced the relationship between eco-emotions and PEBs was explored. There was evidence of differential impacts of eco-emotions found; only anger was directly associated with increased PEBs and hope was indirectly associated through problem-focused coping.

Although SES moderated the relationship between hope and PEBs, it did not moderate the indirect effect or remain significant when controlling for other emotions.

4.1 Eco-emotions and PEBs

In the current study, all unpleasant eco-emotions were correlated with PEBs and with each other, suggesting eco-emotions co-occur. However, when controlling for the influence of the other emotions, anger was the only emotional response directly associated with higher rates of PEBs. This highlights emotional responses to the climate crisis have differential effects on outcomes. Previous findings relating eco-anxiety to increased PEBs that have not considered the role of other emotions (e.g. Pavani et al., 2023) could be masking a more pertinent association between eco-anger and PEBs.

Anger being the only emotional response directly associated with PEBs is theoretically consistent with appraisal theories of emotions (Frijda, 1987; Lazarus, 1991) that outline that different emotions have different action tendencies, and approach-avoidance motivation theories (Carver, 2006; 2008) that highlight the role of emotion in motivation. Approach-avoidance motivation models distinguish approach motivation and avoidance motivation; the former is the motivation to pursue positive outcomes, and the latter is the motivation to avoid negative outcomes (Trew, 2011). Anger is an approach emotion, and is activating (Harmon-Jones, 2003). Anger often has negative connotations due to associations with aggression (van Doom et al., 2014). However, anger has motivational potential and is a common response to perceived injustices or moral violations, known as 'moral anger' (Kuppen et al., 2003). Moral anger has been found to have motivational influence in social movements working against inequalities (Antadze, 2020; Wlodarczyk et al., 2017). The findings suggest that anger has a motivational influence in the context of the climate crisis, a social justice issue. This corroborates with findings from Stanley et al (2021) and qualitative research in which climate activists describe anger as motivational (Marczak et al., 2023). While anger is not always constructive (such as when it is directed at oneself; Ellsworth & Tong, 2006), our finding that the relationship between anger and PEBs was mediated by problem-focused coping provides further insight into when eco-anger is constructive.

Like anger, hope is an activating emotion (Snyder, 2002). The indirect relationship between hope and PEBs is consistent with other research that has found a relationship between hope and behavioural intentions regarding taking climate action (Geiger et al., 2021). There have been inconsistent findings about the role of hope with some studies findings that hope is not associated with PEBs (van Zomeren et al., 2019). The findings in the current study suggest that hope only related to PEBs via problem-focused coping which may partially explain these inconsistencies.

However, Marlon et al (2019) proposed that the role of hope on PEBs depends on the type of hope explored. They found that 'false hope' based on beliefs about environmental issues being fixed by distant others (such as politicians or technology) was inversely related with PEBs. In contrast,

'constructive hope' (belief that one can individually or collectively act on climate change) was related to more PEBs. Our study did not explore this distinction; thus, our findings may be capturing both forms of hope. The role of false hope may explain the lack of direct association between eco-hope and PEBs.

The association of anger and hope with PEBs indicates that communications to promote PEBs could emphasise the injustice of the climate crisis that may promote eco-anger over other unpleasant emotions. Indeed, communications that emphasised public anger have been found to increase support for climate mitigation (Sabherwal et al., 2021). Eliciting hope in communications about the climate crisis has produced mixed results (Marlon et al., 2019), likely related to false hope potentially diminishing the urgency of change. As both hope and anger were associated with PEBs through problem-focused coping, it indicates that communications should include suggestions around problem-focused coping strategies to ensure the emotions elicited are channeled into constructive behaviours.

4.2 The role of coping

Eco-emotions also had differential relationships with coping styles, highlighting further the differential influence of unique eco-emotions on outcomes. The only exception was guilt, which was not associated with any of the coping strategies.

These findings support the hypothesis that the way in which a person copes with emotional responses may influence their outcomes. Problem-focused coping being associated with PEBs is consistent with other research (Ojala & Bengtsson, 2019; Wullenkord & Ojala, 2023). However, our findings do not support that meaning-focused coping is associated with more PEBs or that emotion-focused coping was inversely related to PEBs. Ojala & Bengtsson (2019) explored the role of de-emphasising as a form of emotion-focused coping, rather than distraction, as explored in the current study. De-emphasising the problem may prevent emotional experiences from occurring in the first place whereas distraction is a response to an unpleasant emotional experience. Without the emotional experience occurring, this may further decrease the likelihood of engaging in PEBs.

The reasons for divergence in findings regarding meaning-focused coping is less clear as the same measure was used. This measure included items about trusting organisations and government to effectively respond. In the development of the measure these were theorised to elicit pleasant emotions, such as hope (Ojala, 2012). Indeed, hope was associated with meaning-focused coping in this study. However, the type of hope may determine an increase or decrease in PEBs. As these items may be capturing hope in distant others (conceptualised as 'false hope') which has been found to be inversely related to PEBs (Marlon et al., 2019), this may account for the lack of association between meaning-focused coping and PEBs.

As these findings highlight the role of coping strategies on outcomes of emotional responses to the climate crisis, further research into potential coping strategies in relation to the climate crisis is warranted. Other coping strategies implicated in relation to the climate crisis include rumination, wishful thinking, resignation and expression of emotions (Helm et al., 2022). These other forms of coping could be explored in future research as to whether they influence the relationship between eco-emotions and PEBs.

4.3 The role of SES

Contrary to the hypothesis, SES did not moderate the relationship between unpleasant emotions and PEBs. SES moderated the relationship between hope and PEBs, this relationship was stronger for those lower in SES. However, this finding did not remain significant when controlling for other emotions. SES was not associated with unpleasant eco-emotions or PEBs, suggesting that emotional responses to the climate crisis may span socio-economic classes. These findings contrast with previous findings that higher SES is associated with increased PEBs (Grandin et al., 2022). The pro-environmental behaviours included in this study were low cost rather than intentions to donate, social activism or costly individual behaviours which may account for the differences. Further, this study only explored objective measures of SES when there is a debate around whether subjective SES is more important in influencing behaviours (Antonopolis, 2023). Further research could explore the relationship between subjective SES, unpleasant eco-emotions and PEBs.

4.4. Clinical Implications

Eco-emotions are not impairing or a mental health disorder in and of themselves (Hogg et al., 2021) and can lead to constructive as well as unconstructive outcomes. Therefore, interventions targeting unconstructive outcomes of eco-distress comes with the dilemma of not unintentionally reducing constructive outcomes. To achieve this delicate balance, clarifying what contributes to unconstructive and constructive outcomes is needed. Our findings highlight possible avenues that contribute to constructive outcomes.

Firstly, as eco-emotions appear to have differential influences on outcomes, psychoeducation about emotions generally, and eco-emotions specifically, may be beneficial in interventions aimed at reducing impairing outcomes of eco-distress. Psychoeducation around emotions is common across Cognitive Behavioural Therapies (CBT; Greenberg et al., 2019), however, action tendencies and behavioural responses related to unique emotions are particularly emphasised in Dialectical Behavioural Therapy (DBT; Linehan, 2015). The detail and specificity of emotion literacy in DBT may be helpful for individuals in understanding the impact of eco-emotions and when they lead to constructive or unconstructive outcomes. This understanding could enable individuals to helpfully respond to their emotional responses to the climate crisis. A pilot intervention for addressing impairing levels of eco-distress included identifying emotions and practicing channeling

emotions into meaningful action and the finding of the pilot have promising outcomes (Lindhe et al., 2023), suggesting clinicians working with individuals that have impairing eco-distress could incorporate psychoeducation and exploration of emotions in relation to climate crisis in their treatment plan.

Further, the findings highlight that promoting effective coping in interventions may be helpful in managing emotional responses while not having unintended impact on constructive outcomes. The relationship between anger and hope with problem-focused coping and PEBs has two implications; (1) these eco-emotions appear to foster problem-focused coping and (2) problem-focused coping is an effective coping strategy in promoting constructive outcomes for these emotions.

In relation to the first implication, eliciting activating emotions in interventions may promote effective coping and constructive outcomes. Eliciting hope is a key treatment component for mental health difficulties (Gallagher et al., 2020). Hope has generally been found to be associated with better psychological wellbeing and protective of poorer mental health outcomes (Ritschel & Sheppard, 2018). In the context of emotional responses to the climate crisis, having hope appears related to constructive outcomes such as PEBs. This suggests that eliciting constructive hope is a component of intervention that can be useful when working with people for whom eco-distress is impairing without unintentionally reducing constructive outcomes. This is consistent with findings from a scoping review of interventions for individuals who have eco-distress as part of their clinical presentation that found a common theme in interventions was fostering hope (Bauchen & Jachens, 2022) as was emotion focused interventions, encouraging clients to take action and join groups to aid emotional and social support, encouraging connecting with nature and cognitive interventions.

In relation to the second implication, promoting problem-focused coping for eco-anger could be a helpful approach in treatment for those who have impairing levels of eco-distress to ensure constructive outcomes of anger. Promoting problem-focused coping in therapy could include introducing problem-solving skills, a strategy included in cognitive behavioral therapy for management of problematic anger (Hollin & Bloxsom, 2007).

Sadness and fear in response to the climate crisis were associated with emotion-focused coping, specifically distraction. This form of coping was not associated with constructive outcomes. This is also consistent with appraisal theories of emotion and approach-avoidance motivation models. These emotions are deactivating, and associated with inaction, withdrawal or avoidance (Carver & Harmon-Jones, 2009). Indeed, distraction can be a form of avoidance if over-used (Walker et al., 2022). Avoidance has been implicated as a maintaining factor in various mental health difficulties such as anxiety and depression (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Johnson et al., 2003). Further, low approach motivation has also been implicated in depression (Jones and Day, 2008). The distraction and avoidance coping strategies that did not lead to constructive outcomes in

this study may also contribute to development of poorer mental health outcomes, suggesting that targeting avoidance and withdrawal in treatment with individuals presenting with impairing levels of eco-distress may be helpful addressing unconstructive outcomes and promoting constructive outcomes. Behavioural activation is often adopted to address withdrawal (Kennerley et al., 2017), thus using these therapeutic techniques may be helpful in the context of eco-distress. However, the hypothesis that avoidance and withdrawal contribute to unconstructive outcomes of eco-distress needs to be verified by future research.

Therefore, the findings of the study suggest that when working with individuals who have eco-distress as part of their clinical presentation, introducing emotion focused interventions, eliciting hope, promoting problem focused coping through problem solving skills may be helpful in promoting constructive outcomes. However, while this study suggests which coping strategies contribute to constructive outcomes and which do not, it did not explore these factors in relation to unconstructive outcomes such as impairment in daily living or poorer mental health. It is unclear whether the associated constructive outcomes found in this study are protective of potential poorer mental health outcomes. While some research has found that eco-anger does not contribute to poor mental health outcomes (Stanley et al., 2021) and that coping in relation to the eco-distress may be protective of mental health outcomes (Helm et al., 2022), future research is warranted to inform strategies to simultaneously promote constructive outcomes of eco-emotions and decrease unconstructive outcomes.

4.4 Strengths and limitations

Strengths of the study include furthering understanding of the relationship between eco-emotions and PEBs and what factors influence this relationship. Other strengths include the multiple sources of recruitment to reduce bias of recruitment methods, the range of emotions, the complex relationships explored between the study variables and the study was well powered.

Despite the contributions of this study, several limitations should be acknowledged. One key limitation is the use of cross-sectional design, which cannot establish causal relationships and is particularly limiting in relation to the mediational analysis. Cross-sectional designs can produce biased or inconsistent estimates of mediation effects when compared to longitudinal designs (Maxwell and Cole., 2007). Although there is strong theoretical and empirical support for the proposed pathways (Frijda, 1987; Lazarus 1991), this study cannot confirm the temporal order of these relationships. Future research using longitudinal designs is needed to better understand how eco-emotions influence coping and pro-environmental behaviour over time.

Other limitations include the non-representative sample, which limits the generalisability of findings to the general population. Further, the measures in the study were limited. The coping and PEBs questionnaires have only been demonstrated as valid and reliable in the original papers (Ojala &

Bengtsson, 2019; Whitmarsh et al., 2022) rather than established by validation studies. However, other papers have used these measures and found similar findings to the original study suggesting the measures are reliable (Daeninck et al., 2023). Some of the measures used were only one item such as hope and guilt. Single item measures are psychometrically inferior to multi-item measures in terms of validity and reliability (Gosling et al., 2003). Future research could explore a range of eco-emotions with multi-item measures such as the Inventory of Climate Emotions (Marczak et al., 2023). The emotion-focused subscale was also only a two-item measure, which may account for the lack of association with PEBs. However, as research into emotions and coping in relation to the climate crisis is relatively new (Baudon & Jachens, 2021) the availability of valid and reliable measures is limited (Owczarek et al., 2025).

5. Conclusions

We found evidence of differential impacts of eco-emotions on pro-environmental behaviours. Eco-anger was associated with pro-environmental behaviours over and above other emotional responses (guilt, sadness, anxiety and fear). Eco-hope had an indirect relationship with pro-environmental behaviours. Moreover, problem-focused coping mediated this relationship, suggesting that coping strategies for emotional responses to the climate crisis influences whether eco-emotions have constructive outcomes. Promoting effective coping for eco-emotions may increase constructive outcomes. These findings suggest that longitudinal research into the complex relationships between eco-emotions, coping styles and constructive vs unconstructive outcomes would be an important research endeavor.

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Supplementary Materials

As referenced in the main text, regression analysis with control variables and the moderated mediation analyses that were not significant were placed in the supplementary materials. This was to preserve the main text for the main findings. Further, in the introduction of the empirical paper, it was outlined that socio-demographic variables would be explored, however there was not a specific hypothesis about the role of socio-demographic variables and the focus of the paper was eco-emotions, coping and socio-economic status. Therefore, the majority of the findings about demographic variables have been placed in supplementary materials. At times the eco-emotions are not broken down into individual eco-emotions in the main text, instead the results show findings related to a collation of the unpleasant emotions. This is due to the steps of the analysis first explored the effect of emotions generally before exploring the role of the unique emotions. Where there was not a significant finding at the general level, or if the results are not directly related to the study's hypotheses, the unique emotions were not reported on in the main text. However please see the analyses below.

Regression analysis controlling for demographic variables

Table S1

Regression analysis exploring the relationship between eco-emotions and pro-environmental behaviours with demographic variables as controls

	B	*SE*	*Beta*	*t*	*p*	*95% CI*
Anger	0.65	0.22	0.23	2.95	.004	[0.21, 1.09]
Anxiety	0.15	0.3	0.05	0.48	.63	[-0.45, 0.74]
Fear	0.31	0.33	0.1	0.94	.35	[-0.34, 0.96]
Sadness	0.14	0.29	0.004	0.05	.96	[-0.55, 0.58]
Guilt	0.05	0.18	0.02	0.28	.78	[-0.3, 0.4]
Hope	0.19	0.13	0.06	1.42	.16	[-0.07, 0.45]
Gender	1.15	0.37	0.13	3.07	.002	[0.41, 1.88]
Age	0.03	0.02	0.08	1.76	.08	[-0.003, 0.07]

Table S2

Regression analysis exploring the relationship between eco-emotions and pro-environmental behaviours controlling for recruitment method

	B	*SE*	*Beta*	*t*	*p*	*95% CI*
Anger	0.49	0.22	0.17	2.23	.03	[0.06, 0.94]
Anxiety	0.24	0.3	0.08	0.79	.43	[-0.35, 0.82]
Fear	0.17	0.33	0.06	0.52	.60	[-0.47, 0.81]
Sadness	-0.05	0.28	-0.01	-0.16	.87	[-0.06, 0.51]
Guilt	0.05	0.17	0.02	0.3	.77	[-0.29, 0.39]
Hope	0.24	0.13	0.07	1.8	.07	[-0.02, 0.49]
Recruitment method	-2.03	0.46	-0.2	-4.47	<.001	[-2.93, -1.14]

Moderated mediation analysis

Table S3

Moderated mediation – SES and anger

	B	SE	*t*	*p*	95% CI
Moderation of a pathway (PFC)					
Anger	0.19	0.03	5.71	<.001*	[0.004, 0.08]
SES	0.04	0.02	2.25	.03*	[0.01, 0.08]
Anger*SES	-0.01	0.01	-0.87	.39	[-0.03, 0.01]
Moderation of a pathway (EFC)					
Anger	-0.12	0.05	-2.67	.01*	[-0.21, -0.03]
SES	-0.04	0.03	-1.49	.14	[-0.09, 0.01]
Anger*SES	-0.01	0.02	-0.73	.47	[-0.04, 0.02]
Moderation of a pathway (MFC)					
Anger	-0.01	0.03	-0.4	.69	[-0.07, 0.04]
SES	0.05	0.02	3.05	.002*	[0.02, 0.08]
Anger*SES	-0.02	0.01	-1.79	.07	[-0.03, 0.002]
Moderation of b pathway (PEB)					
Anger*SES	0.08	0.09	0.84	.40	[-0.1, 0.25]
SES*PFC	0.08	0.18	0.46	.65	[-0.27, 0.44]
SES*EFC	-0.03	0.13	-0.27	.79	[-0.28, 0.21]
SES*MFC	0.01	0.19	0.07	.95	[-0.36, 0.39]

*Notes. SE = standard error of B, CI = confidence intervals, SES = socio-economic status, PFC = problem-focused coping, EFC = emotion focused coping, MFC = Meaning focused coping, PEB = Pro-environmental behaviours *indicates significance*

Table S4

Moderated mediation (SES and Anxiety)

	B	**SE**	***t***	***p***	**95% CI**
Moderation of a pathway (PFC)					
Anxiety	0.04	0.05	0.89	.37	[-0.05, 0.14]
SES	0.04	0.02	2.25	.03*	[0.01, 0.08]
Anxiety*SES	-0.01	0.02	-1.05	.29	[-0.03, 0.01]
Moderation of a pathway (EFC)					
Anxiety	0.03	0.06	0.51	.61	[-0.09, 0.16]
SES	-0.04	0.03	-1.44	.15	[-0.09, 0.01]
Anxiety*SES	-0.01	0.01	-0.56	.72	[-0.03, 0.02]
Moderation of a pathway (MFC)					
Anxiety	0.08	0.04	2.02	.04	[0.002, 0.15]
SES	0.05	0.02	3.17	.002*	[0.02, 0.08]
Anxiety*SES	-0.01	0.01	-1.2	.23	[-0.03, 0.007]
Moderation of b pathway (PEB)					
Anxiety*SES	0.04	0.09	0.51	.61	[-0.06, 0.26]
SES*PFC	0.12	0.18	0.64	.53	[-0.24, 0.47]
SES*EFC	-0.03	0.13	-0.21	.84	[-0.28, 0.22]
SES*MFC	-0.01	0.19	-0.04	.97	[-0.38, 0.36]

*Notes. SE = standard error of B, CI = confidence intervals, SES = socio-economic status, PFC = problem-focused coping, EFC = emotion focused coping, MFC = Meaning focused coping, PEB = Pro-environmental behaviours, *indicates significance*

Table S5

Moderated mediation – SES and fear

	B	**SE**	***t***	***p***	**95% CI**
Moderation of a	**pathway**	**(PFC)**			
Fear	0.01	0.05	0.16	.88	[-0.09, 0.11]
SES	0.04	0.02	2.25	.03*	[0.01, 0.08]
Fear*SES	-0.01	0.01	-0.90	.37	[-0.03, 0.06]
Moderation of a	**pathway**	**(EFC)**			
Fear	0.15	0.07	2.18	.03*	[0.02, 0.29]
SES	-0.04	0.03	-1.44	.15	[-0.09, 0.01]
Fear*SES	-0.001	0.02	-0.06	.96	[-0.03, 0.03]
Moderation of a	**pathway**	**(MFC)**			
Fear	-0.05	0.04	-1.13	.26	[-0.13, 0.04]
SES	0.05	0.02	3.17	.002*	[0.02, 0.08]
Fear*SES	-0.01	0.01	-1.37	.17	[-0.03, 0.01]
Moderation of b	**pathway**	**(PEB)**			
Fear*SES	0.11	0.09	1.13	.26	[-0.08, 0.29]
SES*PFC	0.05	0.18	0.29	.77	[-0.31, 0.41]
SES*EFC	-0.06	0.13	-0.45	.66	[-0.31, 0.2]
SES*MFC	0.02	0.19	0.11	.92	[-0.35, 0.39]

*Notes: SE = standard error of B, CI = confidence intervals, SES = socio-economic status, PFC = problem-focused coping, EFC = emotion focused coping, MFC = Meaning focused coping, PEB = Pro-Environmental Behaviours, *indicates significance*

Table S6

Moderated mediation – SES and sadness

	B	**SE**	***t***	***p***	**95% CI**
Moderation of a	**pathway**	**(PFC)**			
Sadness	0.08	0.04	1.81	.07	[-0.01, 0.17]
SES	0.04	0.02	2.23	.03*	[0.01, 0.08]
Sadness*SES	-0.01	0.01	-0.57	.57	[-0.04, 0.02]
Moderation of a	**pathway**	**(EFC)**			
Sadness	0.14	0.06	2.31	.02*	[0.02, 0.26]
SES	-0.04	0.03	-1.43	.15	[-0.09, 0.01]
Sadness*SES	0.002	0.02	0.1	.92	[-0.04, 0.04]
Moderation of a	**pathway**	**(MFC)**			
Sadness	-0.03	0.04	-0.72	.47	[-0.1, 0.05]
SES	0.05	0.02	3.13	.002*	[0.02, 0.08]
Sadness*SES	-0.01	0.01	-0.37	.71	[-0.06,0.04]
Moderation of b	**pathway**	**(PEB)**			
Sadness*SES	0.13	0.11	1.14	.26	[-0.1, 0.36]
SES*PFC	0.05	0.18	0.29	.78	[-0.31, 0.41]
SES*EFC	-0.06	0.13	-0.45	.65	[-0.31, 0.2]
SES*MFC	0.03	0.19	0.13	.89	[-0.35, 0.4]

*Notes: SE = standard error of B, CI = confidence intervals, SES = socio-economic status, PFC = problem-focused coping, EFC = emotion focused coping, MFC = Meaning focused coping, *indicates significance*

Table S7

Moderated mediation – SES and guilt

	B	**SE**	***t***	***p***	**95% CI**
Moderation of a	**pathway**	**(PFC)**			
Guilt	0.002	0.03	0.07	.95	[-0.05, 0.06]
SES	0.05	0.02	2.34	.02*	[0.01, 0.08]
Guilt*SES	-0.03	0.01	-2.54	.01*	[-0.03, 0.01]
Moderation of a	**pathway**	**(EFC)**			
Guilt	0.03	0.04	0.78	.44	[-0.04, 0.1]
SES	-0.04	0.03	-1.47	.14	[-0.09, 0.01]
Guilt*SES	0.02	0.02	1.02	.31	[-0.02, 0.05]
Moderation of a	**pathway**	**(MFC)**			
Guilt	0.03	0.02	1.43	.15	[-0.01, 0.08]
SES	0.05	0.02	3.2	.001*	[0.02, 0.08]
Guilt*SES	-0.01	0.01	-1.02	.31	[-0.03, 0.01]
Moderation of b	**pathway**	**(PEB)**			
Guilt*SES	-0.003	0.09	-0.03	.98	[-0.17, 0.17]
SES*PFC	0.17	0.17	0.99	.32	[-0.17, 0.51]
SES*EFC	-0.01	0.13	-0.05	.96	[-0.25, 0.24]
SES*MFC	-0.02	0.19	-0.11	.91	[-0.39, 0.35]

Notes. SE = standard error of B, CI = confidence intervals, SES = socio-economic status, PFC = problem-focused coping, EFC = emotion focused coping, MFC = Meaning focused coping, *indicates significance

Although there was a significant interaction between guilt and SES on problem focused coping, when exploring the effect at one standard deviation above and below the mean, there was no significant difference at the different levels

Table S8

Moderated mediation - Gender and Anger

	B	SE	*t*	*p*	95% CI
Moderation of a	**pathway**	**(PFC)**			
Anger	0.2	0.04	5.23	<.001	[0.12, 0.27]
Gender	0.14	0.07	1.9	.06	[-0.005, 0.28]
Anger*Gender	-0.02	0.04	-0.44	.66	[-0.1, 0.07]
Moderation of a	**pathway**	**(EFC)**			
Anger	-0.14	0.05	-2.83	0.005	[-0.24, -0.04]
Gender	0.05	0.1	0.49	.62	[-0.14, 0.23]
Anger*Gender	-0.17	0.06	-2.93	0.004*	[-0.28, -0.06]
Moderation of a	**pathway**	**(MFC)**			
Anger	-0.03	0.03	-0.89	.37	[-0.09, 0.03]
Gender	-0.11	0.06	-1.82	0.07	[-0.22, 0.01]
Anger*Gender	-0.05	0.04	-1.32	.19	[-0.12, 0.02]
Moderation of b	**pathway**	**(PEB)**			
Anger*Gender	-0.43	0.33	-1.3	.19	[-1.07, 0.22]
Gender*PFC	0.24	0.64	0.37	.71	[-1.02, 1.5]
Gender*EFC	0.5	0.45	1.09	.28	[-0.4, 1.39]
Gender*MFC	-0.98	0.68	-1.44	.15	[-2.31, 0.35]

Notes. SE = standard error of Beta, CI = confidence intervals, SES = socio-economic status, PFC = problem-focused coping, EFC = emotion focused coping, MFC = Meaning focused coping, PEB = Pro-environmental behaviours, *indicates significance

Table S9

Moderated mediation – Gender and Hope

	B	SE	*t*	*p*	95% CI
Moderation of a	**pathway**	**(PFC)**			
Hope	0.15	0.02	6.08	<.001	[0.1, 0.19]
Gender	0.14	0.07	1.9	.06	[-0.003, 0.27]
Hope*Gender	0.03	0.04	0.74	.46	[-0.05, 0.12]
Moderation of a	**pathway**	**(EFC)**			
Hope	-0.04	0.03	-1.52	0.13	[-0.1, 0.01]
Gender	0.08	0.1	0.82	.41	[-0.11, 0.27]
Hope*Gender	0.003	0.06	-0.05	0.96	[-0.11, 0.12]
Moderation of a	**pathway**	**(MFC)**			
Hope	0.2	0.02	11.6	<.001	[0.17, 0.24]
Gender	-0.11	0.06	-1.82	0.07	[-0.22, 0.01]
Hope*Gender	-0.004	0.04	-0.1	.92	[-0.07, 0.07]
Moderation of b	**pathway**	**(PEB)**			
Hope*Gender	0.45	0.31	1.47	.14	[-0.15, 1.06]
Gender*PFC	-0.31	0.54	-0.58	.56	[-1.38, 0.75]
Gender*EFC	0.46	0.45	1.04	.3	[-0.41, 1.34]
Gender*MFC	-1.27	0.73	-1.74	.08	[-2.71, 0.17]

Notes. SE = standard error of B, CI = confidence intervals, SES = socio-economic status, PFC = problem-focused coping, EFC = emotion focused coping, MFC = Meaning focused coping, *indicates significanc**e**

Additional analyses of socio-demographic variables

Table S1

Correlations between demographic variables and study variables

Variables	PEB	PFC	EFC	MFC
Gender[1]	.24***	.22***	.16***	-.10*
Age	-.07	-.14***	-.32***	-.01
Ethnicity[2]	.03	.17***	.06	.13*
Income	.03	.02	-.09*	.16***
Education	.095*	.14***	.01	.11*
SES	.09	.09*	-.06	.17**
Parental status[3]	-.003	-.03	-.19***	.07

*PEB = pro-environmental behaviours, PFC = problem-focused coping, EFC = emotion focused coping, MFC = meaning focused coping, SES = socioeconomic status index, [1]Gender reference variable, 0 = Male. [2]Ethnicity reference variable, 0 = White British, [3]Parental status reference variable, 0 = Non-parent. * = p < .05, ** = p < 0.01, *** = p < .001*

Demographic variables – differences in coping styles

Men reported engaging in more meaning focused coping (*M* = 2.87, *SD* = 0.74) compared to women and minority genders (*M* = 2.73, *SD* = 0.62) and this difference was significant *t*(524) = 2.24, p = .03, whereas women and minority genders reported engaging in more problem-focused coping (*M* = 2.86, *SD* = 0.91) compared to men (*M* = 2.55, *SD* = 0.88), which was significant *t*(525) = -3.69, p < .001 and emotion-focused coping (M_{women} = 2.87, M_{men} = 2.62), *t*(524) = -2.57, p = .005.

Higher socio-economic status index scores were associated with more meaning-focused coping strategies (*r* = .17, *p* <.001) and problem-solving coping strategies (*r* = .09, *p* = .04) but socio-economic status was not associated with emotion-focused coping (*r* = -.06, *p* = .14).

Younger participants reported engaging in more emotion-focused coping strategies (*r* = -.32, *p* <.001) and problem focused coping (*r* = -.14, p < .001) but age was not correlated with meaning-focused coping (*r* = -.008, p = .85).

Demographic variables – differences in individual eco-emotions

Table S2

Correlations between continuous demographic variables and eco-emotions

	Anger	Anxiety	Fear	Sadness	Guilt	Hope
Age	-.28***	-.33***	-.35***	-.28***	-.23***	.06
SES	-.03	.01	.06	.01	.04	.06

Notes. ****p < .001*

Table S3

Means, standard deviations and t-tests for demographic variables and eco-emotions

	M (SD)	*t*	*p*
Anger			
Gender			
Male	2.65 (1.56)		
Female	3.15 (1.64)	-3.21	<.001
Parental status			
Parent	2.75 (1.6)		
Non-parent	3.48 (1.78)	4.83	<.001
Anxiety			
Gender			
Male	2.92 (1.71)		
Female	3.49 (1.67)	-3.53	<.001
Parental status			
Parent	0.03 (1.77)		
Non-parent	3.76 (1.65)	4.78	<.001
Fear[+]			
Gender			
Male	2.93 (1.47)		
Female	2.34 (1.56)	-4.08	<.001
Parental status			
Parent	2.15 (1.52)		
Non-parent	3.18 (1.67)	4.86	<.001
Sadness			
Gender			
Male	2.39 (1.23)		
Female	2.71 (1.3)	-2.57	.001
Parental status[+]			
Parent	2.39 (1.2)		
Non-parent	2.98 (1.43)	5.16	<.001
Guilt			
Gender			
Male	2.39 (1.47)		
Female	3.06 (1.61)	-4.45	<.001
Parental status			
Parent	2.71 (1.56)		
Non-parent	3.09 (1.67)	2.64	.004
Hope			
Gender			
Male	3.08 (1.62)		
Female	2.79 (1.49)	1.97	.02
Parental status			
Parent	2.65 (1.59)		
Non-parent	3.18 (1.44)	-3.99	<.001

[+]Equal variance not assumed reported

Appendix A – Journal specifications

Journal specifications

Accessed from [on 21st April 2025] https://www.sciencedirect.com/journal/journal-of-environmental-psychology/publish/guide-for-authors

Introduction

The Journal of Environmental Psychology is the premier journal in the field, serving individuals in a wide range of disciplines who have an interest in the scientific study of the transactions and interrelationships between people and their surroundings (including built, social, natural, and virtual environments, the use and abuse of nature and natural resources, and sustainability-related behavior). The journal publishes internationally contributed empirical studies and systematic and meta-analytic reviews of research on these topics that advance new insights.

As an important forum for the field, the journal publishes some of the most influential papers in the discipline that reflect the scientific development of environmental psychology. Contributions on theoretical, methodological, and practical aspects of all human-environment interactions are welcome, along with innovative or interdisciplinary approaches that have a psychological emphasis.

Research areas include:

•Psychological and behavioral aspects of people and nature

•Cognitive mapping, spatial cognition and wayfinding

•Ecological consequences of human actions

•Theories of place, place attachment, and place identity

•Environmental risks and hazards: perception, behavior, and management

•Perception and evaluation of buildings and natural landscapes

•Effects of physical and natural settings on human cognition, health, and well-being

•Theories of pro-environmental behavior, norms, attitudes, and personality

•Psychology of sustainability and climate change

•Psychological aspects of resource management and crises

•Social use of space: crowding, privacy, territoriality, personal space

•Design of, and experiences related to, the physical aspects of workplaces, schools, residences, public buildings and public space

The journal does not typically publish highly exploratory, descriptive case studies, narrative reviews, or rapid scoping reviews. The desk rejection rate of the Journal of Environmental Psychology is about 75%.

Submission checklist

You can use this list to carry out a final check of your submission before you send it to the journal for review. Please check the relevant section in this Guide for Authors for more details.

Ensure that the following items are present:

One author has been designated as the corresponding author with contact details:

- E-mail address
- Full postal address

All necessary files have been uploaded:

- Manuscript
- Include keywords
- All figures (include relevant captions)
- All tables (including titles, description, footnotes)
- Ensure all figure and table citations in the text match the files provided; Indicate clearly if color should be used for any figures in print
- Graphical Abstracts / Highlights files (where applicable)
- Supplemental files (where applicable)

Further considerations:

- Manuscript has been 'spell checked' and 'grammar checked'
- All references mentioned in the Reference List are cited in the text, and vice versa
- Permission has been obtained for use of copyrighted material from other sources (including the Internet)
- A competing interests statement is provided, even if the authors have no competing interests to declare
- Journal policies detailed in this guide have been reviewed

Declaration of interest

All authors must disclose any financial and personal relationships with other people or organizations that could inappropriately influence (bias) their work. Examples of potential competing interests

include employment, consultancies, stock ownership, honoraria, paid expert testimony, patent applications/registrations, and grants or other funding. Authors must disclose any interests in two places: 1. A summary declaration of interest statement in the title page file (if double anonymized) or the manuscript file (if single anonymized). If there are no interests to declare then please state this: 'Declarations of interest: none'. 2. Detailed disclosures as part of a separate Declaration of Interest form, which forms part of the journal's official records. It is important for potential interests to be declared in both places and that the information matches.

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The below guidance only refers to the writing process, and not to the use of AI tools to analyse and draw insights from data as part of the research process.

Where authors use generative artificial intelligence (AI) and AI-assisted technologies in the writing process, authors should only use these technologies to improve readability and language. Applying the technology should be done with human oversight and control, and authors should carefully review and edit the result, as AI can generate authoritative-sounding output that can be incorrect, incomplete or biased. AI and AI-assisted technologies should not be listed as an author or co-author, or be cited as an author. Authorship implies responsibilities and tasks that can only be attributed to and performed by humans, as outlined in Elsevier's AI policy for authors.

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Statement: During the preparation of this work the author(s) used [NAME TOOL / SERVICE] in order to [REASON]. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication

This declaration does not apply to the use of basic tools for checking grammar, spelling, references etc. If there is nothing to disclose, there is no need to add a statement.

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Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Resources; Software; Supervision; Validation; Visualization; Roles/Writing - original draft; and Writing - review & editing. Note that not all roles may apply to every manuscript, and authors may have contributed through multiple roles. More details and an example.

Submission

Our online submission system guides you stepwise through the process of entering your article details and uploading your files. The system converts your article files to a single PDF file used in the peer-review process. Editable files (e.g., Word, LaTeX) are required to typeset your article for final publication. All correspondence, including notification of the Editor's decision and requests for revision, is sent by e-mail.

Submission Site for Journal of Environmental Psychology

Please submit your paper at: https://www.editorialmanager.com/JEVP/default.aspx

Manuscript Elements And Formatting Requirements

All manuscripts must contain the essential elements needed to convey your manuscript, including: Abstract, Keywords, Introduction, Materials and Methods, Results, Conclusions, References, Appendices, Tables and Figures with Captions, and any Relevant Artwork.

In addition, we encourage all original submissions to conform to the American Psychological Association style (see the Publication Manual of the American Psychological Association, 7th ed.). Figures and Tables should be embedded in the main manuscript file next to the relevant text (not separately at the end).

Methods And Results

To ensure high reproducibility standards in the field of environmental psychology, whenever possible, all manuscripts should include and report; a) confidence intervals, b) effect-sizes, c) appropriately visualize raw (experimental) data with error bars, d) include a power analysis or discussion of how sample size was determined, and e) include a clear statement or discussion of institutional ethics review and approval.

In addition, descriptive statistics must be clearly reported, including standard deviations, correlations, and exact sample sizes for each cell in experimental designs. In general, it is preferred that exact p-values are reported. Exploratory research is welcome but should be explicitly labelled as such to avoid Hypothesizing After Results are Known (HARKing). All submissions require a data availability statement. To further facilitate transparency, analyses should be reported with and without exclusion criteria, outliers, and covariates. Guidelines on mediation and moderation analysis are more complicated, please see our editorial on how to best report such results in the Journal of Environmental Psychology.

Reference

References should also conform to the American Psychological Association guidelines (see the Publication Manual of the American Psychological Association, 7th ed.). Numbered reference systems should be avoided. Use of DOI is generally encouraged. The reference style used by the journal will be applied to the accepted article by Elsevier at the proof stage. Note that missing data will be highlighted at proof stage for the author to correct.

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All manuscripts must contain the essential elements needed to convey your manuscript, for example Abstract, Keywords, Introduction, Materials and Methods, Results, Conclusions, Artwork and Tables with Captions.

If your article includes any Videos and/or other Supplementary material, this should be included in your initial submission for peer review purposes.

Divide the article into clearly defined sections.

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Please ensure the figures and the tables included in the single file are placed next to the relevant text in the manuscript, rather than at the bottom or the top of the file. The corresponding caption should be placed directly below the figure or table.

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Authors may choose among five different types of submissions:

1. Empirical research articles: These submissions are complete reports of original research. Rationale, methods, findings, and conclusions discussed with limitations and potential real world significance should be included.

a. Single-study articles: The word limit for this submission type is 7,000 words.

b. Multiple-studies articles: These submissions may involve experimental, meta-analytical, or cross-cultural research. The word limit for this submission type is 10,000 words.

2. Review articles: These submissions are substantial overviews of original research. While JEVP is open to narrative reviews, the journal prioritizes reviews that utilize meta-analytic techniques. The word limit for this submission type is 10,000 words.

3. Brief empirical notes: These submissions are often a brief report, or a commentary on an article, supported with data. The word limit is 3,000 words.

Letters to the Editor: These are short statements of thoughtful opinion meant to advance the field of environmental psychology and draw attention to a particular topic. The word limit is 1,000 words.

Please note that the word limit refers to the body of the manuscript and does not include references and other sections like figures and tables.

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This journal uses double anonymized review, which means the identities of the authors are concealed from the reviewers, and vice versa. More information is available on our website. To facilitate this, please include the following separately:

Title page (with author details): This should include the title, authors' names, affiliations, acknowledgements and any Declaration of Interest statement, and a complete address for the corresponding author including an e-mail address.

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Sections

Divide your article into clearly defined and numbered sections. Subsections should be numbered 1.1 (then 1.1.1, 1.1.2, ...), 1.2, etc. (the abstract is not included in section numbering). Use this numbering also for internal cross-referencing: do not just refer to 'the text'. Any subsection may be given a brief heading. Each heading should appear on its own separate line.

Appendices

If there is more than one appendix, they should be identified as A, B, etc. Formulae and equations in appendices should be given separate numbering: Eq. (A.1), Eq. (A.2), etc.; in a subsequent appendix, Eq. (B.1) and so on. Similarly for tables and figures: Table A.1; Fig. A.1, etc.

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Title. Concise and informative. Titles are often used in information-retrieval systems. Avoid abbreviations and formulae where possible.

Author names and affiliations. Please clearly indicate the given name(s) and family name(s) of each author and check that all names are accurately spelled. You can add your name between parentheses in your own script behind the English transliteration. Present the authors' affiliation addresses (where the actual work was done) below the names. Indicate all affiliations with a lower-case superscript letter immediately after the author's name and in front of the appropriate address. Provide the full postal address of each affiliation, including the country name and, if available, the e-mail address of each author.

Corresponding author. Clearly indicate who will handle correspondence at all stages of refereeing and publication, also post-publication. This responsibility includes answering any future queries about Methodology and Materials. Ensure that the e-mail address is given and that contact details are kept up to date by the corresponding author.

Present/permanent address. If an author has moved since the work described in the article was done, or was visiting at the time, a 'Present address' (or 'Permanent address') may be indicated as a footnote to that author's name. The address at which the author actually did the work must be retained as the main, affiliation address. Superscript Arabic numerals are used for such footnotes.

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Highlights are mandatory for this journal as they help increase the discoverability of your article via search engines. They consist of a short collection of bullet points that capture the novel results of your research as well as new methods that were used during the study (if any). Please have a look at the example Highlights.

Highlights should be submitted in a separate editable file in the online submission system. Please use 'Highlights' in the file name and include 3 to 5 bullet points (maximum 85 characters, including spaces, per bullet point).

Abstract

A concise and factual abstract is required. The abstract should state briefly the purpose of the research, the principal results and major conclusions. An abstract is often presented separately from the article, so it must be able to stand alone. For this reason, References should be avoided, but if essential, then cite the author(s) and year(s). Also, non-standard or uncommon abbreviations should be avoided, but if essential they must be defined at their first mention in the abstract itself.

Keywords

Immediately after the abstract, provide a maximum of 6 keywords, using British spelling and avoiding general and plural terms and multiple concepts (avoid, for example, 'and', 'of'). Be sparing with abbreviations: only abbreviations firmly established in the field may be eligible. To maximise discoverability, use terms and words that are not already in the manuscript's title and abstract as keywords. Consider the terms that potential readers may use to search for work on this topic that do not already appear in the title and abstract. Include synonyms and related terms to cover different variations of how readers might search for your topic. Specific keywords target niche audiences, while broad keywords increase the chances of your article reaching a wider audience. These keywords will be used for indexing purposes.

Acknowledgements

Acknowledgements should be submitted in the title page of the submission. They should not be included in the main source file. List here those individuals who provided help during the research (e.g., providing language help, writing assistance or proof reading the article, etc.).

Footnotes

Footnotes should be used sparingly. Number them consecutively throughout the article. Many word processors build footnotes into the text, and this feature may be used. Should this not be the case, indicate the position of footnotes in the text and present the footnotes themselves separately at the end of the article.

Tables

Please submit tables as editable text and not as images. Tables can be placed either next to the relevant text in the article, or on separate page(s) at the end. Number tables consecutively in accordance with their appearance in the text and place any table notes below the table body. Be sparing in the use of tables and ensure that the data presented in them do not duplicate results described elsewhere in the article. Please avoid using vertical rules and shading in table cells.

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Journal names should be abbreviated according to the List of Title Word Abbreviations.

Supplementary material

Supplementary material such as applications, images and sound clips, can be published with your article to enhance it. Submitted supplementary items are published exactly as they are received (Excel or PowerPoint files will appear as such online). Please submit your material together with the article and supply a concise, descriptive caption for each supplementary file. If you wish to make changes to supplementary material during any stage of the process, please make sure to provide an updated file. Do not annotate any corrections on a previous version. Please switch off the 'Track Changes' option in Microsoft Office files as these will appear in the published version.

Data statement

To foster transparency, we encourage you to state the availability of your data in your submission. This may be a requirement of your funding body or institution. If your data is unavailable to access or unsuitable to post, you will have the opportunity to indicate why during the submission process, for example by stating that the research data is confidential. The statement will appear with your published article on ScienceDirect. For more information, visit the Data Statement page.

Data linking

If you have made your research data available in a data repository, you can link your article directly to the dataset. Elsevier collaborates with a number of repositories to link articles on ScienceDirect with relevant repositories, giving readers access to underlying data that gives them a better understanding of the research described.

There are different ways to link your datasets to your article. When available, you can directly link your dataset to your article by providing the relevant information in the submission system. For more information, visit the database linking page.

For supported data repositories a repository banner will automatically appear next to your published article on ScienceDirect.

In addition, you can link to relevant data or entities through identifiers within the text of your manuscript, using the following format: Database: xxxx (e.g., TAIR: AT1G01020; CCDC: 734053; PDB: 1XFN).

Appendix B – Search strategy

PsycINFO / MedLine / CINAHL

TI / AB (climate anxiety OR eco anxiety OR environmental anxiety OR eco grief OR eco guilt OR eco sadness OR eco depression OR eco anger OR climate grief OR climate guilt OR climate depression OR climate anger)

Research Question 1: AND association

Research Question 2: AND predict*

Scopus

TITLE-ABS-KEY("climate change anxiety" OR “Climate anxiety” OR "eco anxiety" OR "environmental anxiety" OR "eco grief" OR "eco guilt" OR "eco sadness" OR “eco anger” OR “climate grief” OR “climate guilt” OR “climate depression” or “climate anger”)

Research Question 1: AND "association"

Research Question 2: AND “predict*”

Web of Science

Search field: Title / Abstract

climate anxiety OR eco anxiety OR environmental anxiety OR eco grief OR eco guilt OR eco sadness OR eco depression OR eco anger OR climate grief OR climate guilt OR climate depression OR climate anger

Research Question 1: AND association

Research Question 2: AND predict*

PubMed

Climate change anxiety[tiab] OR climate anxiety[tiab] OR eco anxiety[tiab] OR environmental anxiety[tiab] OR eco grief[tiab] OR eco guilt[tiab] OR eco sadness[tiab] OR eco anger[tiab] OR eco depression[tiab] OR climate grief[tiab] OR Climate guilt[tiab] OR climate anger[tiab] OR climate depression[tiab]

Appendix C - Inclusion and exclusion protocol

	Inclusion	Exclusion
Participants	Child and adult general populations	Non-human studies
Method – design	Quantitative studies Cross sectional Longitudinal* Prospective	Case study designs Qualitative studies Mixed method design studies
Method – statistical analysis	Linear regression Logistic regression Multiple linear regression Multinomial regression Structural equation modelling Generalised Linear modelling Any other statistical analysis that allows for inferences regarding predictive relationships	Statistical analysis that does not allow for inferences regarding predictive relationships e.g. Correlation ANOVA ANCOVA T-tests Or any non-parametric equivalent If not a longitudinal study or also including a regression analysis
Outcome	Eco-distress (negative emotions related to climate change) as the dependent variable	Cognitive only concepts related to climate change (e.g. eco-worry, eco-concern, climate change beliefs) Positive emotions related to climate change Pro-environmental beliefs as the DV Eco-distress is the predictor variable Mediation/moderation studies where eco-distress is not the DV (e.g. eco-distress is the moderator/mediator variable)
Other	Published in English Published after 2017	No translation into English Published before 2017

*Longitudinal or prospective studies are prioritised above other criteria

Appendix D – Quality Assessments

AXIS contains a checklist of 20 items related to common biases and pitfalls in scientific studies using cross-sectional methodology. Users of the tool mark 'yes,' 'no,' and 'don't know' next to each iteam. This tool was used as it is intended to be used with flexibility as necessary, and this review adopted the procedure outlined by Colombo and colleagues (2023) that excluded two items of the checklist (item number five regarding the sample frame and item number 14 regarding non-responders) and converted the item responses to quantify the risk of bias. Namely 'yes' was converted to 2, 'don't know' was converted to 1 and 'no' was converted to 0. A percentage score was then calculated measuring the level of bias, with between 0 and 33% indicating low bias; between 33 and 66% indicating medium bias; and between 66 and 100% indicating high bias.

Criteria item	Asgarizadeh et al (2023)	Baskaya et al (2024)	Cameron & Kagee (2025)	Chan et al (2024)	Eren & Yildaz (2024)	Feather & Williams (2022)	Hajek & Konig (2022)	Hajek & Konig (2024)	Jalin et al (2024)	Jaśkiewicz et al (2023)	Kotera et al (2024)	Li et al (2025)	Maduneme (2024)	Mat & Yilmaz (2024)	Ogunbode et al (2022)	Parmentier et al (2024)	Patrick et al (2023)	Prencipe et al (2023)	Ramírez-López et al (2023)	Reese et al (2023)	Smith et al (2023)	Tucholska (2024)	Whitmarsh et al (2022)	Wullenkord et al (2024)
1	2	2	2	2	2	2	0	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
3	0	2	1	1	0	2	1	0	0	2	0	1	2	1	1	1	0	1	0	2	2	0	0	2
4	1	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2
6	0	0	1	1	1	1	1	1	0	0	0	1	1	1	1	2	0	2	1	0	0	0	1	1
7	0	0	0	0	0	0	1	0	0	0	0	0	0	2	1	0	1	0	0	0	0	0	0	0
8	2	2	1	2	2	2	1	2	2	2	2	1	2	2	2	2	2	2	2	1	1	1	1	2
9	2	2	2	1	2	2	1	2	1	1	2	1	1	1	1	2	1	1	1	2	2	1	1	1
10	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
11	2	2	1	1	2	2	1	2	2	0	0	1	1	2	2	2	1	1	2	1	1	1	2	2
12	2	2	2	2	2	2	2	2	2	0	2	2	2	2	2	2	2	2	2	2	2	0	2	2
13	1	1	1	0	2	1	1	0	1	1	1	0	1	2	1	1	1	2	1	1	2	1	1	1
15	2	2	2	2	2	1	2	2	2	2	2	2	2	2	1	2	2	2	2	2	1	2	2	2
16	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
17	2	2	2	2	2	2	2	2	2	2	1	2	2	1	2	2	2	2	2	2	2	2	2	2
18	2	2	1	2	2	2	1	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
19	1	2	2	2	2	1	2	2	1	1	1	2	1	2	1	2	1	2	1	1	2	1	2	2
20	2	2	2	1	2	2	2	2	2	1	1	2	2	0	2	1	2	2	2	0	2	2	2	2
Overall score	33%	17%	27%	25%	17%	19%	25%	10%	28%	36%	28%	32%	17%	14%	19%	22%	17%	22%	22%	33%	25%	39%	19%	8%

Yes = 2, Don't know/partial = 1, No= 2

Questions/Items:

1. 1.Were the aims/objectives of the study clear?
2. Was the study design appropriate for the stated aim(s)?
3. Was the sample size justified?
4. Was the target/reference population clearly defined?
5. This item was removed as per procedure by Colombo and colleagues (2023)
6. Was the selection process likely to select subjects/participants that were representative of the target/reference population under investigation?
7. Were measures taken to address and categorise non-responders?
8. Were risk factors and outcome variables measured appropriate to aims of the study?
9. Were risk factors and outcome variables measured correctly using instruments/measurements that had been trialled, piloted or published previously?
10. Is it clear what was used to determine statistical significance and/or precision estimates?
11. Were the methods (including statistical methods) sufficiently described to enable them to be repeated?
12. Were the basic data adequately described?
13. Does the response rate raise concerns about non-response bias?
14. This item was removed as per procedure by Colombo and colleagues (2023)
15. Were the results internally consistent?
16. Were the results presented for all the analyses described in the methods?
17. Were the authors discussions and conclusions justified by the results?
18. Were the limitations of the study discussed?
19. Were there any funding sources or conflicts of interest that may affect the authors interpretations of the results?
20. 20. Was ethical approval or consent of participants attained?

Table A1 - QUADS Quality Assessment scores for studies that were not cross-sectional

	Anneser et al (2024)	Bratu et al (2022)	Kühner et al (2024)	Zacher & Rudolph (2023)
Theoretical or conceptual underpinning to the research	2	3	3	2
Statement of research aims	3	2	3	3
Clear description of research setting and target population	3	3	2	2
Study design is appropriate for aims	2	2	3	3
Appropriate sampling to address the research aims	3	2	2	2
Rationale for data collection tools	2	3	3	2
The format and content of data collection tool is appropriate to address the stated research aims	2	3	2	3
Description of data collection procedure	3	3	2	3
Recruitment data provided	3	2	3	3
Justification for analytic method selected	3	3	3	2
The method of analysis was appropriate to answer the research aims	3	3	3	2
Strengths and limitations critically discusssed	3	2	3	2
Total	32	30	32	29
Converted to risk of bias %	12%	17%	12%	19%

Notes. One item was removed as item measured an aspect of research not assessed by AXIS (PPI involvement – item 12) to have consistency in the paper

Appendix E – List of predictor variables

1. Age
2. Gender
3. Number of children
4. Parental status
5. Martial status
6. Employment status
7. Income
8. Level of education
9. Political orientation
10. Migration status
11. Region (remote vs cities)
12. Country
13. Health status
14. Social disadvantage
15. Religiosity
16. Greenery (exposure/access)
17. Green physical activity
18. Environmental comfort
19. Flooding
20. Heatwaves
21. Food insecurity
22. Water insecurity
23. Air pollution
24. Environmental pollution
25. Toxic release
26. Subjective exposure to climate related events
27. Self-efficacy beliefs
28. Collective efficacy beliefs
29. Belief in science
30. Symbolic threat perception
31. Climate change beliefs/attitudes
32. Climate risk perception
33. Realistic threat perception
34. Perceived vulnerability
35. Psychological distance
36. Environmental locus of control
37. Social Dominance Orientation
38. Connectedness to nature
39. Nature-relatedness
40. Knowledge of climate change
41. Climate change awareness
42. Media exposure (type)
43. Frequency of media exposure / information seeking
44. Attention to media about climate change

45. Big 5 Personality traits (Openness, Neuroticism, Conscientiousness)
46. Time perspective
47. Climate change worry
48. Climate change concern
49. Generalized Anxiety Disorder (GAD-7)
50. Depression (PHQ-9)
51. Fear about Corona virus
52. Fear about conventional war
53. Trait anxiety
54. Psychological inflexibility
55. Mindfulness
56. Environmental affect traits
57. Personal values
58. Hedonistic values
59. Egoistic values
60. Altruistic values
61. Biospheric values
62. Pro-sociality
63. Altruism
64. Pro-environmental Behaviours
65. Descriptive norms
66. Pro-environmental self-identity

Appendix F – Ethical approval

From: ergo2@soton.ac.uk <ergo2@soton.ac.uk>
Sent: Sunday, November 3, 2024 1:51 PM
To: Becky Bell-Wadsworth <R.Bell@soton.ac.uk>
Subject: Approved by Faculty Ethics Committee - ERGO II 90860.A1

Approved by Faculty Ethics Committee - ERGO II 90860.A1

ERGO II – Ethics and Research Governance Online https://www.ergo2.soton.ac.uk

Submission ID: 90860.A1
Submission Title: Thesis_Emotions related to climate crisis (Amendment 1)
Submitter Name: Becky Bell

Your submission has now been approved by the Faculty Ethics Committee. You can begin your research unless you are still awaiting any other reviews or conditions of your approval.

Comments:

-
-

Click here to view the submission

Ref: 22011_Email_to_submitter___Approval_from_Faculty_Ethics_committee__cat_2___C_ Id: 887411

R.Bell@soton.ac.uk coordinator

Please do not reply to this message as it has been automatically generated by the system. This email address is not monitored.

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Appendix G – Questionnaires

Demographics Questionnaire

What is your age? _____

What is your gender?

Options:

- Male
- Female
- Non-binary
- Other

What is your ethnicity?

Options:

- White - British
- White - Irish
- White - European
- White – Any other white background
- Mixed – White and Black Caribbean
- Mixed – White and Black African
- Mixed – White and Asian
- Mixed – Any other mixed background
- Asian or Asian British – Indian
- Asian or Asian British – Pakistani
- Asian or Asian British – Bangladeshi
- Asian or Asian British – Chinese
- Asian or Asian British – Any other Asian background
- Black or Black British – Caribbean
- Black or Black British – African
- Black or Black British – Any other Black background
- Other Ethnic groups – Any other ethnic group
- Prefer not to say

What is your highest level of education?

Options:

- Primary school education or equivalent
- Secondary school education or equivalent
- A and AS levels or equivalent
- NVQ or equivalent qualification
- Degree-level
- Masters level
- Post doctorate level
- None of the above

What is your household income per annum?

Options:

- £1 to £9, 999
- £10, 000 to £24, 999
- £25, 000 to £49, 999
- £50, 000 to £74, 999
- £75, 000 to £99, 999
- £100, 000 or more

Are you a parent or grandparent?

Options:

- Yes – parent
- Yes – parent and grandparent
- No

Discrete Emotions Questionnaire (Harmon-Jones et al., 2016)

When it comes to climate change and everything you associate with it, to what extent did you experience these emotions?

	Not at all						An extreme amount
Anxiety	1	2	3	4	5	6	7
Sad	1	2	3	4	5	6	7
Dread	1	2	3	4	5	6	7
Terror	1	2	3	4	5	6	7
Rage	1	2	3	4	5	6	7
Grief	1	2	3	4	5	6	7
Anger	1	2	3	4	5	6	7
Nervous	1	2	3	4	5	6	7
Lonely	1	2	3	4	5	6	7
Scared	1	2	3	4	5	6	7
Mad	1	2	3	4	5	6	7
Empty	1	2	3	4	5	6	7
Panic	1	2	3	4	5	6	7
Fear	1	2	3	4	5	6	7
Worry	1	2	3	4	5	6	7
Pissed off	1	2	3	4	5	6	7
Guilt	1	2	3	4	5	6	7
Hope	1	2	3	4	5	6	7

Coping questionnaire (Ojala, 2012; Ojala & Bengsston, 2019; Wullenkord & Ojala, 2023)

Below is a list and for every item we would like you to indicate how well it applies to what you *do* or *think* when you are reminded of climate change. Choose the option that you feel best applies to you.

1 = Not at all true	2 = Not very true	3 = Fairly true	4 = Very true	5 = Completely true

Even though it is a big problem, one has to have hope

1	2	3	4	5

I talk with my family and friends about what one can do to help

1	2	3	4	5

I have faith in humanity, we can fix all kinds of problems

1	2	3	4	5

I try to think of something else

1	2	3	4	5

I search for information about what I can do

1	2	3	4	5

More and more people have started to take climate change seriously

1	2	3	4	5

I think of what I can do

1	2	3	4	5

I trust scientists to come up with a solution in the future

1	2	3	4	5

I have faith in people engaged in environmental organizations

1	2	3	4	5

I trust politicians to come up with a solution for the future

1	2	3	4	5

I distract myself

1	2	3	4	5

Items in each subscale:

Sub-scale	Items
Problem-focused coping	I talk with my family and friends about what one can do to help
	I search for information about what I can do
	I think of what I can do
Emotion-focused coping	I try to think of something else
	I distract myself
Meaning focused coping	Even though it is a big problem, one has to have hope
	I have faith in humanity, we can fix all kinds of problems
	More and more people have started to take climate change seriously
	I trust scientists to come up with a solution in the future
	I have faith in people engaged in environmental organizations
	I trust politicians to come up with a solution for the future

Please note and additional item of 'Nothing bad will happen in my lifetime' was used for verification purposes to assist with quality checks

Pro-environmental behaviour (Whitmarsh et al., 2022)

At the moment, roughly how many times per month do you do each of the following?

1) Eat organic, locally-grown or in season food
2) Encourage other people to save energy
3) Buy products with less packaging
4) Recycle household waste (e.g. glass)
5) Avoid wasting food (e.g. by using leftovers)
6) Borrow or rent items (e.g. tools, toys)
7) Eat red meat (e.g., beef, lamb)*

Participants select from 0 (Never) – 30 (Everyday)

**This item was reverse scored*

Appendix H -Participant Information Sheet

Participant Information Sheet – Social Media

Study Title: Emotions, coping and behaviours in response to climate change

Researcher: Rebekah Bell-Wadsworth
ERGO number: 90860

You are being invited to take part in the above research study. To help you decide whether you would like to take part or not, it is important that you understand why the research is being done and what it will involve. Please read the information below carefully. If you are happy to participate you will be asked for your consent.

What is the research about?
The aim of this study is to look the relationship between different emotions and actions related to climate change.

Why have I been asked to participate?
You have been asked to participate because you are over the age of 16 and are a fluent English speaker. Your participation is optional and will provide valuable data for this research to utilise.

What will happen to me if I take part?
This study involves completing an anonymous questionnaire. You will be asked to complete several questionnaires, some will ask you for demographic information, some will ask you about emotions and others will ask you about behaviours and coping styles. It will take approximately 5-10 minutes to complete the questionnaires. If you are happy to complete this survey, you will need to tick (check) the box below to show your consent. As this survey is anonymous, the research team will not be able to know whether you have participated, or what answers you provided.

Are there any benefits in my taking part?
If you decide to take part in this study, you have an opportunity to enter a prize draw with the chance to win £50 worth of vouchers. At the end of the survey there will be a link to enter the prize draw.

You will also be contributing to novel research and greater understanding of emotions and actions related to climate change.

Are there any risks involved?
There are no significant risks involved in this study beyond those you would encounter in everyday life. Some of the questions you may be asked may ask you to think about personal or sensitive topics and although we have tried to ensure that the study does not cause distress some people may experience temporary feelings of negative emotion.

What data will be collected?
Raw data will be collected and stored on the Qualtrics platform, which is password-protected. The downloaded anonymised data will be stored on the researcher's computer on the Southampton University Server and password protected. As per university policy, the anonymised dataset will be uploaded to the university repository (and deleted from the server) and accessible only subject to appropriate permissions once the study has ended.

Entering the prize draw requires you to input your email address so you can be contacted if you win. This information is collected separately from the raw data. This information will be stored separately from your answers on the questionnaires.

Will my participation be confidential?
Your participation and the information we collect about you during the course of the research will be kept strictly confidential.

Only members of the research team and responsible members of the University of Southampton may be given access to data about you for monitoring purposes and/or to carry out an audit of the study to ensure that the research is complying with applicable regulations. Individuals from regulatory authorities (people who check that we are carrying out the study correctly) may require access to your data. All of these people have a duty to keep your information, as a research participant, strictly confidential.

Do I have to take part?
No, it is entirely up to you to decide whether or not to take part. If you decide you want to take part, you will need to tick (check) the box below.

What happens if I change my mind?
You have the right to change your mind and withdraw at any time without giving a reason and without your participant rights being affected. Once you have started the survey you can leave the study at any point. The questionnaire data that you have completed will have saved once you click 'next.' Please note, once you start the study any saved data will not be possible to withdraw as the data is anonymous. If you withdraw from the study, we will keep the information about you that we have already obtained for the purposes of achieving the objectives of the study only.

What will happen to the results of the research?
Your personal details will remain strictly confidential. Research findings made available in any reports or publications will not include information that can directly identify you without your specific consent.

Where can I get more information?
If you would like further information about this study, or have any questions, please contact Rebekah at rb9n22@soton.ac.uk

What happens if there is a problem?
If you have a concern about any aspect of this study, you should speak to the researchers who will do their best to answer your questions.

If you remain unhappy or have a complaint about any aspect of this study, please contact the University of Southampton Head Research Ethics and Governance (023 8059 5058, rgoinfo@soton.ac.uk).

Also, we have tried to ensure that the questions in this study do not cause any distress. However, it is not uncommon to experience some anxieties or concerns when completing questionnaires about emotions, and support is available. If participating in this study raises any issues for you, we recommend that you contact one of the following resources:

- Find a counsellor at https://www.bacp.co.uk/

More information on your rights as a study participant is available via this link:
https://www.southampton.ac.uk/about/governance/participant-information.page

Thank you for reading this information sheet and considering taking part in this research.

☐ Please tick (check) this box to indicate that you have read and understood information on this form, are aged 16 or over and agree to take part in this survey.

Participant Information Sheet - Prolific

Study Title: Emotions, coping and behaviours in response to climate change
Researcher: Rebekah Bell-Wadsworth
ERGO number: 90860

You are being invited to take part in the above research study. To help you decide whether you would like to take part or not, it is important that you understand why the research is being done and what it will involve. Please read the information below carefully. If you are happy to participate you will be asked for your consent.

What is the research about?
The aim of this study is to look the relationship between different emotions and actions related to climate change.

Why have I been asked to participate?
You have been asked to participate because you are over the age of 18 and are a fluent English speaker. Your participation is optional and will provide valuable data for this research to utilise.

What will happen to me if I take part?
This study involves completing an anonymous questionnaire. You will be asked to complete several questionnaires, some will ask you for demographic information, some will ask you about emotions and others will ask you about behaviours and coping styles. It will take approximately 5-10 minutes to complete the questionnaires. If you are happy to complete this survey, you will need to tick (check) the box below to show your consent. As this survey is anonymous, the research team will not be able to know whether you have participated, or what answers you provided.

Are there any benefits in my taking part?
If you decide to take part in this study, you will receive £1.00 for your participation. You will also be contributing to novel research and greater understanding of emotions and actions related to climate change.

Are there any risks involved?
There are no significant risks involved in this study beyond those you would encounter in everyday life. Some of the questions you may be asked may ask you to think about personal or sensitive topics and although we have tried to ensure that the study does not cause distress some people may experience temporary feelings of negative emotion.

What data will be collected?
Raw data will be collected and stored on the Qualtrics platform, which is password-protected. The downloaded anonymised data will be stored on the researcher's computer on the Southampton University Server and password protected. As per university policy, the anonymised dataset will be uploaded to the university repository (and deleted from the server) and accessible only subject to appropriate permissions once the study has ended.

Will my participation be confidential?
Your participation and the information we collect about you during the course of the research will be kept strictly confidential.

Only members of the research team and responsible members of the University of Southampton may be given access to data about you for monitoring purposes and/or to carry out an audit of the study to ensure that the research is complying with applicable regulations. Individuals from regulatory authorities (people who check that we are carrying out the study correctly) may require access to your data. All of these people have a duty to keep your information, as a research participant, strictly confidential.

Do I have to take part?
No, it is entirely up to you to decide whether or not to take part. If you decide you want to take part, you will need to tick (check) the box below.

What happens if I change my mind?
You have the right to change your mind and withdraw at any time without giving a reason and without your participant rights being affected. Once you have started the survey you can leave the study at any point. The questionnaire data that you have completed will have saved once you click 'next.' If you withdraw from the study through leaving the survey, we will keep the information about you that we have already obtained for the purposes of achieving the objectives of the study only. If you wish to withdraw your data, please contact the researcher at rb9n22@soton.ac.uk citing your Prolific ID. Please note, this will mean your data will no longer be anonymous and you can only withdraw your data up until the end of the study.

What will happen to the results of the research?
Your personal details will remain strictly confidential. Research findings made available in any reports or publications will not include information that can directly identify you without your specific consent.

Where can I get more information?
If you would like further information about this study, or have any questions, please contact Rebekah at rb9n22@soton.ac.uk

What happens if there is a problem?
If you have a concern about any aspect of this study, you should speak to the researchers who will do their best to answer your questions.

If you remain unhappy or have a complaint about any aspect of this study, please contact the University of Southampton Head Research Ethics and Governance (023 8059 5058, rgoinfo@soton.ac.uk).

Also, we have tried to ensure that the questions in this study do not cause any distress. However, it is not uncommon to experience some anxieties or concerns when completing questionnaires about emotions, and support is available. If participating in this study raises any issues for you, we recommend that you contact one of the following resources:

- Find a counsellor at https://www.bacp.co.uk/

More information on your rights as a study participant is available via this link:
https://www.southampton.ac.uk/about/governance/participant-information.page

Thank you for reading this information sheet and considering taking part in this research.

☐ Please tick (check) this box to indicate that you have read and understood information on this form, are aged 16 or over and agree to take part in this survey.

Appendix I -Debriefing form

Debriefing Form – Social Media

Study Title: Emotions, coping and behaviours in response to climate change
Ethics/ERGO number: 90860
Researcher(s): Rebekah Bell-Wadsworth
University email(s): rb9n22@soton.ac.uk
Version and date: Version 2, July 2024

Thank you for taking part in our research project. Your contribution is very valuable and greatly appreciated.

Purpose of the study
The aim of this research was aimed to explore how different emotions may impact our behaviour in response to the climate crisis, and whether other factors such as socioeconomic status and coping styles impact this relationship.

It is expected that there will be differential associations between individual eco-emotions and pro-environmental behaviours. Further, it Is expected that sociodemographic factors, socioeconomic factors, and coping styles will influence the association between eco-emotions and pro-environmental behaviours. Your data will help our understanding of what factors contribute to pro-environmental behaviours.

Confidentiality
Results of this study will not include your name or any other identifying characteristics.

Prize draw
Please click on a link at the bottom of this form which will take you to a separate survey to collect your contact details. Please note that by providing your contact details, your participation in the study might be no longer anonymous, but researcher will not know what information you provided.

Further reading
Pihkala, P. (2022). The process of eco-anxiety and ecological grief: A narrative review and a new proposal. *Sustainability*, *14*(24), 16628.

Further support
If taking part in this study has caused you discomfort or distress, or you are struggling with climate crisis distress, you can contact the following organisations for support:

- UK:
  - BPS: https://www.bps.org.uk/find-psychologist
  - HCPC: Check the Register and find a registered health and care professional | (hcpc-uk.org)
  - British Association of Counselling and Psychotherapy: https://www.bacp.co.uk/
  - Counselling directory: https://www.counselling-directory.org.uk/climate-and-ecoanxiety.html#whatisecoanxiety
- Worldwide: www.allaboutcounseling.com

The following groups provide a supportive space for people with concerns around the climate crisis with possible actions to get involved with:

- Extinction Rebellion: extinctionrebellion.uk/?wpmobileexternal=true
- Friends of the earth: Join the fight for people and planet | Friends of the Earth
- Groundwork: Groundwork - Groundwork

Further information

If you have any concerns or questions about this study, please contact Rebekah Bell-Wadsworth at rb9n22@soton.ac.uk who will do their best to help.

If you remain unhappy or would like to make a formal complaint, please contact the Head of Research Integrity and Governance, University of Southampton, by emailing: rgoinfo@soton.ac.uk, or calling: + 44 2380 595058. Please quote the Ethics/ERGO number which can be found at the top of this form. Please note that if you participated in an anonymous survey, by making a complaint, you might be no longer anonymous.

Thank you again for your participation in this research.

If you would like to be entered into the prize draw, please follow this link to enter your email address: [Insert link to prize draw survey]

University of Southampton

Debriefing Form – Prolific

Study Title: Emotions, coping and behaviours in response to climate change
Ethics/ERGO number: 90860
Researcher(s): Rebekah Bell-Wadsworth
University email(s): rb9n22@soton.ac.uk
Version and date: Version 2, July 2024

Thank you for taking part in our research project. Your contribution is very valuable and greatly appreciated.

Purpose of the study

The aim of this research was aimed to explore how different emotions may impact our behaviour in response to the climate crisis, and whether other factors such as socioeconomic status and coping styles impact this relationship.

It is expected that there will be differential associations between individual eco-emotions and pro-environmental behaviours. Further, it Is expected that sociodemographic factors, socioeconomic factors, and coping styles will influence the association between eco-emotions and pro-environmental behaviours. Your data will help our understanding of what factors contribute to pro-environmental behaviours.

Confidentiality
Results of this study will not include your name or any other identifying characteristics.

Further reading
Pihkala, P. (2022). The process of eco-anxiety and ecological grief: A narrative review and a new proposal. *Sustainability*, *14*(24), 16628.

Further support
If taking part in this study has caused you discomfort or distress, or you are struggling with climate crisis distress, you can contact the following organisations for support:

- UK:
  - BPS: https://www.bps.org.uk/find-psychologist
  - HCPC: Check the Register and find a registered health and care professional | (hcpc-uk.org)
  - British Association of Counselling and Psychotherapy: https://www.bacp.co.uk/
  - Counselling directory: https://www.counselling-directory.org.uk/climate-and-ecoanxiety.html#whatisecoanxiety
- Worldwide: www.allaboutcounseling.com

The following groups provide a supportive space for people with concerns around the climate crisis with possible actions to get involved with:

- Extinction Rebellion: extinctionrebellion.uk/?wpmobileexternal=true

- Friends of the earth: Join the fight for people and planet | Friends of the Earth
- Groundwork: Groundwork - Groundwork

Further information

If you have any concerns or questions about this study, please contact Rebekah Bell-Wadsworth at rb9n22@soton.ac.uk who will do their best to help.

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Thank you again for your participation in this research.

Appendix J -Bot Management Protocol

Bot check item	Bot indicator	Actions/guidance
ReCAPTCHA Score	If score is closer to 0; indicates a bot	If between 0.5-0.8; investigate further If under 0.5; exclude
Attention check	If selected any other answer, it may indicate a bot	If selected any other answer; exclude
Completion time	If completed too quickly it could indicate a bot	If under 2 mins investigate further If under 100 seconds; exclude
Demographic data	Nonsensical answers could indicate a bot	Do the answers make sense? Unlikely combinations of answers could indicate a bot e.g. If participant put their age as 20 but also selected they were a grandparent
Likert scores pattern	If answers similarly on all questions in DEQ/coping questionnaire/PEB questionnaire: May be a bot (a non-bot more likely to have variation)	Non-bots likely to have variation e.g. expect recycling to be much higher than rent/borrowing items
Bulk sets of answers	Multiple questionnaires completed at the same	If all completed at the same time

Appendix K – Analytic strategy and assumptions

Preliminary analyses:

Box plots were used to identify outliers. Eight outliers were observed, however did not impact the analysis so were kept in the analysis. Normality of data was assessed using inspection of histograms. Scatterplots were assessed for linear relationships.

Regression analyses:

For each regression analyses, scatterplots were inspected for the assumption of linearity.

Durbin-Watson test was used to test that the residuals were not related (independent errors) and the score was around 2 indicating this assumption was met.

Due to the eco-emotions correlating highly, multicollinearity was a potential issue. Anxiety and Fear were correlated above 0.9 indicating potential multicollinearity (Field, 2018; Tabachnick & Fidell, 2019). Both anxiety and fear variables had Variance Inflation Factor (VIF) values over 5 (all other eco-emotions/variables were under 5). As VIF values indicated anxiety and fear may make *b* values less reliable (Field, 2018) the regression was run with and without either Anxiety or Fear variables. The exclusion of either variable did not influence the findings. As the VIF values were under 10 (Iacobucci et al., 2016; Marquardt 1970), they were therefore included in the analysis. Tolerance values were all above 0.1.

The regression models showed 1 to 4 outliers, however as this was under 5% of the cases it was unlikely to influence the model so were included in the analysis (Field, 2018). Further, the leverage values were all below 0.1 and no influential points were above 1 (Field, 2018) so they were kept in the analysis. Standardized residuals were plotted against standardized predicted values on scatterplots and on P-P Normality plot to assess homoscedasticity.

References

Field, A. (2018). *Discovering Statistics Using IBM SPSS Statistics* (5th ed.). Thousand Oaks, CA: Sage Publications.

Iacobucci, D., Schnieder, M., Popovich, D., Bakamitsos, G. (2016). Mean centering helps alleviate micro but not macro multicollinearity. Behav. Res. 48, 1308-1317. DOI 10.3758/s13428-015-0624-x

Marquardt, D. W. (1970). Generalized inverses, ridge regression, biased linear estimation, and nonlinear estimation. *Technometrics, 12*(3), 591–612.

Tabachnick, B., & Fidell, L. (2019). *Using Multivariate Statistics* (7th ed.). Boston, MA: Pearson Education.

Appendix L – Recruitment poster

24/07/2024 [Version 3]

University of Southampton

EMOTIONS AND THEIR IMPACT ON BEHAVIOURS AND COPING

About the study

- This study is exploring the impact of emotions on our behaviour and coping styles.
- The study involves completing questionnaires about emotions, behaviours and coping styles. Demographic information will also be collected (e.g. age).

Who are we?

A research team at the University of Southampton This is the main researcher

What's involved?

Completing some questionnaires

How long does it take?

Approximately 5-10 minutes

Ethical approval

ERGO no: 90860

How do I participate?

Please scan the QR code above to take part!

Who can take part?

- Anyone above the age of 16
- Anyone who is computer literate and has access to the internet
- Any UK citizen

What's in it for me?

- A chance to win £50 worth of vouchers
- Contribute to novel research

Contact us

- If you would like any further information, please contact rb9n22@soton.ac.uk