RESEARCH PAPER

The Impact of Eco-Anxiety and Extreme Weather Proximity on Young People's Happiness and Life Satisfaction: A Natural Experiment

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Abstract

This article investigates how eco-anxiety relates to subjective well-being among young people in Luxembourg, and whether this relationship is modified by proximity to extreme weather events. Luxembourg, with one of the highest GDPs in the world, represents a noteworthy case of a nation that also consistently ranks among the happiest. Yet it experienced a severe flooding in the summer of 2021. Using data from a natural experiment, we find that eco-anxiety is positively associated with happiness, an affective dimension of well-being, but unrelated to life satisfaction, a cognitive dimension. This association remains unchanged after experiencing the flooding, even among individuals directly affected by it. Our study contributes to the growing body of research on the relationship between well-being and eco-anxiety by disentangling the affective and cognitive dimensions of well-being in the context of an extreme weather event, using a natural experiment design. Overall, our findings suggest that eco-anxiety may be partly shaped by social desirability, rather than by intrinsic motivational beliefs and psychological distress. This conclusion may contribute to explaining why young people in high-income countries remain less inclined to take action against climate change.

Keywords Eco-anxiety · Subjective well-being · Happiness · Life satisfaction · Climate change · Youth

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1 Introduction

Experts agree that without measures to mitigate climate change, extreme weather events will become more frequent globally (Lawrence et al., 2022),[1] posing major risks to health, housing, food systems, and livelihoods–especially for the most vulnerable (IPCC, 2023; UN, 2023).

Yet beyond these material consequences, climate change is also expected to generate profound psychological impacts and preference shifts among citizens, especially after weather disasters such as extreme floods, fires, or hurricanes (Bourque & Cunsolo Willox, 2014). For instance, the *2017 Lancet Countdown on Climate Change and Health* concluded that the psychological effects of climate change are real and potentially irreversible. Similarly, Hayes et al. (2018) argued that different mental health outcomes resulting from climate change effects could appear and increase very rapidly. Complementing this view, Sekulova and Van den Bergh (2016) provide empirical evidence from Bulgaria showing that experiencing floods significantly reduces life satisfaction—even several years after the event—and that psychological and intangible damages can be as substantial as material ones. Their findings highlight how the intensity of floods, rather than just their timing, plays a crucial role in shaping these lasting effects, underscoring the enduring emotional toll of such climate-related events.

These nonmaterial effects, often labelled 'hidden costs', have only very recently started to be examined by academics when evaluating and addressing the consequences of climate change (Hayes et al., 2018; Lawrance et al., 2022). By analysing the latter, we can better understand how individuals and societies are affected by and react to the effects of climate change and thus develop more effective strategies to mitigate its costs.

One of the psycho-social consequences that has recently gained attention in academia has been eco-anxiety, which seems to affect especially young people in developed countries (e.g., see: The Guardian, 2021; The, 2021; Hickman et al., 2020). Eco-anxiety can be defined as 'the anxiety people face from constantly being surrounded by the wicked and threatening problems associated with climate change' (Hayes et al., 2018: 7; Albrecht, 2011). Although 'anxiety' is a psychological term used to refer to a well-established concept, the term eco-anxiety is sometimes used to include other negative emotions, such as worry, nervousness, fear, guilt and sadness (Clayton & Karazsia, 2020; Kurth & Pihkala, 2022; Verplanken et al., 2020). In a review on eco-anxiety, Coffey et al. (2021) conclude that 'despite evidence for the effects on youth and their concerns, there were no studies investigating young people's experiences of eco-anxiety' (Coffey et al., 2021:5). This lack of studies is puzzling, considering the extensive literature that has examined the relationship between subjective well-being and individual-level climate change-related variables. While the former spans happiness and life satisfaction (Diener, 1984; Layard, 2005), the latter include pro-environmental behaviours (Bouman et al., 2020), sustainable consumption patterns (Kaida & Kaida, 2016; Zawadzki et al., 2020) and natural environment engagement (Clayton, 2020). We aim to complement these studies by addressing this gap in the literature and providing empirical evidence on the relationship between eco-anxiety and subjective well-being.

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[1] During the last two decades, the frequency of climate change-related weather disasters has increased by 46% (Watts et al., 2017).

The central aim of our study is to address how eco-anxiety relates to well-being among young people. It asks: How does eco-anxiety relate to happiness and life satisfaction among young people? Are these relationships stronger after an extreme weather event?

We focus our analysis on Luxembourg. Luxembourg is an interesting setting because it represents an 'extreme' case study in terms of socioeconomic development and well-being, being a country with a high GDP and level of economic development (World Bank, 2024) and consistently ranked among the top 10 happiest countries (Helliwell et al., 2024). Additionally, Luxembourg was affected by an unusually severe flood in August 2021 (Kreienkamp et al., 2021). We are able to draw on data collected before and after the flood, which provides us with a natural experimental setting, enabling us to explore the impact on the relationship between eco-anxiety and well-being.

Our study contributes to two main streams of literature. First, it contributes to the growing literature on climate change and well-being (e.g., see Fischer & Van de Vliert, 2011; Lamb & Steinberger, 2017) by increasing the scarce empirical evidence available on the relationship between eco-anxiety and subjective well-being. We explore how eco-anxiety relates to two related but distinct dimensions of subjective well-being: the affective-momentary dimension based on feelings of happiness, and the cognitive, retrospective dimension based on life satisfaction (see Layard, 2005; Kahneman & Riis, 2005).

A second contribution of this study is to the literature on well-being among young people. By analysing the extent to which eco-anxiety relates to subjective well-being among young people, our research adds evidence on emerging determinants of well-being in this demographic. Additionally, it sheds light on how young people's emotions and behaviours respond to the current ecological crisis.

The study is organised as follows: the next section reviews the relevant research on eco-anxiety and subjective well-being and the modifying role of extreme weather events, from which our hypotheses are derived. Next, we describe the context and data of our study and the analytical strategy. Finally, we present and discuss our results and offer conclusions.

2 Theoretical Discussion and Hypotheses

2.1 Eco-Anxiety and Subjective Well-Being

Subjective well-being can be defined as the self-reported affective and cognitive appraisal of one's life (Diener, 1984; Diener et al., 2002) broadly equated with happiness and life satisfaction in the social science literature, respectively (Veenhoven, 2012). Even if most research related to eco-anxiety and subjective well-being suggests a strong relationship between them over and above individual characteristics (e.g., see: Kurth & Pihkala, 2022; Clayton, 2020), recent theoretical and empirical findings are mixed (Kurth & Pihkala, 2022) and remain in the early stages of exploration (Lawrence et al., 2022: 462).

2.1.1 Negative Associations Between Eco-Anxiety and Mental Health

On the one hand, there are a few empirical studies (mostly related to mental health) that suggest a close negative relationship between eco-anxiety and subjective well-being, including both quantitative (e.g., Grose, 2020; Hickman, 2020; Stanley et al., 2021) and qualitative

studies (Bell et al., 2022; Uddin et al., 2021). For instance, in a cross-sectional study conducted across 25 countries, Ogunbode et al. (2021) found that negative emotions about climate change were significantly related to worse mental health outcomes. In an eight-year longitudinal study with adolescents in Australia, Sciberras et al. (2022) found that climate-change-related worry was significantly related to poorer mental health. All these studies are consistent with an early study by Searle and Gow (2010) in the same context and with the results of Clayton and Karazsia (2020) in the United Kingdom. It is important to distinguish between subjective well-being and mental health, noting that a high level of subjective well-being is not just the opposite of poor mental health (Clark et al., 2018).

2.1.2 *Negative Associations Between Related Variables of Eco-Anxiety and Subjective Well-Being*

On the other hand, there is some evidence for eco-anxiety having a complex relationship with subjective well-being (see Hogg et al., 2024). There are related studies on concepts such as eco-grief (Comtesse et al., 2021; Cunsolo et al., 2020; Cunsolo & Ellis, 2018), solastalgia (Eisenman et al., 2015), and eco-anger (Pihkala, 2020) that suggest a negative relationship with subjective well-being outcomes.

2.1.3 *Potential Positive Links Between Eco-Anxiety and Subjective Well-Being*

Further research has argued that there are other related positive feelings that people who are eco-anxious can develop and may generate a positive relationship with subjective well-being, such as existential feelings (Ojala et al., 2021) or feelings of nature connectedness (e.g., Clayton, 2020; Mayer & Frantz, 2004; Howell et al., 2011; Nisbet et al., 2011). For instance, Capaldi et al. (2014) found that nature connectedness has effects on both affective and cognitive subjective well-being. Furthermore, there are also studies that argue that individuals with high levels of eco-anxiety may be more likely to engage in responsible behaviours that make them feel that they are promoting a meaningful way of life that is also likely to enhance their well-being (Kurth & Pihkala, 2022). For instance, they may be more likely to engage in pro-environmental behaviours (Bouman et al., 2020; Netuveli & Watts, 2020; Sampaio et al., 2023) and sustainable consumption patterns, such as regularly using public transportation, recycling, and purchasing green products (Kaida & Kaida, 2016; Zawadzki et al., 2020). They may also be more prone to postpone or avoid reproductive-parental decisions (Schneider-Mayerson & Leong, 2020; Helm et al., 2021). These behavioural engagements and sense of purpose may also reflect the fulfilment of intrinsic needs for autonomy, competence, and relatedness, as posited by Self-Determination Theory (Ryan & Deci, 2017), which has been broadly linked to greater well-being. At the societal level, it has been argued that eco-anxiety can be a valuable emotional response to collectively reverse climate change threats, thus advancing planetary well-being (Kurth & Pihkala, 2022, Antó et al., 2021), e.g., by promoting support for pro-environmental political movements and legislation (Morin, 2011), environmentally friendly businesses, and collective climate action (Kleres & Wettergen, 2017; Ojala, 2022).

2.1.4 *Hypothesis*

Theoretical research conducted thus far has suggested a variety of potential effects of eco-anxiety, but the limited empirical evidence available has yielded mixed results regarding the direction of the association. Based on this, we propose that eco-anxiety is linked to subjective well-being (*Hypothesis 1*), but we do not anticipate a specific nature of this relationship. Exploring the impact of extreme weather events may provide further insight into the role of eco-anxiety and help to enhance our understanding of this phenomenon.

2.2 The Role of Extreme Weather Events

Climate change researchers have argued that extreme weather events are likely to continue to increase in a context of insufficient political and societal action (UN, 2022). The Intergovernmental Panel on Climate Change (IPCC) of the United Nations Environment Program and the World Meteorological Association define an extreme weather event as one 'that is rare at a particular place and time of the year' (IPCC, 2022). While research has shown that extreme weather events may increase eco-anxiety concerns (Lawrence et al., 2022; Middleton et al., 2020; Ogunbode et al., 2020) as well as negative subjective well-being outcomes (Bryant et al., 2014; Brown et al., 2018; Hayes et al., 2018; McDermott et al., 2014; Ojala et al., 2021; Sirey et al., 2017), the interlinks between eco-anxiety, extreme weather events and subjective well-being are less clear and almost unexplored. Furthermore, little related research has been conducted in continental Europe according to a recent review of Lawrence et al. (2022). In a related study, Demski et al. (2017) explored the subjective experiences of extreme flooding with a sample of British individuals. The authors found that the direct experience of flooding leads to a general increase in climate change salience, pronounced emotional responses, and heightened perceptions of personal vulnerability and risk. Overall, they argue that direct experiences with extreme weather events can produce deep changes in people's experiences of climate change.[2]

Another related example is the two-year longitudinal study of Higginbotham et al. (2014) using telephone interviewers. The authors found that the environmental damage from intense mining in the Hunter Valley (Australia) was associated with greater environmental distress and worse mental health outcomes among residents of a heavily affected area than among residents of a similar but unaffected area. Similar results were reported by Clemens et al. (2013) when analysing the effects of extreme weather events in the form of floods and cyclones in Australia in 2010 and 2011 with two cross-sectional samples. The authors of the report argue that those who experienced a direct impact of extreme weather events had higher levels of climate anxiety and worse mental health outcomes than those who did not experience a direct impact.

It could be argued that physically experiencing direct consequences of climate change, such as extreme weather events, can trigger strong emotional responses (Myers et al., 2013). Furthermore, there is evidence showing that the experience of multiple disasters has a cumulative impact on mental health and likewise implications for subjective well-being (see Leppold, 2022). Severe flooding is an example of an extreme weather event that could thus modify the relationship between eco-anxiety and subjective well-being. Based on pre-

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[2] It is worth mentioning that flooding is currently the most common extreme weather event (Ogunbode et al., 2020).

vious empirical evidence, we expect that the relationship between eco-anxiety and subjective well-being will become stronger after a flood occurs in individuals' country/region than before the flood (*Hypothesis 2a: flood timing*). We also expect that the more geographically close to the flooding an individual is, the stronger the relationship between their eco-anxiety and subjective well-being (*Hypothesis 2b: proximity*).

2.3 The Focus: Youth in Luxembourg

Our hypotheses are tested with a sample of young individuals (16–29 years old) in Luxembourg. Compared with other countries in the world, Luxembourg can be considered an extreme case study due to its high socioeconomic development and because it consistently scores as one of the world's top countries in terms of GDP *per capita* (World Bank, 2024) and happiness (Helliwell et al., 2024). However, it suffered an extreme weather event in the summer of 2021 in the form of widespread extreme flooding. Although flooding has occurred in Luxembourg in the past, The 2021 event is regarded as a "100-year flood" due to its severity and the substantial impact it had on the population (Luxembourg Institute of Science and Technology, 2021; United Nations Office of Disaster Risk Reduction, 2022). More than 25 municipalities were flooded, more than 4,000 inhabitants were evacuated and damages to agriculture, transport infrastructure and private property were estimated at around €45 million (Luxembourg Institute of Science and Technology, 2021; European Environment Agency, 2022).

The 2021 flooding can analytically be treated as a natural experiment to examine whether it modifies the relationship between eco-anxiety and subjective well-being in the context of a highly developed country. It is important to mention that we examined meteorological archives for 1–30 July 2021 and found no other declared natural disasters (heat waves, storms, forest fires) or major industrial accidents during this window; thus, the mid-July flood is the only major event that could potentially influence our results (MeteoLux, 2021). Luxembourg's relatively small size adds relevance to our analysis, as citizens are more likely to perceive extreme weather events as being closer to home. In larger countries, such events might occur far from where many residents live, reducing the personal impact felt across the population.

Another relevant feature of our research worth mentioning is our specific focus on the young population. Research on climate change, mental health, and eco-anxiety consistently shows that younger age groups are more prone than older adults to experience emotional distress related to climate change (Clayton & Karazsia, 2020; Gifford & Gifford, 2016).

3 Methodology

3.1 Data

To investigate our research questions, we referred to cross-sectional data from the Young People and COVID-19 (YAC+) survey, a stratified random sample of all residents aged 12–29 in Luxembourg from the National Registry of Natural Persons (Schomaker et al., 2022). Participants received postal invitations and completed the questionnaire online via computer-assisted web interviews (CAWI). The overall response rate was 34.1% (Scho-

maker et al., 2022). Our analysis sample comprises the second wave from July to October 2021 and an additional cross-sectional survey of YAC+conducted between August and October 2021. The latter survey was designed with the intention of forming a longitudinal panel for future waves of data collection (Schomaker et al., 2022). Both surveys contain the same variables relevant to the study, and both samples were drawn from the population using the same procedure.[3] We analysed data from respondents aged 16 to 29, as the questionnaire answered by younger respondents did not contain key variables required for our analysis. After excluding missing values and people aged between 12 and 15, our analysis sample comprised 3519 respondents (see Fig. A1 in Appendix A, which plots the overall and restricted samples for the key variables of the model, life satisfaction, happiness and eco-anxiety, showing a similar distribution for both).

3.2 Analytical Strategy

We developed the following equation to model the relationship between eco-anxiety and subjective well-being (SWB):[4]

$$SWB_i = \alpha + ecoanxiety_i\psi + flooding_{it}\beta + [ecoanxiety\ x\ flooding_{it}]\zeta + X_i\delta + \epsilon_i \quad (1)$$

$$SWB_i = \alpha + ecoanxiety_i\psi + flooding_{it}\beta + proximity_i\beta \\ + [ecoanxiety\ x\ flooding\ x\ proximity_{it}]\zeta + X_i\delta + \epsilon_i \quad (2)$$

Equation (1) includes *SWB*, which represents the subjective well-being levels of individual *i*, and *ecoanxiety*, which indicates the eco-anxiety experienced by individual *i*, allowing us to test Hypotheses 1. The vector X_i includes age, gender, subjective health and socioeconomic status, which are considered individual variables relevant to the youth population. *Flooding* is a group dummy that refers to the flooding that occurred in Summer 2021 before (t-0) and after (t-1) the event, and $ecoanxiety\ x\ flooding_{it}$ indicates the interaction between eco-anxiety by individual *i* and the flooding dummy. This interaction allows us to test Hypothesis 2a (*flood timing*). Equation (2) includes the proximity dummy, which was coded 1 if respondents lived in one of 102 municipalities directly affected by the floods and 0 if not. It indicates the three-way interaction between eco-anxiety by individual *i*, the flooding dummy, and the proximity dummy. This interaction allows us to test Hypothesis 2b *(proximity)*. Finally, ϵ is the error term. To further control for autocorrelated yearly errors, we adjusted for clustered standard errors and clustering by municipalities. Estimates were considered statistically significant when $p<0.05$. Unless otherwise stated, two-tailed hypothesis testing was used.

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[3] The dataset for this manuscript is not publicly available as it contains sensitive data. Any reasonable requests for accessing the dataset can be directed to [*e-mail excluded to ensure anonymity*]. All data of the manuscript will be provided upon approval by the ethics committee and the Data Protection Officer.

[4] The syntax (in R) used to conduct the analysis is available (anonymously) at https://osf.io/wexpt/?view_only=f0334c922a9e440989d37c53eda48966.

3.3 Dependent and Independent Variables

Subjective Well-being Our study uses two measures of subjective well-being: affective (happiness) and cognitive (life satisfaction) (Diener et al., 2017). Affective subjective well-being (happiness) is operationalised with the following question: '*how often have you felt like this in the past 2 weeks: I was happy and in a good mood* 1–6 (Never–All the time)'. Cognitive subjective well-being (life satisfaction) is measured with the following question: '*Below is a ladder. The top level on this ladder means the best possible life for you*, *and the bottom level means the worst possible life for you. Looking at your current life*, *where on the ladder do you feel you stand at?* 0–10 (Worst–Best).'

Eco-Anxiety This is the main independent variable, captured by the statement: '*It worries me when I think about the environmental conditions in which our children and grandchildren will probably have to live*.' This aligns with the above-presented definition of eco-anxiety and is in line with the usual ways researchers operationalise the concept overall in survey-based research (e.g., see the review of Coffey et al., 2021).[5] Response options range from 1 to 5, where 1 means 'strongly disagree' and 5 'strongly agree'. While this single-item measure is commonly used in large-scale studies due to practical constraints, we acknowledge that it offers a simplified view of a multi-dimensional construct. More elaborate multi-item scales may provide deeper insight into the different emotional, cognitive, and behavioural components of eco-anxiety.

Flooding *For temporal differentiation between the observations before and after the occurrence of the flood, the dataset was stratified in a binary fashion based on the date. This means that observations received after 14 July 2021, i.e., after the beginning of the floods, were coded 1, and the observations before flooding were coded 0 (see Bulut & Samuel, 2024) for a similar strategy/use of this dataset).*

Proximity *To better capture the impact of the floods, the 102 municipalities of Luxembourg were coded according to whether they were directly affected geographically by the floods using a dummy variable. A coding of 1 corresponds to a direct local impact, while 0 corresponds to no immediate impact. Using data on the flood status of rivers published by the Administration du Cadastre et de la Topographie (2022), we classified a municipality as 'affected' if at least one river segment crossing its administrative boundary was marked as flooded.*

3.4 Control Variables

Our empirical model allows us to control for a set of covariates that the economics of happiness literature has shown to be essential for subjective well-being among young people (see Fernandez-Urbano, 2024; Dolan et al., 2008): age, age squared, gender, ill health, and subjective family wealth (see Clark & Oswald, 2006). Ill health was added as a dummy variable from a subjective health question (1 `very bad health condition', 0 `all else'), and subjective

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[5] Although not available in our survey, more granular methods to operationalize the concept do exist. For instance, the Hogg Eco-Anxiety Scale (HEAS) for young adults consists of 13 items and captures multiple dimensions of eco-anxiety, such as affective symptoms, rumination, and functional impairment. See Sampaio et al. (2023) for an application in Portugal.

family wealth was added as a continuous variable where individuals had to choose how well-off they think their family is (1–5; very well off–not at all well-off).

It is important to recognize that while the set of covariates mentioned above is widely applied in the economics of happiness research–particularly in studies focusing on youth populations–the inclusion of certain control variables that do not necessarily precede eco-anxiety (i.e., intervening variables or colliders) can introduce overcontrol bias (Rohrer, 2018). This bias can lead to the underestimation of the overall effect of eco-anxiety on subjective well-being, particularly in cross-sectional analyses (Bartram, 2021). Consequently, we made the deliberate decision to control for only those variables that are likely to precede and jointly influence both eco-anxiety and subjective well-being, such as gender, age, and family wealth. While it is plausible that subjective health perceptions could affect both eco-anxiety and subjective well-being, it is equally conceivable that eco-anxiety could, in turn, influence subjective health. To account for this potential reciprocal relationship and mitigate the risk of overcontrol bias, we conducted robustness checks excluding subjective health from the model. The results, presented in Appendix B, demonstrate that the estimates remain qualitatively robust, even when subjective health is excluded, thus reinforcing the validity of our findings.

4 Results

4.1 Descriptive Statistics

Tables 1 and 2 present the correlations and descriptive statistics of the sample. Happiness has an average value of 3.19 (1–5 scale), which shows that, on average, the youth population in Luxembourg is neither very unhappy nor very happy. Similarly, life satisfaction has an average value of 6.29 (0–10 scale). This is 1 point lower than the reported value in the World Happiness Report of the United Nations in 2021 (Helliwell et al., 2021) that uses a similar question with the same scale, where Luxembourg scores at the top of the table with an average life satisfaction of 7.3, ranked 8th worldwide.[6] This could be because the UN

Table 1 Correlations

	Eco-Anxiety	Ill health	Gender	Age	Subjective family wealth	Happiness
Eco-anxiety						
Ill health	–0.01					
Gender	0.15***	0.02				
Age	0.03	–0.01	–0.03			
Subjective family wealth	–0.03*	0.07***	0.03	0.11***		
Happiness	0.07***	–0.17***	–0.06***	0.02	–0.20***	
Life satisfaction	0.04*	–0.23***	–0.05**	0	–0.32***	0.53***

*p<0.05; **p<0.01; ***p<0.001

Data source: YAC+, Luxembourg

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[6] To contextualise the country rankings, the unhappiest countries in the world (e.g., many sub-Saharan African countries) usually have scores around 2 and 3 on a 0–10 scale, and the happiest ones (e.g. Scandinavian

Table 2 Descriptive statistics

	Mean	SD	N
Eco-anxiety	4.15	0.99	3442
Ill health	0.03	0.16	3442
Gender	0.57	0.5	3442
Age	22.71	4.24	3442
Subjective family wealth	2.77	0.89	3442
Happiness	3.12	1.17	3442
Life satisfaction	6.1	1.96	3442

*p<0.05; **p<0.01; ***p<0.001

Data source: YAC+, Luxembourg

Table 3 Happiness, life satisfaction and eco-anxiety before and after the floods by proximity (mean values with standard deviation in brackets)

Proximity	Before flooding			After flooding		
	Happiness	Life satisfaction	Eco-anxiety	Happiness	Life satisfaction	Eco-anxiety
All	3.05	6.19	4.07	3.12	6.1	4.16
(n: 3,442)	(1.13)	(1.96)	(0.95)	(1.18)	(1.95)	(0.99)
Close to floods	3.04	6.15	4.01	3.11	6.07	4.16
(n: 2.257)	(1.11)	(1.93)	(0.92)	(1.18)	(1.94)	(1)
Not close to floods	3.07	6.25	4.2	3.14	6.15	4.15
(n: 1,185)	(1.16)	(2.02)	(0.99)	(1.17)	(1.99)	(0.97)

Data source: YAC+, Luxembourg

report is based on pre-pandemic surveys as well as because it uses life evaluations based on the Cantril Ladder, which is a slightly different question from the one used in the present survey. The mean value of eco-anxiety is 4.15 (scale 1–5), which means that, on average, the youth in Luxembourg are very worried about the environmental conditions. In other words, the youth present high levels of eco-anxiety. The mean age of the participants is 20.9 years, which reflects the young nature of the sample, which is composed of individuals from 16 to 29 years of age. The average value of ill health is 0.03, reflecting that 98% of individuals in the sample consider themselves (very) healthy. Finally, the average value of SES is 2.3 (1–5 scale), which reflects that the youth in the sample consider themselves quite well off.

Table 3 describes the mean values of the main variables, happiness, life satisfaction and eco-anxiety, before and after the flooding, as well as by its proximity to it.

Before the floods, young people had average happiness and life satisfaction values of 3.05 and 6.19, respectively. Individuals not living close to the floods reported slightly higher values than those living close to the floods, but there were no significant differences between the groups. After the floods, we can observe that happiness levels tended to slightly increase for all groups, while we can observe a slight deterioration of life satisfaction for the overall population, particularly for those not living close to the floods. These results may seem counterintuitive but can potentially be explained by a short-term emotional relief effect experienced in the aftermath of the flood. Previous research suggests that such temporary boosts in affective well-being can stem from increased social cohesion and support, particularly from family and close community ties, which often intensify following natural disasters (Kaniasty, 2012; Zhen et al., 2018; Lebowitz et al., 2019). It is worth mentioning that those not living close to the floods report slightly higher levels of happiness and life satisfaction before and after the floods than individuals living close to them. Eco-anxiety

countries) usually have scores between 7.5 and 8 (Helliwell et al., 2024).

levels seem to slightly deteriorate after the floods, with the biggest deterioration shown by those living close to the floods (deterioration of 0.15 points on a 1–5 scale). Table 4 shows a small but significant positive effect of floodings on eco-anxiety ($\beta=0.092$, $p<0.05$). This indicates a slight increase in eco-anxiety levels following the flooding event.

4.2 Eco-anxiety and Subjective well-being

Table 5 presents eight models that allowed us to test Hypotheses 1 and 2a with our two conceptions of subjective well-being: affective (happiness) and cognitive (life satisfaction). First, the empty models (1a and 2a) are presented containing our main dependent and independent variables only. The second models (models 1b and 2b) add our individual covariates, and models 1c and 2c include the role of severe flooding, which is operationalised through a dummy (before and after flooding). Finally, models 1 d and 2 d add the interaction between eco-anxiety and flooding, which allows us to observe the extent to which flooding modifies the original relationship between eco-anxiety and subjective well-being.

The results show that eco-anxiety is positively correlated with happiness and life satisfaction in all the baseline models without controls (i.e. Models 1a and 2a). Interestingly, while models 1a–c show that eco-anxiety has a statistically significant correlation with happiness at the 0.01% level before and after controlling for covariates, models 2a–c show that eco-anxiety is not significantly correlated with life satisfaction once controls are considered in the model. In other words, eco-anxiety appears to boost happiness but not life satisfaction. Therefore, Hypothesis 1, which stated that eco-anxiety will matter for subjective

Table 4 Predicting eco-anxiety using OLS regression model ($n = 3442$)

	Eco-Anxiety
Flooding	0.092*
	(0.041)
Ill Health	−0.067
	(0.119)
Gender	0.303***
	(0.035)
Age	0.062
	(0.060)
Age Squared	−0.001
	(0.001)
Subjective Family Wealth	−0.048*
	(0.019)
(Intercept)	3.235***
	(0.676)
R2 Adj.	0.025

Standard errors in parentheses *p<0.05; **p<0.01; ***p<0.001
Data source: YAC+, Luxembourg

Table 5 Predicting happiness and life satisfaction using OLS regression models ($n=3{,}442$)

	Happiness				Life satisfaction			
	Model 1a	Model 1b	Model 1c	Model 1d	Model 2a	Model 2b	Model 2c	Model 2d
Eco-anxiety	0.083*** (0.020)	0.083*** (0.020)	0.082*** (0.020)	0.048 (0.063)	0.070* (0.034)	0.055 (0.032)	0.055 (0.032)	0.036 (0.101)
Ill health		–1.155*** (0.122)	–1.155*** (0.122)	–1.157*** (0.122)		–2.538*** (0.196)	–2.538*** (0.196)	–2.539*** (0.196)
Gender		–0.143*** (0.039)	–0.142*** (0.039)	–0.142*** (0.039)		–0.144* (0.063)	–0.144* (0.063)	–0.144* (0.063)
Age		–0.041 (0.056)	–0.044 (0.056)	–0.043 (0.056)		–0.125 (0.090)	–0.126 (0.090)	–0.126 (0.090)
Age squared		0.001 (0.001)	0.001 (0.001)	0.001 (0.001)		0.003 (0.002)	0.003 (0.002)	0.003 (0.002)
Subjective family wealth		–0.248*** (0.022)	–0.251*** (0.022)	–0.251*** (0.022)		0.661*** (0.035)	0.662*** (0.035)	0.662*** (0.035)
Flooding			0.113 (0.063)	–0.041 (0.277)			0.035 (0.101)	–0.048 (0.444)
Eco anxiety × flooding				0.038 (0.066)				0.020 (0.106)
Intercept	2.772*** (0.086)	3.889*** (0.625)	3.829*** (0.664)	3.954*** (0.664)	5.815*** (0.144)	9.053*** (1.003)	9.034*** (1.005)	9.101*** (1.065)
R2 Adj.	0.005	0.074	0.075	0.075	0.001	0.145	0.145	0.145

Standard errors in parentheses *p<0.05; **p<0.01; ***p<0.001

Data source: YAC+, Luxembourg

well-being beyond individual characteristics, can be corroborated only with the affective dimension of subjective well-being (i.e., happiness) but not with the cognitive one (i.e., life satisfaction). This finding suggests the importance of distinguishing between emotional states and broader life assessments when examining the psychological implications of eco-anxiety (see discussion).[7]

Hypothesis 2a (flood timing), which proposed that the relationship between eco-anxiety and subjective well-being will become stronger after a flood occurs in individuals' country/region than before the flood, is not supported by the results. The interactions terms between eco-anxiety and flooding in models 1 d and 2 d are statistically non-significant, indicating no modifying effect of flood exposure on the relationship between eco-anxiety and either happiness or life satisfaction. It is also worth noting that the flooding dummy is not statistically significant in models 1c and 2c (p=0.07 and p=0.89, respectively). In other words, the occurrence of flooding does not appear to alter how eco-anxiety relates to either affective or cognitive dimensions of subjective well-being. The estimates for the additional covariates are largely in line with the subjective well-being literature.

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[7] Robustness checks using linear models with sandwich-robust standard errors (Appendix D, Table D.1) and mixed-effects models accounting for respondent clustering (Appendix D, Table D.2) yield consistent results.
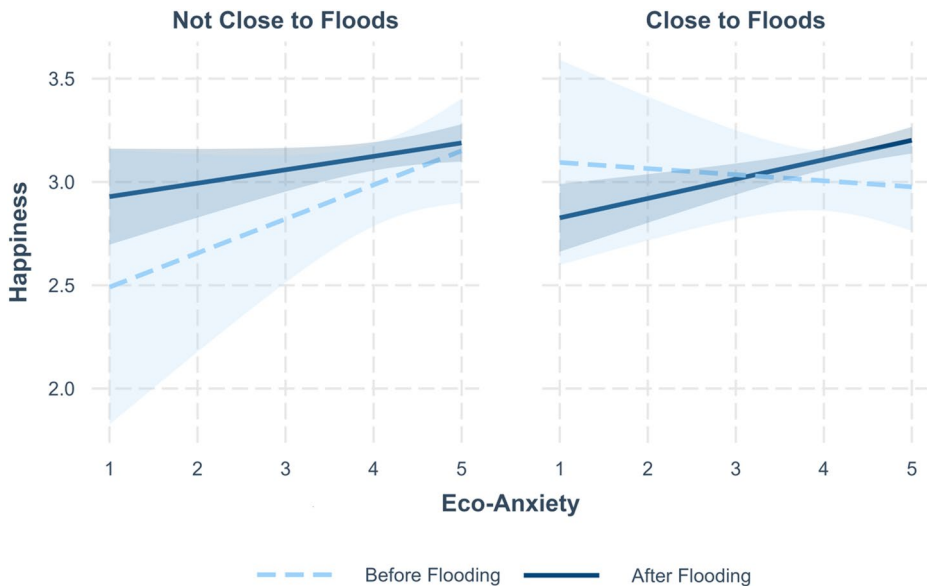
Fig. 1 Three-way interactions of eco-anxiety, floodings, proximity and happiness. Shaded areas are 95% confidence intervals. *Data source*: YAC+, Luxembourg

Hypothesis 2b (proximity), which stipulated that the more geographically close to flooding, the stronger the relationship between eco-anxiety and subjective well-being, was tested by including a three-way interaction between eco-anxiety, flooding and proximity to flooding dummy. This triple interaction can be interpreted as a robustness check of the previous models 1 d and 2 d given the relatively small geographical size of Luxembourg that is roughly equivalent to some regions of neighbouring countries such as Germany, Belgium or France.[8] Results show that the triple interaction between eco-anxiety, flooding and proximity to flooding dummy is not statistically significant for both dimensions of subjective well-being ($p=0.09$ for happiness and $p=0.41$ for life satisfaction). These results suggest that flooding does not modify the relationship between eco-anxiety and happiness even when individuals physically experience it close enough (see Fig. 1 below showing the three-way interactions of eco-anxiety, floodings, proximity and happiness as well as Models 1e and 2e in Table C.1 in Appendix C). Overall, our results do not allow us to corroborate our Hypothesis 2b (proximity), which stated that the more geographically close to the flooding an individual is, the stronger the relationship is between eco-anxiety and subjective well-being.

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[8] Although the use of a moderated mediation analysis (e.g., Hayes' Model 59) could be considered to explore the relationships between eco-anxiety, flooding, and subjective well-being, such a model requires specific assumptions that are not fully met in our dataset. Notably, our research questions are more focused on moderation than mediation. Specifically, we are interested in how external factors (flooding and proximity) modify the eco-anxiety to well-being relationship, rather than examining whether eco-anxiety influences well-being through an indirect pathway (with flooding as a mediator). Additionally, the temporal causality necessary for mediation—where the independent variable (eco-anxiety) precedes the mediator and the outcome—is difficult to establish with cross-sectional data. The model's assumption of normally distributed mediators and outcomes might also not hold, particularly as subjective well-being is often skewed in its distribution, as observed in well-being research. Therefore, we opted for a simpler three-way interaction analysis, which better aligns with the nature of our data and research questions.

5 Discussion and Conclusions

This study aimed to provide empirical evidence on the relationship between eco-anxiety and subjective well-being among young people, examining the modifying role of extreme weather events and the proximity to them. We used two subjective well-being dimensions widely used in the literature: a momentary-affective dimension based on feelings of happiness and a more retrospective and cognitive dimension based on life satisfaction (see Layard, 2005; Kahneman & Riis, 2005). Using a cross-sectional survey in Luxembourg with a young population (16–29 years old) that was collected before and after a severe flooding in the summer of 2021, two main findings emerged that may be valuable for theory building: (1) while a positive statistically significant relationship between eco-anxiety and happiness exists beyond individual characteristics, this relationship appears to be non-existent for life satisfaction; (2) the association between eco-anxiety and subjective well-being is not sensitive to extreme flooding even if individuals are directly exposed to it.

Regarding the first finding, our results contribute to the literature on eco-anxiety, demonstrating its salience among the youth and relevance for subjective well-being. Therefore, our study contributes evidence on the psycho-social effects of climate change in the population. Without effective mitigation measures, these effects are likely to intensify as new cohorts of young people transition from childhood to adulthood in the coming decades.

However, contrary to our initial expectations, our results show that eco-anxiety is related to happiness but not to life satisfaction. In other words, although eco-anxiety is related to affective well-being, it seems unrelated to a deeper, holistic dimension of cognitive well-being such as life satisfaction. It is also important to highlight that the results suggest a positive relationship between eco-anxiety and happiness. Rather than causing an overall negative psychological impact, eco-anxiety can be viewed as a psychosocial construct that may convey a sense of identity, lifestyle, and responsibility towards the environment among the youth (see related subjective well-being studies on the notions of 'green self-image' (Welsh & Kühling, 2018; Binder & Blankengerg, 2017) and 'green behaviour' (Welsh, Binder & Blankengerg, 2021). Nonetheless, our study shows that the effect size is relatively small when compared to the usual determinants of subjective well-being (see Geerling & Diener, 2020; Layard & De Neve, 2023; Clark et al., 2018) even among individuals with high levels of eco-anxiety. This modest effect may help explain why many young individuals in developed countries remain reluctant to undertake radical climate-related changes beyond limited behaviours such as attending public demonstrations or adopting some sustainable consumption habits.

One possible interpretation is that eco-anxiety may be shaped more by a desire to act in socially appreciated ways (Kurth & Pihkala, 2022) than by intrinsic motivational beliefs. In this sense, while eco-anxiety may provide short-term emotional rewards or social validation–contributing to happiness–it may not substantially influence life satisfaction, which typically involves broader considerations of purpose, achievement and meaning in life (Forgeard et al., 2011). A stronger link with cognitive-evaluative components of well-being might be necessary for eco-anxiety to translate into more transformative behavioural change.

Alternatively, young people may feel relatively well insulated from floods, relying on a functioning welfare system and family support to buffer the impacts of extreme climate events. In this view, the capacity for communities to mobilize and act collectively toward a

common goal, could play a central role (Kaniasty, 2012; Zhen et al., 2018; Lebowitz et al., 2019).

This leads to our second point of discussion: even if individuals were exposed to extreme flooding, the relationship between eco-anxiety and subjective well-being was not affected. Our evidence shows that unusually extreme flooding does not appear to make the relationship between eco-anxiety and subjective well-being, even among individuals who report having been directly affected. However, given the lack of individual-level data on the material or bodily consequences of the flood, and considering that most participants likely experienced the event from a position of relative socioeconomic stability, caution is warranted when interpreting the salience of this exposure. Notably, the young people in our sample exhibited high levels of eco-anxiety both before and after the flood. One could argue that, although the 2021 flood was unusual and extreme, it was perceived and framed within an already familiar pattern of extreme weather events and information about climate change impacts indirectly experienced through media. This may suggest that unless more frequent and more extreme weather events broadly impact a region or country, fundamental changes in behavioural and consumption patterns necessary for combating climate change more effectively are unlikely. This aligns with qualitative evidence showing a gap between pro-environmental intention and the willingness to sacrifice comfort for environmental care (Connell et al., 1999; ElHaffar et al., 2020; Park & Lin, 2020). Nevertheless, it is beyond the scope of this study to delve into the associations between eco-anxiety, subjective well-being, and pro-environmental behaviours. Future research could focus on these dynamics, comparing them with existing literature that points to the negative relationship between eco-anxiety and poor mental health (e.g., Ogunbode et al., 2021; Hickman, 2020; Stanley et al., 2021) and the positive link between eco-anxiety and pro-environmental behaviour (e.g., Bouman et al., 2020; Netuveli & Watts, 2020; Sampaio et al., 2023).

The results of this study are subject to some limitations that offer new avenues for research. First, our evidence is based on cross-sectional data with a short time horizon. It could be important to include questions on eco-anxiety in panel surveys that would allow us to control for unobserved fixed heterogeneity and examine the persistence and evolution of eco-anxiety over time. Longitudinal approaches would also allow for the investigation of whether eco-anxiety becomes a more relevant element for evaluative dimensions of subjective well-being, compared to more transient affective conceptions, as environmental concerns intensify in the coming years and decades. Moreover, tracking eco-anxiety over time would make it possible to assess the long-term psychological impact of natural catastrophes, such as the severe flooding analysed in our study. There is evidence that some psychological reactions may take some time to emerge after negative shocks (e.g., see Bonanno, 2004; Adams & Boscarino, 2006), which may also apply here. For instance, psychological reactions from environmental disasters can appear after 6–12 months or more only (Lawrance et al., 2022). Future research would benefit from including eco-anxiety modules in panel surveys that also capture respondents' prior exposure to extreme weather events, thereby enhancing our understanding of these dynamics. Furthermore, given the cross-sectional nature of our data, we cannot rule out potential reverse causality concerns as well as the influence of omitted variable bias (whether observed or not) that might affect both constructs. These issues underscore the need for longitudinal and mixed method approaches to strengthen causal interpretation. For instance, qualitative approaches, such as semi-structured interviews, could complement quantitative methods by providing a deeper insight

into the lived experiences, meanings, and emotional processes associated with eco-anxiety, especially among younger populations who are particularly affected.

The second limitation of this study is that our data were collected during the COVID-19 pandemic. The results may have been different during a non-pandemic scenario. For instance, weaker results might have appeared in our study, as individuals might have been more concerned about the pandemic situation and its potential health and macroeconomic consequences than about climate change, which may have been temporarily relegated to a secondary level of concern. Although COVID-related restrictions in Luxembourg were not particularly strict (see OECD, 2022; Research Luxembourg, 2021), they may have influenced individuals' reports of subjective well-being and help explain why flooding did not affect the relationship between eco-anxiety and subjective well-being. Therefore, it is important to collect data after the pandemic to examine to what extent eco-related emotions are relevant for subjective well-being. An interesting avenue of research could be to compare outcomes in contexts before, during and after specific macro crises (e.g., pandemics, wars, economic crises).

Finally, although it has not been possible with the data at hand, it is worth mentioning that a promising avenue for future research is to analyse the role of socioeconomic status or sociocultural background (between and within groups, both within and between countries). Even if climate change has the capacity to exacerbate existing material and nonmaterial vulnerabilities among disadvantaged groups (Lawrance et al., 2022), some related evidence suggests that individuals from wealthier backgrounds and countries may be more sensitive to and aware of environmental concerns, in part due to their privileged access to green areas and greater socioeconomic security (Gerrish & Watkins, 2018; Hughey et al., 2016; Sathyakumar et al., 2019; Shen et al., 2017).

Overall, our study provides insights into how eco-anxiety relates to affective and cognitive dimensions of subjective well-being in a highly affluent country. We found that flooding does not modify this relationship. These findings highlight the need for further evidence to understand how eco-anxiety affects our ability to address climate emergencies and its role for a sustainable future.

Declarations

References

Adams, R. E., & Boscarino, J. A. (2006). Predictors of PTSD and delayed PTSD after disaster: The impact of exposure and psychosocial resources. *The Journal of Nervous and Mental Disease*, *194*(7), 485. https://doi.org/10.1097/01.nmd.0000228503.95503.e9

Albrecht, G. (2011). Chronic environmental change: Emerging 'psychoterratic' syndromes. In I. Weissbecker (Ed.), *Climate change and human Well-Being. International and cultural psychology*. Springer. https://doi.org/10.1007/978-1-4419-9742-5_3

Antó, J. M., Martí, J. L., Casals, J., Bou-Habib, P., Casal, P., Fleurbaey, M., & Williams, A. (2021). The planetary wellbeing initiative: Pursuing the sustainable development goals in higher education. *Sustainability*, *13*(6), 3372. https://doi.org/10.3390/su13063372

Bartram, D. (2021). Cross-sectional model-building for research on subjective well-being: Gaining clarity on control variables. *Social Indicators Research*, *155*(2), 725–743. https://doi.org/10.1007/s11205-020-02586-3

Bell, F. M., Dennis, M. K., & Brar, G. (2022). Doing hope: Ecofeminist spirituality provides emotional sustenance to confront the climate crisis. *Affilia,37*(1), 42–61. https://doi.org/10.1177/0886109920987242

Binder, M., & Blankengerg, A. K. (2017). Green lifestyles and subjective well-being: More about self-image than actual behavior? *Journal of Economic Behavior & Organization,137*, 304–323. https://doi.org/10.1016/j.jebo.2017.03.009

Bonanno, G. A. (2004). Loss, trauma, and human resilience: Have we underestimated the human capacity to thrive after extremely aversive events? *American Psychologist*, *59*(1), 20. https://doi.org/10.1037/1942-9681.S.1.101

Bouman, T., Verschoor, M., Albers, C. J., Bö Hm G, fisher SD, Poortinga W, et al. (2020). When worry about climate change leads to climate action: How values, worry and personal responsibility relate to various climate actions. *Global Environmental Change,62*, Article 102061. https://doi.org/10.1016/j.gloenvcha.2020.102061

Bourque, F., & Cunsolo Willox, A. (2014). Climate change: The next challenge for public mental health? *International Review of Psychiatry*, *26*(4), 415–422. https://doi.org/10.3109/09540261.2014.925851

Brown, L. A., Fernandez, C. A., Kohn, R., Saldivia, S., & Vicente, B. (2018). Pre-disaster PTSD as a moderator of the relationship between natural disaster and suicidal ideation over time. *Journal of Affective Disorders*, *230*, 7–14. https://doi.org/10.1016/j.jad.2017.12.096

Bryant, R. A., Waters, E., Gibbs, L., Gallagher, H. C., Pattison, P., Lusher, D., & Forbes, D. (2014). Psychological outcomes following the Victorian Black Saturday bushfires. *Australian and New Zealand Journal of Psychiatry,48*(7), 634–643. https://doi.org/10.1177/0004867414534476

Bulut, H., & Samuel, R. (2024). The influence of the 2021 European flooding on pro-environmental attitudes and partial behaviour transition. *Npj Climate Action*, *3*(1), 22. https://doi.org/10.1038/s44168-024-00103-7

Capaldi, C. A., Dopko, R. L., & Zelenski, J. M. (2014). The relationship between nature connectedness and happiness: A meta-analysis. *Frontiers in Psychology,* Article 976. https://doi.org/10.3389/fpsyg.2014.00976

Clark, A. E., & Oswald, A. J. (2006). *The curved relationship between subjective well-being and age* (No. halshs-00590404). HAL.

Clark, A. E., Flèche, S., Layard, R., Powdthavee, N., & Ward, G. (2018). *The origins of happiness: The science of wellbeing over the life course*. Princeton University Press.

Clayton, S. (2020). Climate anxiety: Psychological responses to climate change. *Journal of Anxiety Disorders*, *74*, 102263. https://doi.org/10.1016/j.janxdis.2020.102263

Clayton, S., & Karazsia, B. T. (2020). Development and validation of a measure of climate change anxiety. *Journal of Environmental Psychology*, *69*, 101434. https://doi.org/10.1016/j.jenvp.2020.101434

Clemens, S. L., Berry, H. L., McDermott, B. M., & Harper, C. M. (2013). Summer of sorrow: Measuring exposure to and impacts of trauma after Queensland's natural disasters of 2010–2011. *Medical Journal of Australia,199*(8), 552–555. https://doi.org/10.5694/mja13.10307

Coffey, Y., Bhullar, N., Durkin, J., Islam, M. S., & Usher, K. (2021). Understanding eco-anxiety: A systematic scoping review of current literature and identified knowledge gaps. *The Journal of Climate Change and Health*, *3*, 100047. https://doi.org/10.1016/j.joclim.2021.100047

Comtesse, H., Ertl, V., Hengst, S. M., Rosner, R., & Smid, G. E. (2021). Ecological grief as a response to environmental change: A mental health risk or functional response? *International Journal of Environmental Research and Public Health,18*(2), Article 734. https://doi.org/10.3390/ijerph18020734

Connell, S., Fien, J., Lee, J., Sykes, H., & Yencken, D. (1999). If it doesn't directly affect you, you don't think about it': A qualitative study of young people's environmental attitudes in two Australian cities. *Environmental Education Research*, *5*(1), 95–113. https://doi.org/10.1080/1350462990050106

Cunsolo, A., & Ellis, N. R. (2018). Ecological grief as a mental health response to climate change-related loss. *Nature Climate Change*, *8*(4), 275–281. https://doi.org/10.1038/s41558-018-0092-2

Cunsolo, A., Borish, D., Harper, S. L., Snook, J., Shiwak, I., Wood, M., & Herd Caribou Project Steering Committee. (2020). You can never replace the caribou: Inuit experiences of ecological grief from caribou declines. *American Imago*, *77*(1), 31–59. https://doi.org/10.1353/aim.2020.0002

Demski, C., Capstick, S., Pidgeon, N., Sposato, R. G., & Spence, A. (2017). Experience of extreme weather affects climate change mitigation and adaptation responses. *Climatic Change*, *140*, 149–164. https://doi.org/10.1007/s10584-016-1837-4

Diener, E. (1984). Subjective well-being. *Psychological Bulletin*, *95*(3), 542–575. https://doi.org/10.1037/0033-2909.95.3.542

Diener, E., Lucas, R. E., & Oishi, S. (2002). Subjective well-being: The science of happiness and life satisfaction. *Handbook of Positive Psychology*, *2*, 63–73.

Diener, E., Heintzelman, S. J., Kushlev, K., Tay, L., Wirtz, D., Lutes, L. D., & Oishi, S. (2017). Findings all psychologists should know from the new science on subjective well-being. *Canadian Psychology*, *58*(2), 87. https://doi.org/10.1037/cap0000063

Dolan, P., Peasgood, T., & White, M. (2008). Do we really know what makes us happy? A review of the economic literature on the factors associated with subjective well-being. *Journal of Economic Psychology,29*(1), 94–122. https://doi.org/10.1016/j.joep.2007.09.001

Eisenman, D., McCaffrey, S., Donatello, I., & Marshal, G. (2015). An ecosystems and vulnerable populations perspective on solastalgia and psychological distress after a wildfire. *EcoHealth,12*, 602–610. https://doi.org/10.1007/s10393-015-1052-1

ElHaffar, G., Durif, F., & Dubé, L. (2020). Towards closing the attitude-intention-behavior gap in green consumption: A narrative review of the literature and an overview of future research directions. *Journal of Cleaner Production*, *275*, 122556. https://doi.org/10.1016/j.jclepro.2020.122556

European Environment Agency, Förster, H., Nissen, C., Siemons, A., Renders, N., et al. (2022). *Trends and projections in Europe 2022*. Publications Office of the European Union. https://data.europa.eu/doi/ https://doi.org/10.2800/16646

Fernandez-Urbano, R. (2024). The economics of happiness research. In H. Brockmann, & R. Fernandez-Urbano (Eds.), *Encyclopedia of happiness, quality of life and subjective wellbeing* (pp. 7–13). Edward Elgar Publishing. https://doi.org/10.4337/9781800889675.00009

Fischer, R., & Van de Vliert, E. (2011). Does climate undermine subjective well-being? A 58-nation study. *Personality and Social Psychology Bulletin*, *37*(8), 1031–1041. https://doi.org/10.1177/0146167211407075

Forgeard, M. J., Jayawickreme, E., Kern, M. L., & Seligman, M. E. (2011). Doing the right thing: Measuring wellbeing for public policy. *International Journal of Wellbeing,1*(1), 79–106. https://doi.org/10.5502/ijw.v1i1.15

Geerling, D. M., & Diener, E. (2020). Effect size strengths in subjective well-being research. *Applied Research in Quality of Life,15*(1), 167–185. https://doi.org/10.1007/s11482-018-9670-8

Gerrish, E., & Watkins, S. L. (2018). The relationship between urban forests and income: A meta-analysis. *Landscape and Urban Planning*, *170*, 293–308. https://doi.org/10.1016/j.landurbplan.2017.09.005

Gifford, E., & Gifford, R. (2016). The largely unacknowledged impact of climate change on mental health. *Bulletin of the Atomic Scientists*, *72*(5), 292–297. https://doi.org/10.1080/00963402.2016.1216505

Grose, A. (2020). A guide to eco-anxiety: How to protect the planet andyour mental health. London: Watkins media limited.

Hayes, K., Blashki, G., Wiseman, J., Burke, S., & Reifels, L. (2018). Climate change and mental health: Risks, impacts and priority actions. *International Journal of Mental Health Systems*, *12*(1), 1–12. https://doi.org/10.1186/s13033-018-0210-6

Helliwell, J. F., Layard, R., Sachs, J. D., & Neve, J. E. D. (2021). *World happiness report 2021*. Sustainable Development Solutions Network.

Helliwell, J. F., Layard, R., Sachs, J. D., De Neve, J. E., Aknin, L. B., & Wang, S. (Eds.). (2024). *World happiness report 2024*. Wellbeing Research Centre.

Helm, S., Kemper, J. A., & White, S. K. (2021). No future, no kids–no kids, no future? An exploration of motivations to remain childfree in times of climate change. *Population and Environment*, *43*, 108–129. https://doi.org/10.1007/s11111-021-00379-5

Hickman, C. (2020). We need to (find a way to) talk about… Eco-anxiety. *Journal Of Social Work Practice,34*(4), 411–424. https://doi.org/10.1080/02650533.2020.1844166

Higginbotham, N., Connor, L. H., & Baker, F. (2014). Subregional differences in Australian climate risk perceptions: Coastal versus agricultural areas of the Hunter Valley, NSW. *Regional Environmental Change,14*, 699–712. https://doi.org/10.1007/s10113-013-0529-0

Hogg, T. L., Stanley, S. K., O'Brien, L. V., Watsford, C. R., & Walker, I. (2024). Clarifying the nature of the association between eco-anxiety, wellbeing and pro-environmental behaviour. *Journal of Environmental Psychology*, *95*, 102249. https://doi.org/10.1016/j.jenvp.2024.102249

Howell, A. J., Dopko, R. L., Passmore, H. A., & Buro, K. (2011). Nature connectedness: Associations with well-being and mindfulness. *Personality and Individual Differences*, *51*(2), 166–171. https://doi.org/10.1016/j.paid.2011.03.037

Hughey, S. M., Walsemann, K. M., Child, S., Powers, A., Reed, J. A., & Kaczynski, A. T. (2016). Using an environmental justice approach to examine the relationships between park availability and quality indicators, neighborhood disadvantage, and racial/ethnic composition. *Landscape and Urban Planning*, *148*, 159–169. https://doi.org/10.1016/j.landurbplan.2015.12.016

IPCC (2023). *Climate Change Widespread, Rapid, and Intensifying*. Available at: https://www.ipcc.ch/2021/08/09/ar6-wg1-20210809-pr/

IPCC (Ed.). (2022). *Global warming of 1.5° C: IPCC special report on impacts of global warming of 1.5° C above Pre-industrial levels in context of strengthening response to climate change, sustainable development, and efforts to eradicate poverty*. Cambridge University Press. https://doi.org/10.1017/9781009157940

Kahneman, D., & Riis, J. (2005). Living, and thinking about it: Two perspectives on life. *The Science of Well-Being: Integrating Neurobiology, Psychology and Social Science* (pp. 285–304). Oxford University Press.

Kaida, N., & Kaida, K. (2016). Pro-environmental behavior correlates with present and future subjective well-being. *Environment, Development and Sustainability,18*, 111–127. https://doi.org/10.1007/s10668-015-9629-y

Kaniasty, K. (2012). Predicting social psychological well-being following trauma: The role of postdisaster social support. *Psychological Trauma: Theory, Research, Practice, and Policy,4*(1), 22–33. https://doi.org/10.1037/a0021412

Kleres, J., & Wettergren, Å. (2017). Fear, hope, anger, and guilt in climate activism. *Social Movement Studies*, *16*(5), 507–519. https://doi.org/10.1080/14742837.2017.1344546

Kreienkamp, F., Philip, S. Y., Tradowsky, J. S., Kew, S. F., Lorenz, P., Arrighi, J., & Wanders, N. (2021). Rapid attribution of heavy rainfall events leading to the severe flooding in Western Europe during July 2021. *World Weather Atribution*

Kurth, C., & P. Pihkala (2022). Eco-anxiety: What it is and why it matters. *Frontiers in Psychology*, 13,981814.https://doi.org/10.3389/fpsyg.2022.981814.

Lamb, W. F., & Steinberger, J. K. (2017). Human well-being and climate change mitigation. *WIREs Climate Change,8*(6), Article e485. https://doi.org/10.1002/wcc.485

Lawrance, E. L., Thompson, R., Le Vay, N., Page, J., L., & Jennings, N. (2022). The impact of climate change on mental health and emotional wellbeing: A narrative review of current evidence, and its implications. *International Review of Psychiatry*, *34*(5), 443–498. https://doi.org/10.1080/09540261.2022.2128725

Layard, R. (2005). *Happiness*. Allen Lane.

Layard, R., & De Neve, J. E. (2023). *Wellbeing: Science and policy*. Cambridge University Press.

Lebowitz, A., Tachikawa, H., Aiba, M., Okamoto, Y., Takahashi, S., Nemoto, K., & Arai, T. (2019). Postflood social support networks and morbidity in Jôsô city, Japan. *Psychiatry Research*, *271*, 708–714. https://doi.org/10.1016/j.psychres.2018.11.073

Leppold, C., Gibbs, L., Block, K., Reifels, L., & Quinn, P. (2022). Public health implications of multiple disaster exposures. *The Lancet Public Health*, *7*(3), e274–e286. https://doi.org/10.1016/S2468-2667(21)00255-3

Luxembourg Institute of Science and Technology (2021). LIST Report Confirms Exceptional Nature of Recent Floods. Retrieved 15 October 2024 from. https://www.list.lu/en/media/press/list-report-confirms-exceptional-nature-of-recent-floods/

Mayer, F. S., & Frantz, C. M. (2004). The connectedness to nature scale: A measure of individuals' feeling in community with nature. *Journal of Environmental Psychology*, *24*(4), 503–515. https://doi.org/10.1016/j.jenvp.2004.10.001

McDermott, B., Cobham, V., Berry, H., & Kim, B. (2014). Correlates of persisting posttraumatic symptoms in children and adolescents 18 months after a cyclone disaster. *Australian and New Zealand Journal of Psychiatry,48*(1), 80–86. https://doi.org/10.1177/0004867413500349

MeteoLux (2021). *Retour sur les pluies diluviennes du 14 et 15 juillet 2021*. MeteoLux. Retrieved April 18, 2025, from https://www.meteolux.lu/fr/actualites/retour-sur-les-pluies-diluviennes-du-14-et-15-juillet-2021/ meteolux.lu

Middleton, J., Cunsolo, A., Jones-Bitton, A., Wright, C. J., & Harper, S. L. (2020). Indigenous mental health in a changing climate: A systematic scoping review of the global literature. *Environmental Research Letters,15*(5), 053001. https://doi.org/10.1088/1748-9326/ab68a9

Morin, E. (2011). *La vía: Para El futuro de La Humanidad*. Grupo Planeta Spain.

Myers, T. A., Maibach, E. W., Roser-Renouf, C., Akerlof, K., & Leiserowitz, A. A. (2013). The relationship between personal experience and belief in the reality of global warming. *Nature Climate Change*, *3*(4), 343–347. https://doi.org/10.1038/nclimate1754

Netuveli, G., & Watts, P. (2020). Pro-environmental behaviours and attitudes are associated with health, wellbeing and life satisfaction in multiple occupancy households in the UK household longitudinal study. *Population And Environment,41*(3), 347–371. https://doi.org/10.1007/s11111-020-00337-7

Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2011). Happiness is in our nature: Exploring nature relatedness as a contributor to subjective well-being. *Journal of Happiness Studies*, *12*, 303–322. https://doi.org/10.1007/s10902-010-9197-7

OECD. (2022). *Evaluation of Luxembourg's COVID-19 Response: Learning from the Crisis to Increase Resilience*. OECD Publishing. https://doi.org/10.1787/2c78c89f-en

Ogunbode, C. A., Doran, R., & Böhm, G. (2020). Individual and local flooding experiences are differentially associated with subjective attribution and climate change concern. *Climatic Change*, *162*, 2243–2255. https://doi.org/10.1007/s10584-020-02793-4

Ogunbode, C. A., Pallesen, S., Böhm, G., Doran, R., Bhullar, N., Aquino, S., & Lomas, M. J. (2021). Negative emotions about climate change are related to insomnia symptoms and mental health: Cross-sectional evidence from 25 countries. *Current Psychology*. https://doi.org/10.1007/s12144-021-01385-4

Ojala, M. (2022). Hope and climate-change engagement from a psychological perspective. *Current Opinion in Psychology*. https://doi.org/10.1016/j.copsyc.2022.101514. 101514.

Ojala, M., Cunsolo, A., Ogunbode, C. A., & Middleton, J. (2021). Anxiety, worry, and grief in a time of environmental and climate crisis: A narrative review. *Annual Review of Environment and Resources*, *46*, 35–58. https://doi.org/10.1146/annurev-environ-012220-022716

Pihkala , P. (2020). Anxiety and the ecological crisis: An analysis of eco-anxiety and climate anxiety. *Sustainability*, *12*(19), 7836. https://doi.org/10.3390/su12197836

Park, H. J., & Lin, L. M. (2020). Exploring attitude–behavior gap in sustainable consumption: Comparison of recycled and upcycled fashion products. *Journal of Business Research*, *117*, 623–628. https://doi.org/10.1016/j.jbusres.2018.08.025

Research Luxembourg (2021). *Luxembourg comes second in dealing with COVID-19*. Research Luxembourg. https://www.researchluxembourg.org/en/luxembourg-comes-second-in-dealing-with-covid-19/

Rohrer, J. M. (2018). Thinking clearly about correlations and causation: Graphical causal models for observational data. *Advances in Methods and Practices in Psychological Science*, *1*(1), 27–42. https://doi.org/10.1177/2515245917745629

Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford.

Sampaio, F., Costa, T., Teixeira-Santos, L., De Pinho, L. G., Sequeira, C., Luís, S., & Stanley, S. K. (2023). Validating a measure for eco-anxiety in Portuguese young adults and exploring its associations with environmental action. *BMC Public Health,23*(1), 1905. https://doi.org/10.1186/s12889-023-16816-z

Sathyakumar, V., Ramsankaran, R. A. A. J., & Bardhan, R. (2019). Linking remotely sensed urban green space (UGS) distribution patterns and socio-economic status (SES)-A multi-scale probabilistic analysis based in Mumbai, India. *GIScience & Remote Sensing,56*(5), 645–669. https://doi.org/10.1080/15481603.2018.1549819

Schneider-Mayerson, M., & Leong, K. L. (2020). Eco-reproductive concerns in the age of climate change. *Climatic Change*, *163*(2), 1007–1023. https://doi.org/10.1007/s10584-020-02923-y

Schomaker, L., Residori, C., & Samuel, R. (2022). Young people and COVID-19: Social, economic, and health consequences of infection prevention and control measures among young people in Luxembourg–Technical report 2021 cross-sectional survey. *Esch-sur-Alzette*. https://doi.org/10.17605/OSF.IO/4AMQU

Sciberras, E., & Fernando, J. W. (2022). Climate change-related worry among Australian adolescents: An eight-year longitudinal study. *Child and Adolescent Mental Health*, *27*(1), 22–29. https://doi.org/10.1111/camh.12530

Searle, K., & Gow, K. (2010). Do concerns about climate change lead to distress? *International Journal of Climate Change Strategies and Management*, *2*(4), 362–379. https://doi.org/10.1108/17568691011089891

Sekulova, F., & Van den Bergh, J. C. (2016). Floods and happiness: Empirical evidence from Bulgaria. *Ecological Economics*, *126*, 51–57. https://doi.org/10.1016/j.ecolecon.2016.02.014

Shen, Y., Sun, F., & Che, Y. (2017). Public green spaces and human wellbeing: Mapping the spatial inequity and mismatching status of public green space in the central city of Shanghai. *Urban Forestry & Urban Greening,27*, 59–68. https://doi.org/10.1016/j.ufug.2017.06.018

Sirey, J. A., Berman, J., Halkett, A., Giunta, N., Kerrigan, J., Raeifar, E., & Raue, P. J. (2017). Storm impact and depression among older adults living in Hurricane Sandy–affected areas. *Disaster Medicine and Public Health Preparedness,11*(1), 97–109. https://doi.org/10.1017/dmp.2016.189

Stanley, S. K., Hogg, T. L., Leviston, Z., & Walker, I. (2021). From anger to action: Differential impacts of eco-anxiety, eco-depression, and eco-anger on climate action and wellbeing. *The Journal of Climate Change and Health*, *1*, 100003. https://doi.org/10.1016/j.joclim.2021.100003

The, B. M. J. (2021). The climate crisis and the rise of eco-anxiety. Retrieved 9 May, 2023, from https://blogs.bmj.com/bmj/2021/10/06/the-climate-crisis-and-the-rise-of-eco-anxiety/

The Guardian (2021). 'Eco-anxiety': fear of environmental doom weighs on young people. Retrieved 9 May, 2023, from https://www.theguardian.com/society/2021/oct/06/eco-anxiety-fear-of-environmental-doom-weighs-on-young-people

Uddin, R., Philipsborn, R., Smith, D., Mutic, A., & Thompson, L. M. (2021). A global child health perspective on climate change, migration and human rights. *Current Problems in Pediatric and Adolescent Health Care*, *51*(6), 101029. https://doi.org/10.1016/j.cppeds.2021.101029

UN (2023). *What is Climate Change?* Retrieved 9 May, 2023, from https://www.un.org/en/climatechange/what-is-climate-change

United Nations Office for Disaster Risk Reduction (2022). Current and future flood risk in Luxembourg. Retrieved 15 Octobr 2024; from https://www.preventionweb.net/news/current-and-future-flood-risk-luxembourg

Veenhoven, R. (2012). Happiness: Also known as life satisfaction and subjective well-being. In: Land, K., Michalos, A., Sirgy, M. (eds) *Handbook of social indicators and quality of life research* (pp. 63–77). Springer, Dordrecht.

Verplanken, B., Marks, E., & Dobromir, A. I. (2020). On the nature of eco-anxiety: How constructive or unconstructive is habitual worry about global warming? *Journal of Environmental Psychology*, *72*, 101528. https://doi.org/10.1016/j.jenvp.2020.101528

Watts, N., Adger, W. N., Ayeb-Karlsson, S., Bai, Y., Byass, P., Campbell-Lendrum, D., & Costello, A. (2017). The lancet countdown: Tracking progress on health and climate change. *The Lancet*, *389*(10074), 1151–1164. https://doi.org/10.1016/S0140-6736(16)32124-9

Welsch, H., & Kühling, J. (2018). How green self image is related to subjective well-being: Pro-environmental values as a social norm. *Ecological Economics*, *149*, 105–119. https://doi.org/10.1016/j.ecolecon.2018.03.002

Welsch, H., Binder, M., & Blankengerg, A. K. (2021). Green behavior, green self-image, and subjective well-being: Separating affective and cognitive relationships. *Ecological Economics*, *179*, 106854. https://doi.org/10.1016/j.ecolecon.2020.106854

World Bank (2024). *GDP per capita, PPP (current international $) | Data*. World Bank Data. Retrieved March 8, 2023, from https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD?year_high_desc=true

Zawadzki, S. J., Steg, L., & Bouman, T. (2020). Meta-analytic evidence for a robust and positive association between individuals' pro-environmental behaviors and their subjective wellbeing. *Environmental Research Letters*, *15*(12), 123007. https://doi.org/10.1088/1748-9326/abc4ae

Zhen, R., Quan, L., & Zhou, X. (2018). How does social support relieve depression among flood victims? The contribution of feelings of safety, self-disclosure, and negative cognition. *Journal of Affective Disorders*, *229*, 186–192. https://doi.org/10.1016/j.jad.2017.12.087