

Post-Flood Eco-Anxiety: A Phenomenological Study of Flood Survivors

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Keywords: *Eco-Anxiety, Floods in Sumatra, Flood Survivors, Hogg Eco-Anxiety Scale, Phenomenology*

Article history:
Received 10
September 2026
Received in revised
form 12 September
2026
Accepted 22
September 2026
Available online 30
September 2026

Abstract. *Introduction* Eco-anxiety refers to anxiety related to environmental threats and uncertainty about future environmental conditions. Most existing research has focused on general populations, while evidence on eco-anxiety among individuals directly exposed to environmental disasters remains limited, especially in developing countries.

Aim This study explores the lived experiences of eco-anxiety among flood survivors in Tapanuli Tengah Regency, North Sumatra, following the November 2025 flash floods.

Result Three themes emerged: emotional responses to environmental stimuli, recurring thoughts about the flood and the environment in the future, and disruptions to daily functioning intertwined with post-flood economic difficulties.

Conclusion Eco-anxiety following direct flood exposure was reflected not only in emotional responses to environmental cues but also in recurring concerns about future flooding and its implications for everyday safety and livelihood recovery. Psychological support for flood survivors may therefore benefit from addressing both responses to the past disaster and concerns about future environmental threats, alongside livelihood recovery and disaster preparedness.

Introduction

Indonesia ranks among the countries most exposed to natural disasters worldwide, a condition rooted in its location between two oceans and two continents and its tropical climate with high rainfall throughout the year (Shalih et al., 2023). In 2025, 4,727 natural disasters were recorded nationwide, including 2,009 floods, making flooding the most frequent disaster type (Pusat Data Informasi dan Komunikasi Kebencanaan, 2025b). This vulnerability was particularly evident in November 2025, when flash floods and landslides affected several areas of Aceh, North Sumatra, and West Sumatra. In North Sumatra, extremely heavy rainfall began on November 17, 2025, and ecological damage from land-use conversion and

deforestation in upstream areas was also reported as a factor exacerbating the disaster. Such environmental degradation may be psychologically relevant because it can heighten survivors' awareness of environmental vulnerability and uncertainty about future disasters. These concerns are central to the experience of eco-anxiety.

On November 24, 2025, flash floods and landslides affected 13 regencies and cities across North Sumatra. According to BNPB data as of December 31, 2025, the disaster resulted in 365 fatalities, 60 missing people, 13,770 evacuees, and 18,960 damaged homes. Tapanuli Tengah Regency experienced the highest number of fatalities in North Sumatra, with 127 deaths (Pusat Data Informasi dan Komunikasi Kebencanaan, 2025a). The disaster's impact also extended beyond the immediate emergency period. By March 2, 2026, North Sumatra had recorded 376 deaths, with 40 people still missing and 4,837 people remaining in evacuation centers (BNPB, 2026). The substantial impact of the disaster in Tapanuli Tengah and its continuing consequences provide an important context for exploring how survivors make sense of environmental threats and uncertainty about future flooding.

Flooding can have substantial psychological consequences in addition to physical and material losses. Experiences such as the loss of family members, damage to homes, and post-disaster uncertainty can affect survivors' psychological well-being (Foudi et al., 2017; Makwana, 2019). A systematic review and meta-analysis found that the prevalence of PTSD among flood survivors reached 29.48%, with the highest rate in Asia at 57.3% (Golitaleb et al., 2022). These findings are supported by a study showing that the prevalence of PTSD among flood survivors reached 30.36% within 6 to 12 months after the flood (Cruz et al., 2020) and, even three years after the disaster, the quality of life of survivors in terms of anxiety and depression remains significantly lower than that of unaffected individuals (Robin et al., 2020). Eco-anxiety provides a complementary perspective by focusing on psychological responses related to environmental threats and changes.

Eco-anxiety refers to a chronic fear of environmental destruction and anxiety related to the deterioration of environmental conditions (Albrecht, 2011). The concept

is related to climate anxiety but has a broader environmental scope. Climate anxiety specifically refers to anxiety associated with perceptions of climate change (Clayton, 2020). In contrast, eco-anxiety encompasses anxiety related to a broader range of ecological and environmental concerns, including climate change, environmental degradation, pollution, and deforestation (Hogg et al., 2021). Eco-anxiety also differs conceptually from post-traumatic stress disorder (PTSD), which is rooted in a response to a traumatic event that has already occurred. Eco-anxiety relates to concerns about what will happen, future plans that seem threatened, and uncertainty regarding the future of the place where a person lives (Hickman, 2020). Thus, while disaster experiences provide the context in which survivors may develop various psychological responses, the present study focuses specifically on how they interpret and experience concerns related to environmental conditions and future environmental threats.

Recent research suggests that direct exposure to climate-related disasters may be particularly relevant to eco-anxiety. Individuals who have directly experienced climate-related disasters may be more vulnerable to eco-anxiety than those exposed indirectly through information about climate change (Betro', 2024). Direct experiences may make environmental threats more concrete and personally relevant. However, research on eco-anxiety remains uneven across populations and contexts. A review of 36 studies on climate change and mental health found that research has predominantly been conducted in developed countries, while populations in developing countries and groups with direct experience of disasters remain less represented (Pitt et al., 2023). In Indonesia, Kaligis et al. (2025) found associations between eco-anxiety and general anxiety among 1,108 adolescents and young adults, but their quantitative study involved the general population rather than disaster survivors. Qualitative research has examined direct disaster experiences, such as Boyd et al. (2024), who explored eco-anxiety among regional Australian youth with recent experiences of floods and wildfires. However, participants were adolescents and young people with existing mental health problems, and data were collected

through focus group discussions involving both clients and clinicians. Consequently, qualitative research remains limited on how people who directly experienced a flood interpret and experience eco-anxiety in their everyday lives, particularly in developing-country contexts such as Indonesia.

The Hogg Eco-Anxiety Scale (HEAS) provides a multidimensional framework consisting of affective symptoms, rumination, behavioral symptoms, and anxiety about personal impacts (Hogg et al., 2021). In the present study, the HEAS framework therefore serves as a sensitizing concept to inform the initial interview guide rather than a fixed framework for categorizing the findings. The interview questions were developed to encourage participants to describe their experiences openly, with prompts informed by the four HEAS dimensions. For example, participants were invited to discuss emotional responses when thinking about environmental conditions, recurring thoughts or worries about future environmental threats, changes in everyday behavior following the flood, and concerns about how environmental changes may affect themselves or their surroundings. Participants were not required to discuss all four dimensions, and experiences that did not correspond to the HEAS dimensions were also explored and retained during analysis. This approach is consistent with Interpretative Phenomenological Analysis (IPA), which emphasizes participants' lived experiences and allows themes to emerge through the interpretative process (Pietkiewicz & Smith, 2014). IPA is appropriate for this study because understanding eco-anxiety after a flood requires attention to how survivors make sense of environmental changes, future uncertainty, and their experiences in everyday life.

This study's novelty lies in its focus on the lived experiences of flood survivors who directly experienced a recent climate-related disaster in a developing-country context. Through individual in-depth interviews, the study examines how survivors interpret environmental threats, uncertainty about future flooding, and their effects on everyday life. Accordingly, this study aims to gain an in-depth understanding of flood survivors' lived experiences of interpreting eco-anxiety in their daily lives

following the 2025 North Sumatra floods. Specifically, this study explores the forms of concern that arise regarding environmental conditions and the future, as well as how these experiences affect their daily lives.

Method

This study received ethical approval from the Health Research Ethics Committee, Faculty of Medicine, State University of Surabaya (approval number 00028/EA/2026/0256243578). The study employed a qualitative phenomenological design using Interpretative Phenomenological Analysis (IPA) to develop an in-depth understanding of how survivors of the 2025 North Sumatra floods interpreted and experienced eco-anxiety. This design was chosen because the study's central concern is participants' subjective and personal experience, which cannot be adequately captured through quantitative measurement (Alase, 2017). The researcher served as the primary instrument, retaining full control over interview planning, data collection, analysis, and reporting, and was responsible for building rapport and maintaining interpersonal sensitivity so that the essence of participants' experiences could be captured with fidelity (Zhang & Okazawa, 2023).

Participants were selected through purposive sampling, based on the alignment between participants' characteristics and the study's objectives (Ahmed, 2024), with inclusion criteria: (1) being 18 years of age or older; (2) having directly experienced the November 2025 floods in Tapanuli Tengah Regency, North Sumatra; (3) continuing to reside in Tapanuli Tengah Regency at the time of data collection; (4) providing voluntary informed consent; and (5) having access to a mobile phone for the online interview. Prospective participants who declined to proceed after receiving the study information were not included. Ten participants met the inclusion criteria and participated in the study. The number of participants was determined during the data collection process based on the adequacy of the information obtained to address the research objectives. A total of 10 participants who met the inclusion criteria participated in the study.

Table 1.
Demographic Profile of Participants

Initials	Gender	Age
ER	Female	55 years
EH	Male	18 years
DAS	Male	22 years
CST	Female	34 years
FALH	Female	34 years
FDS	Female	41 years
LP	Female	40 years
TP	Female	55 years
KH	Male	54 years
RH	Female	46 years

The study was conducted in Tapanuli Tengah Regency, North Sumatra, one of the areas affected by the flash floods of November 24, 2025. Of the 365 deaths recorded across North Sumatra as of December 31, 2025, Tapanuli Tengah recorded the highest toll at 127, followed by Tapanuli Selatan at 88 and Sibolga City at 55 (Pusat Data Informasi dan Komunikasi Kebencanaan, 2025a). Data were collected online via WhatsApp Video Call over one week, from March 22 to 29, 2026, and recorded using a dedicated recording device to preserve audio against network disruption. Interviews lasted 20 to 30 minutes, shorter than the one hour or more generally recommended for IPA (Pietkiewicz & Smith, 2014), a decision made to accommodate participants' post-flood work obligations and to avoid emotional exhaustion given the topic's sensitivity, with depth instead pursued by focusing questions tightly on the core of participants' experience.

Interviews were semi-structured, with the Hogg Eco-Anxiety Scale (HEAS) dimensions serving as a conceptual background for developing the interview guide. The four dimensions identified by Hogg et al. (2021), namely affective symptoms, rumination, behavioral symptoms, and anxiety about personal impact, informed the areas explored during the interviews without being used as predetermined categories for analysis. The interview began with rapport building and general questions about participants' experiences during and after the flood, followed by questions exploring their emotional responses, thoughts and concerns about environmental conditions

and future flooding, behavioral changes, and perceived environmental impacts. The interview concluded with an opportunity for participants to add experiences they considered important but had not yet discussed. During the interview, the researcher used active listening and a nonjudgmental attitude to create a safe space for participants (Lavee & Itzchakov, 2023) and allowed participants to pause or stop the interview when necessary. Some examples of interview questions are:

“After experiencing the flood yesterday, what feelings come to mind most often when you think about the possibility of another flood or the conditions in your surroundings? Why do those feelings come to mind most often?”

“What are your thoughts on the floods you have experienced or those that might occur in the future?”

Recordings were transcribed verbatim in full prior to analysis. Each transcript was returned to its respective participant for member checking, allowing participants to confirm or correct the researcher's interpretation before analysis proceeded, which also served as a first step in establishing confirmability (Candela, 2019). Data were analyzed manually following the IPA procedure outlined by Pietkiewicz & Smith (2014), consisting of repeated reading of each transcript, developing exploratory notes, identifying emergent themes, clustering into superordinate themes at the individual level, and finally formulating overarching themes across participants. Analysis was further guided by the quality criteria proposed by Nizza et al. (2021), which call for presenting findings as a coherent narrative grounded in participants' own language, attending closely to word choice, tone, and repetition within quotations, and explicitly noting both.

The study established trustworthiness based on the four criteria proposed by Lincoln and Guba (1985). Credibility was supported through member checking to assess the findings' credibility with participants. The study addressed transferability through detailed descriptions of the research context, participant characteristics, and selection criteria. The study supported dependability through systematic documentation of the research process, including data recording, verbatim transcription, and analysis. Confirmability was supported by grounding the findings

in participants' accounts and documenting the analytical process to demonstrate that interpretations were derived from the data.

Result

This study identified three themes describing the experiences of eco-anxiety among 10 flood survivors in Tapanuli Tengah Regency, North Sumatra: (1) psychological responses to flooding, (2) recurring thoughts about floods, and (3) disruptions to daily life caused by flooding. These findings are presented narratively by theme to preserve the depth and uniqueness of each participant's lived experience, in accordance with the characteristics of the phenomenological approach.

1. Psychological Responses to Flooding

All participants reported feelings of anxiety, fear, and apprehension in their daily lives, particularly when faced with certain situations that reminded them of the previous flood. Weather conditions, especially rain and overcast skies, were common triggers.

"What I'm feeling is a sense of anxiety, worry, and fear because we've already experienced and gone through the flood yesterday." (P1, 4-6).

"We're really scared and anxious about where this is all going, wondering if the world is about to end." (P8, 10-11).

Psychological responses were also triggered by environmental conditions associated with the flood, such as rain and overcast skies that served as strong triggers for the resurgence of feelings of anxiety and trauma.

"For example, when we see thick clouds like it's about to rain, we get worried that there might be another flood." (P9, 42-44).

Some participants also reported that physical aspects of their surroundings, such as seeing river water begin to rise or noticing flood damage still visible in their homes, also triggered psychological responses.

"Yes, thoughts of the flood come to mind when we see the house is still dirty and hasn't been fully repaired." (P7, 21-22).

Two of the participants, who were mothers, exhibited a more specific and personal form of anxiety. They were concerned about the future and their children's safety because of the flood they experienced.

"It's the worries about being a stay-at-home mom that we often think about, anxiety about our children's future, and their safety." (P4, 16-18).

These concerns reflect how the social role of parenthood interacts with experiences of eco-anxiety and gives rise to a more complex form of anxiety, as environmental threats are perceived not only as threats to oneself but also to the next generation, for whom they are responsible.

2. Recurring Thoughts About Floods

Some participants experienced recurring thoughts about floods that arose spontaneously without being preceded by any clear external stimulus. These recurring thoughts arose suddenly in participants' daily lives, even when there was no threat of flooding, such as just before going to sleep at night.

"Once we're settled in, we still can't help but worry that it might rain and cause flooding, so it makes us feel a little uneasy when we're trying to sleep." (P9, 55-57).

For some participants, thoughts about flooding became a persistent part of their daily lives.

"No matter where we go, we always think about the floods. Who knows when there might be a flood, so let's hurry home." (P8,19-21).

The ruminative thoughts experienced by these participants had distinct characteristics. They were involuntary, arising unbidden, and difficult to stop, even though the participants were aware that there was no actual threat of flooding at that time.

3. Disruptions to Daily Life Caused by Flooding

These disruptions were not merely temporary during the flood itself; they continued into the post-flood period and affected participants' quality of life and their ability to carry out daily activities. Participants commonly reported sleep

disturbances, particularly during rainfall, when they became vigilant about possible increases in water levels.

"At night, when it rains, we sometimes can't sleep because we're afraid the water might suddenly rise, so we keep going back and forth to the river to check." (P5, 49).

Some participants also experienced physical symptoms such as body aches, headaches, fatigue, and a loss of appetite.

"I have trouble sleeping, my body aches, I often get headaches, I feel dizzy, and when I wake up in the morning, I feel really sluggish." (P1, 57-60).

Daily activities and employment were also disrupted. Most participants worked as farmers and reported difficulty returning to their fields because of mud, damaged land, and concerns about rainfall.

"Yes, it's really disruptive. We're worried about flooding, you know? It's like when we're about to start working, and it suddenly starts raining, so we can't go out to the fields or the rice paddies anymore." (P5, 61-63).

Economic losses further intensified the disruption. Damaged household belongings, crop failures, and agricultural land covered by mud reduced participants' sources of income and created additional financial concerns.

"Some rice fields were buried under mud, so the harvest failed. As for the gardens, for example, the sweet potato plants we planted also died because of the mud. It's really concerning, and we've lost about half of our livelihood." (P10, 30-34).

"I'm clearly worried and sad because the cost of living after the flood is so high. I'm definitely worried about what life will be like from now on." (P1, 6-7).

These economic difficulties added to participants' psychological burden, as they faced uncertainty about their future livelihood and ability to meet daily needs.

Discussion

Eco-anxiety is a form of anxiety that arises in response to environmental threats and damage, encompassing concerns about deteriorating ecological conditions and their impact on human life (Albrecht, 2011). Hogg et al. (2021) operationalized this construct into four dimensions measured by the Hogg Eco-Anxiety Scale (HEAS), namely affective symptoms, rumination, behavioral

symptoms, and anxiety about personal impact. Levels of vulnerability to this condition were found to increase significantly among populations directly exposed to natural disasters, as demonstrated in a study by Mosca et al. (2025) involving 1,051 participants, in which direct exposure to natural disasters such as floods, droughts, wildfires, and landslides was strongly correlated with high levels of eco-anxiety.

The present study extends this evidence by showing how people experience and interpret eco-anxiety in everyday life after a flood disaster. Rather than examining disaster exposure as a predictor of eco-anxiety, this study shows how environmental cues, anticipation of recurrent flooding, disruption to daily functioning, and post-flood socioeconomic pressures become interconnected within survivors' accounts.

Emotional and Cognitive Responses to Floods

Persistent anxiety, fear, and worry among participants align with findings among flood survivors in Malaysia, where fear of recurring floods was a common post-disaster response (Kirin et al., 2025) and with evidence that direct flood exposure is associated with greater psychological distress (Philip & V, 2023). However, the present findings suggest that these responses do not necessarily diminish after the immediate disaster period. Instead, environmental cues such as rain, overcast skies, rising river water, and visible flood damage could reactivate anxiety.

These findings support a study by Apriyanto & Setyawan (2020), which found that flood experiences make survivors more sensitive to natural conditions such as overcast skies and changes in the weather. Such environmental cues may become psychologically salient after direct disaster exposure because previous experiences can influence how individuals notice, remember, and interpret subsequent environmental events (Brügger et al., 2021). Thus, rain or other environmental changes may not be perceived as ordinary weather conditions but instead remind participants of the possibility of another flood.

Some participants also experienced rumination, which involves repetitive, ruminative thoughts about negative environmental events (Hogg et al., 2021). These

recurring thoughts about the flood emerged during daily activities such as commuting to work and even at night before falling asleep, indicating that they have become part of their daily thought patterns. Rumination in a post-disaster context can occur unintentionally and be difficult to control (Leal-Soto et al., 2016), and if it persists, it can hinder the emotional processing necessary for recovery and exacerbate existing psychological impacts (García et al., 2015). The experiences of two mothers also demonstrate how social roles can shape eco-anxiety. Their concerns extended from personal safety to the safety and future of their children. Caregiving responsibilities may therefore broaden the perceived consequences of environmental threats, as survivors consider not only their own vulnerability but also their responsibility for others.

Although these recurring thoughts and emotional responses occurred following the flood, they should not be equated with PTSD symptoms, as PTSD was not assessed in the present study. Conceptually, PTSD is associated with responses to past traumatic events, whereas eco-anxiety concerns environmental threats, uncertainty about the future, and threatened future plans (Hogg et al., 2021). Participants' accounts included both memories of the flood and concerns about environmental conditions and possible future flooding, which are discussed here in relation to the broader concept of eco-anxiety.

Disruptions to Daily Functioning and Economic Impacts

The behavioral symptoms identified in this study were closely connected to the participants' living conditions after the flood. Sleep disturbances, physical complaints, and difficulties returning to work suggest that eco-anxiety was not confined to psychological experiences but became embedded in everyday functioning. These findings are consistent with evidence that flooding can have prolonged physical and psychological consequences for survivors (Zhong et al., 2018).

Participants who work as farmers also reported declining motivation and difficulty returning to work because their rice paddies and fields remained covered

in mud after the flood. Previous research has similarly shown that flooding disrupts agricultural work and prolongs recovery among farmers (Z. et al., 2017). The present findings extend this perspective by showing how environmental damage and anxiety about recurrent flooding may interact with livelihood disruption. In the present study, environmental damage and livelihood disruption appeared alongside concerns about recurrent flooding. Damage to agricultural land and uncertainty about economic recovery may make future flooding more psychologically salient because another flood could threaten not only physical safety but also income and livelihood recovery. Thus, economic difficulties and concerns about recurrent flooding appeared intertwined in participants' post-flood experiences, rather than indicating a direct causal relationship between economic losses and eco-anxiety.

Anxiety about personal impact, the fourth HEAS dimension, did not emerge in this study. This dimension focuses on individuals' concerns regarding the extent to which their personal behaviors contribute to environmental damage and the effectiveness of their actions in improving those conditions (Hogg et al., 2021). Among participants in Tapanuli Tengah Regency, the psychological dynamics that emerged appeared more oriented toward the post-disaster recovery process than toward reflecting on how individual behavior contributes to the broader climate crisis. The absence of this dimension does not necessarily indicate that the HEAS construct is inadequate. Instead, it may suggest that different dimensions of eco-anxiety become more or less salient depending on the environmental and social context in which eco-anxiety is experienced. This finding also supports the use of the HEAS dimensions as a conceptual background rather than as predetermined categories for qualitative analysis.

The findings suggest that responses to post-flood eco-anxiety may benefit from integration across psychological, livelihood, and disaster-preparedness domains. At the psychosocial level, programs could include psychoeducation about environmental triggers and practical strategies for managing anxiety when experiencing heavy rain or observing changes in river conditions. Livelihood support

could include training in flood-resilient agricultural practices or alternative income sources for households whose livelihoods depend heavily on flood-sensitive activities. At the community level, strengthening local early-warning systems and providing clear information about flood risks and evacuation procedures may help reduce uncertainty and support preparedness. These approaches may be particularly relevant when psychological concerns are closely connected to environmental and economic conditions.

Several limitations should be considered. First, online interviews through WhatsApp video calls may have limited observation of nonverbal expressions and participants' immediate environments. Future studies could use face-to-face interviews. Second, the study involved 10 participants from a single regency. Although the sample captured variation in experiences, it may have limited the idiographic depth emphasized in IPA. Future IPA studies could use smaller samples and repeated interviews to explore individual experiences more deeply. Third, the cross-sectional design captured experiences at one point in the post-disaster period. Longitudinal research could examine how eco-anxiety changes across different stages of recovery. Finally, the single geographical context limits transferability. Future comparative studies could examine flood survivors across regions or disaster types and explore whether the salience of HEAS dimensions varies across contexts.

Conclusion

This study shows that eco-anxiety among flood survivors in Tapanuli Tengah Regency extends beyond the immediate disaster and becomes embedded in everyday life. Participants' experiences involved persistent emotional responses to environmental stimuli, recurring thoughts about flooding, and disruptions to daily functioning, including sleep, physical well-being, work, and livelihood conditions. Three dimensions of the Hogg Eco-Anxiety Scale, namely affective symptoms, rumination, and behavioral symptoms, were evident, whereas anxiety about personal impact was not identified. The findings extend existing understandings of eco-anxiety by showing how direct flood exposure can make environmental threats an

immediate, recurring concern intertwined with future uncertainty, family responsibilities, and livelihood conditions. These findings highlight the importance of understanding eco-anxiety within the social and environmental contexts in which disaster survivors experience and interpret ongoing environmental threats. Post-disaster recovery should therefore consider future-oriented environmental concerns alongside psychological, livelihood, and socioeconomic needs.

Suggestion

Future research should use longitudinal designs and include participants from diverse geographical and socioeconomic contexts to examine how eco-anxiety changes throughout post-disaster recovery. Further studies could specifically explore the anxiety about personal impact dimension by examining participants' perceptions of how their own environmental behaviors contribute to environmental problems and whether they perceive opportunities for individual or collective environmental action. Research could also examine coping and social support in greater depth, including context-specific practices such as sharing information about flood risks, helping neighbors during heavy rainfall, participating in community preparedness activities, and supporting livelihood recovery. For practitioners and policymakers, post-disaster programs could integrate psychological support with livelihood assistance, environmental risk education, and community-based early-warning systems to address survivors' interconnected concerns.

Acknowledgement

The authors would like to thank everyone who contributed to this study, especially the participants who were willing to share their personal experiences. Their willingness and trust formed the foundation of this study.

Author contribution

RS designed and conducted the study, collected and analyzed the data, and drafted the manuscript. SJ contributed to developing the interview guidelines, provided guidance on the research design, methodology, and analysis, and reviewed

and revised the manuscript. Both authors have read and approved the final version of this manuscript.

Competing interest

The authors declare no financial or professional conflicts of interest related to this study.

Funding

This study did not receive financial support from any party, institution, or organization.

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