
Extreme Weather Events, Student Well-Being, and Adaptive Responses: Examining Physical, Emotional, and Coping Outcomes among Secondary School Students in Catanduanes, Philippines

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Abstract — Extreme weather events (EWEs) increasingly disrupt educational continuity and adversely affect students' physical well-being, psychological health, and academic functioning, particularly in disaster-prone communities. This study examined the physical and emotional impacts of EWEs on students of Catanduanes National High School, Virac, Catanduanes, Philippines, during the School Year 2025–2026. Specifically, it determined students' demographic characteristics, assessed the extent of the physical and emotional impacts of EWEs, evaluated students' adaptation and coping strategies, and examined the relationships among demographic characteristics, EWE impacts, and adaptive responses. Employing a quantitative descriptive–correlational research design, the study involved 275 students selected through proportionate stratified random sampling. Data were collected using a validated researcher-developed questionnaire (Cronbach's $\alpha = .983$) and analyzed using frequency, percentage, weighted mean,

Cramér's V, and Spearman's rank-order correlation. Results revealed that students experienced **very** high physical and emotional impacts of EWEs, with emotional impacts being more pronounced. Respondents also demonstrated a very high level of adaptation and coping. Household income, residential location, and hazard exposure were significantly associated with both EWE impacts and adaptation strategies, whereas sex was not. Moreover, both physical and emotional impacts were significantly related to students' adaptation and coping strategies, with emotional impacts exhibiting a stronger relationship. The findings underscore the need to strengthen school-based disaster preparedness, psychosocial support services, and resilience-building interventions to enhance students' capacity to cope with the increasing impacts of extreme weather events.

Keywords: extreme weather events, physical impacts, emotional impacts, adaptation and coping strategies, disaster resilience, secondary school students, Philippines

I. INTRODUCTION

Extreme weather events (EWEs) have become increasingly frequent and intense due to climate change, posing significant threats to human well-being, education, and community resilience worldwide (Intergovernmental Panel on Climate Change [IPCC], 2023; United Nations Office for Disaster Risk Reduction [UNDRR], 2022). Educational institutions are particularly vulnerable because disruptions caused by typhoons, flooding, storm surges, and extreme heat can adversely affect students' physical safety, psychological well-being, and academic continuity. Recent evidence suggests that exposure to recurring disasters extends beyond immediate physical consequences, contributing to emotional distress, reduced academic engagement, and diminished learning outcomes among school-aged children (UNICEF, 2021; UNESCO, 2023). Consequently, understanding how students experience and respond to EWEs has become a critical concern in advancing disaster-resilient education systems and promoting learners' overall well-being.

In the Philippines, one of the world's most disaster-prone countries, schools are frequently exposed to climate-related hazards that interrupt teaching and learning processes (Department of Education [DepEd], 2023; National Disaster Risk Reduction and Management Council [NDRRMC], 2023). The Bicol Region, particularly the island province of Catanduanes, experiences recurrent typhoons and heavy rainfall due to its geographical location along the Pacific typhoon corridor. These hazards often result in prolonged class suspensions, infrastructure damage, transportation disruptions, and displacement of affected communities. Beyond these physical consequences, repeated exposure to disasters may heighten students' anxiety, uncertainty, and emotional vulnerability, ultimately influencing their academic performance and overall development. Although disaster risk reduction initiatives have been strengthened through national policies and school-based preparedness programs, variations in students' experiences and adaptive capacities remain evident across socioeconomic and environmental contexts (DepEd, 2023; UNDRR, 2022).

Students' responses to EWEs are shaped not only by the severity of hazard exposure but also by their socioeconomic circumstances, residential environments, and access to social and institutional support. Previous studies have shown that adaptive behaviors, such as complying with evacuation procedures, seeking emotional support, adjusting learning routines, and participating in disaster preparedness activities, enhance resilience and reduce disaster-related risks (Masten, 2021; UNICEF, 2021). Likewise, demographic characteristics, including household income and geographic location, have been associated with differences in disaster vulnerability and recovery capacity. Nevertheless, adaptation and coping are dynamic processes influenced by the interaction of physical experiences, emotional responses, and contextual factors, emphasizing the need for comprehensive investigations that integrate these dimensions within a single analytical framework.

Despite the growing body of literature on disaster resilience and climate change adaptation, several research gaps remain. A contextual gap persists because most empirical studies have been conducted in urban or mainland settings, with limited evidence from geographically isolated island provinces such as Catanduanes, where recurrent typhoons create unique educational challenges (UNESCO, 2023). A conceptual gap is evident in the tendency of previous studies to examine either the impacts of disasters or students' coping mechanisms independently, providing limited

understanding of how these constructs interact. Methodologically, many investigations rely primarily on descriptive analyses, with relatively few studies examining the relationships among demographic characteristics, disaster impacts, and adaptation strategies using inferential statistical approaches. Furthermore, an empirical gap exists regarding how socioeconomic status, residential location, and hazard exposure collectively influence both the physical and emotional consequences of EWEs and students' adaptive responses within the Philippine secondary education context. Finally, a research-to-practice gap remains because relatively few studies have translated empirical findings into evidence-based recommendations that can strengthen school disaster preparedness and learner support in hazard-prone communities.

Addressing these gaps, the present study examines the physical and emotional impacts of extreme weather events on students of Catanduanes National High School and investigates the adaptation and coping strategies they employ in response to these events. It further determines the relationships between students' demographic characteristics, the impacts of EWEs, and their adaptive responses within an integrated analytical framework. By situating the investigation in one of the Philippines' most disaster-prone island provinces, the study contributes localized empirical evidence to the growing literature on climate resilience and educational continuity. Ultimately, the findings provide an evidence base for strengthening school-based disaster risk reduction initiatives, enhancing psychosocial support programs, and informing context-responsive interventions that promote students' resilience, safety, and well-being in the face of increasingly frequent extreme weather events.

Statement of the Problem. This study examined the physical and emotional impacts of Extreme Weather Events (EWEs) on students of Catanduanes National High School (CNHS), Virac, Catanduanes, and investigated the adaptive strategies employed by students in response to these events. Specifically, it sought to answer the following questions:

1. What is the demographic profile of the students in terms of:

- 1.1.sex;

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- 1.2. socioeconomic status;
 - 1.3. geographic location; and
 - 1.4. prevailing hazard exposure?
2. What is the extent of the physical and emotional impacts of Extreme Weather Events (EWEs) on students?
 3. What adaptation and coping strategies do students employ in response to the effects of EWEs?
 4. Is there a significant relationship between students' demographic characteristics and the physical and emotional impacts of EWEs?
 5. Is there a significant relationship between students' demographic characteristics and their adaptation and coping strategies toward EWEs?
 6. Is there a significant relationship between the physical and emotional impacts of EWEs and students' adaptation and coping strategies?

Null Hypotheses. The following null hypotheses were tested at a 0.05 significance level:

1. There is no significant relationship between the demographic characteristics of the students (sex, socioeconomic status, geographic location, and prevailing hazard exposure) and the physical and emotional impacts of Extreme Weather Events (EWEs).
2. There is no significant relationship between the demographic characteristics of the students (sex, socioeconomic status, geographic location, and prevailing hazard exposure) and their adaptation and coping strategies toward Extreme Weather Events (EWEs).
3. There is no significant relationship between the physical and emotional impacts of Extreme Weather Events (EWEs) and the adaptation and coping strategies

Scope of the Study. This study was conducted at Catanduanes National High School (CNHS), Virac, Catanduanes, Philippines, during the School Year 2025–2026, focusing on student respondents. It examined students' demographic characteristics (sex, socioeconomic status, geographic location, and prevailing hazard exposure), the physical and emotional impacts of Extreme Weather Events (EWEs), and the adaptation and coping strategies employed in response to these events. Furthermore, the study analyzed the relationships among students' demographic characteristics, the impacts of EWEs, and their adaptation and coping strategies using descriptive and correlational statistical approaches. The findings served as the basis for developing evidence-informed recommendations to strengthen school-based disaster preparedness, psychosocial support, and resilience-building initiatives for students in disaster-prone educational settings.

Theoretical and Conceptual Framework. This study is anchored on Behavioral Learning Theory and Vulnerability Theory, which together provide a comprehensive explanation of how students experience and respond to Extreme Weather Events (EWEs). Behavioral Learning Theory, developed through the works of Watson (1913), Pavlov (1927), and Skinner (1953), posits that behaviors are learned and reinforced through repeated interactions with environmental stimuli. In the context of this study, students' adaptation and coping strategies are viewed as learned responses that develop through recurring exposure to climate-related disruptions, previous disaster experiences, and reinforcement from schools, families, and communities. Consequently, the theory explains how the physical and emotional impacts of EWEs can shape students' adaptive behaviors and resilience over time (Schunk, 2020).

Complementing this perspective, Vulnerability Theory (Cutter, 1996) explains that disaster impacts vary according to individuals' demographic and contextual characteristics rather than hazard exposure alone. Students' sex, socioeconomic status, geographic location, and prevailing hazard exposure influence their susceptibility to the physical and emotional consequences of EWEs as well as their capacity to adapt and recover. This theoretical lens underscores that vulnerability is determined by the interaction of social, economic, and environmental conditions, thereby providing a basis for examining how demographic characteristics influence disaster

impacts and students' adaptive responses in disaster-prone educational settings (Intergovernmental Panel on Climate Change [IPCC], 2022; Leal Filho et al., 2024).

Guided by these theoretical foundations, Figure 1 presents the study's conceptual model, which illustrates the hypothesized relationships among students' demographic characteristics, the physical and emotional impacts of EWEs, and their adaptation and coping strategies. The model identifies demographic characteristics as the independent variables, the physical and emotional impacts of EWEs as the intervening variable, and adaptation and coping strategies as the dependent variable. It specifically examines the relationships between demographic characteristics and EWE impacts, demographic characteristics and adaptation and coping strategies, and the physical and emotional impacts of EWEs and students' adaptation and coping strategies. Collectively, the framework provides the theoretical and empirical basis for understanding students' resilience and for informing evidence-based school disaster preparedness, psychosocial support, and climate adaptation initiatives.

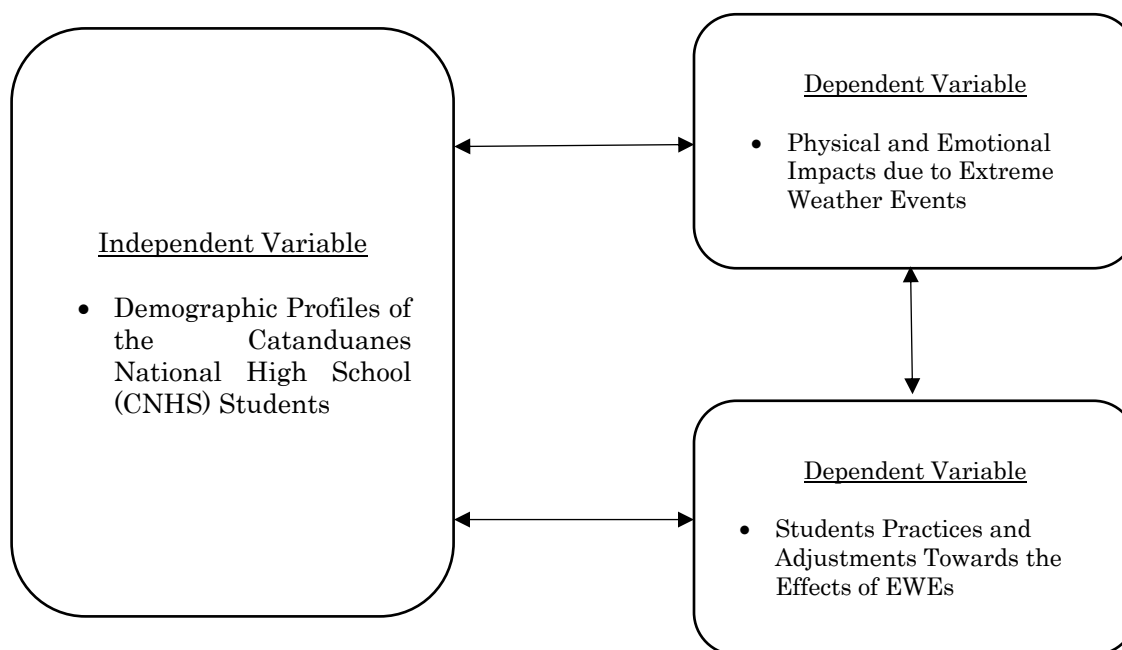


FIGURE 1
CONCEPTUAL MODEL OF THE STUDY

LITERATURES REVIEW

The growing frequency and intensity of extreme weather events (EWEs) have drawn increasing scholarly attention to their multifaceted impacts on students, particularly in disaster-prone regions where educational continuity, physical health, and emotional well-being are most at risk.

Extreme Weather Events and Their Physical and Emotional Impacts on Students

Extreme Weather Events (EWEs) such as typhoons, floods, heatwaves, and droughts have become increasingly frequent and intense due to climate change, posing significant risks to vulnerable populations, particularly students in disaster-prone regions. EWEs are characterized by their unpredictability, severity, and capacity to disrupt normal life patterns, including educational continuity (IPCC, 2021). In Southeast Asia and the Pacific, where climate hazards are recurrent, schools often serve as both educational and evacuation centers, amplifying the exposure of students to disaster risks (UNESCO, 2020).

The physical impacts of EWEs on students include injuries, malnutrition, and increased susceptibility to communicable diseases due to displacement and overcrowded shelters (Shultz et al., 2019). For instance, prolonged flooding has been linked to outbreaks of waterborne illnesses among children, while heatwaves exacerbate dehydration and respiratory conditions (Xu et al., 2020). Beyond physical health, EWEs exert profound emotional and psychological effects. Studies reveal heightened levels of anxiety, depression, and post-traumatic stress among students exposed to disasters, with long-term consequences for their academic performance and social functioning (Tang et al., 2018; Pfefferbaum et al., 2019).

Educational disruptions are equally significant. School closures, damaged facilities, and loss of instructional time undermine learning continuity, particularly in resource-constrained contexts (Anderson, 2020). Empirical studies highlight that students in disaster-prone areas often experience prolonged interruptions in schooling, leading to learning gaps and reduced academic achievement (Kousky, 2016). Despite these findings, limited research systematically examines the

integrated relationship between EWEs, students' physical health, psychological well-being, and educational outcomes in localized contexts such as island provinces in the Philippines. This gap underscores the need for context-specific studies that capture the lived experiences of students during and after EWEs.

Students' Adaptation and Coping Strategies Toward Extreme Weather Events

Adaptation and coping strategies represent critical mechanisms through which students respond to the impacts of EWEs. Adaptation refers to proactive adjustments to reduce vulnerability, while coping involves psychological and behavioral responses to stressors (Norris et al., 2008). Recent literature emphasizes that students employ diverse coping mechanisms, ranging from problem-focused strategies such as preparedness drills to emotion-focused strategies like seeking social support (Masten, 2018).

Behavioral coping mechanisms include participation in disaster preparedness activities, adherence to evacuation protocols, and engagement in community-based resilience programs (Peek et al., 2018). Psychological coping, on the other hand, involves cognitive reframing, emotional regulation, and reliance on peer and family support systems (Bonanno et al., 2018). Schools play a pivotal role in fostering adaptive behaviors by integrating disaster risk reduction (DRR) education into curricula and conducting regular drills (UNICEF, 2019).

Empirical studies demonstrate that students with strong family, school, and community support systems exhibit greater resilience and faster recovery following EWEs (Masten & Motti-Stefanidi, 2020). However, disparities exist in adaptive capacity, with marginalized students often lacking access to resources and psychosocial support. While international frameworks advocate for child-centered DRR, localized empirical evidence on how students in rural and disaster-prone regions adapt and cope remains limited. This gap highlights the need for research that explores culturally and contextually relevant coping strategies among students exposed to recurrent EWEs.

Demographic Characteristics, Vulnerability, and Adaptive Capacity in Disaster Contexts

Students' demographic and contextual characteristics significantly influence their vulnerability to EWEs and their adaptive responses. Vulnerability theory posits that disaster impacts are unevenly distributed across populations, shaped by factors such as age, gender, socioeconomic status, and geographic location (Wisner et al., 2014). Recent studies confirm that younger students are more physically vulnerable to disaster-related injuries and illnesses, while adolescents are more prone to psychological distress (Tang et al., 2018).

Sex differences also emerge in disaster impacts and coping. Research indicates that female students often experience higher levels of emotional distress but demonstrate stronger social coping mechanisms, while male students are more likely to engage in risk-taking behaviors during disasters (Fothergill & Peek, 2015). Socioeconomic status further shapes vulnerability, as students from low-income families face greater challenges in accessing healthcare, educational continuity, and psychosocial support during and after EWEs (Kousky, 2016).

Geographic location is another determinant of hazard exposure. Students in coastal and island communities are disproportionately affected by typhoons and flooding, while those in urban poor settlements face risks from heatwaves and infrastructural collapse (Shultz et al., 2019). Despite these insights, empirical studies rarely integrate demographic variables with adaptive capacity in disaster contexts. Existing literature often treats vulnerability and adaptation as separate constructs, leaving a gap in understanding how demographic characteristics interact with coping strategies to shape resilience among students.

Identified Research Gap

While existing studies provide valuable insights into the physical, emotional, and educational impacts of EWEs, as well as students' coping strategies and demographic vulnerabilities, significant gaps remain. First, much of the literature is concentrated in high-income or urban contexts, with limited empirical focus on rural, geographically isolated, and disaster-prone regions such as island provinces in the Philippines. Second, prior studies often examine

physical health, psychological well-being, or educational disruptions in isolation, without integrating these dimensions to capture the holistic impacts of EWEs on students. Third, there is limited research on the interaction between demographic characteristics and adaptive capacity, particularly in relation to localized coping strategies and resilience-building initiatives.

Hence, the present study addresses these gaps by examining the physical and emotional impacts of EWEs on students, their adaptation and coping strategies, and the influence of demographic characteristics on vulnerability and resilience. By generating localized empirical evidence, this study contributes to the development of context-responsive interventions that strengthen student resilience and educational continuity in disaster-prone regions.

II. METHODOLOGY

Research Design. This study utilized a descriptive-correlational quantitative research design employing a cross-sectional survey approach to examine the physical and emotional impacts of Extreme Weather Events (EWEs) on students and the adaptation and coping strategies they employ. The descriptive aspect was used to characterize students' demographic profiles and assess the extent of EWE-related impacts and adaptive responses, while the correlational aspect determined the significant relationships among demographic characteristics, physical and emotional impacts, and coping strategies. This non-experimental design is appropriate for describing existing conditions and examining naturally occurring associations among variables without manipulation, thereby providing empirical evidence to inform school-based disaster preparedness and student well-being interventions (Creswell & Creswell, 2018; Apuke, 2017).

Population, Samples and Sampling Technique. The study was conducted among students of Catanduanes National High School during the School Year 2025–2026, with a total population of 5,501 students enrolled from Grade 7 to Grade 12. To obtain a representative sample and ensure proportional inclusion of participants across grade levels, the study employed a proportionate stratified sampling approach, wherein five percent (5%) of the population in each grade level was

selected, resulting in a total sample of 275 respondents. Stratified random sampling was utilized, with each grade level serving as a stratum to account for potential differences among student groups and to improve the precision of population estimates. Within each stratum, respondents were selected through simple random sampling methods, such as a lottery technique or computer-generated random numbers, thereby ensuring that every student had an equal probability of being chosen and minimizing sampling bias. The use of stratified random sampling is widely recommended in educational research because it enhances representativeness, reduces sampling error, and increases the validity and generalizability of research findings, particularly when the population consists of distinct subgroups that must be proportionately represented (Etikan & Bala, 2017; Sharma, 2017; Taherdoost, 2016). Consequently, this sampling procedure strengthened the methodological rigor of the study and ensured that the sample adequately reflected the characteristics of the entire student population.

Instrumentation. The study utilized a researcher-developed structured questionnaire as the primary data-gathering instrument to assess students' demographic characteristics, the physical and emotional impacts of Extreme Weather Events (EWEs), and their adaptation and coping strategies. The instrument consisted of three parts: Part I gathered respondents' demographic profile, including sex, socioeconomic status, geographic location, and prevailing hazard exposure, presented in a checklist format. Part II measured the extent of physical and emotional impacts of EWEs across two subscales—physical and emotional dimensions—covering disruptions in health, academic participation, and psychological well-being. Part III assessed students' adaptation and coping strategies in response to EWEs, focusing on preparedness behaviors, coping mechanisms, and adaptive responses. Items in Parts II and III were rated using a 4-point Likert scale, allowing standardized interpretation of responses.

To ensure methodological rigor, the instrument underwent face and content validation by a panel of experts in education and research methodology, who evaluated its relevance, clarity, coherence, and adequacy. Revisions were made based on their recommendations to enhance validity. The finalized questionnaire was pilot-tested with 30 respondents possessing similar characteristics to the target population but excluded from the actual study. Results of the pilot

testing were used to assess internal consistency using Cronbach's alpha, which yielded a coefficient of 0.983, indicating excellent reliability (Polit & Beck, 2021). These procedures ensured that the instrument was both valid and reliable for measuring the intended constructs in the context of extreme weather events and student well-being research, as summarized in Table 1, which presents the evaluation and scoring procedure for both the physical and emotional impacts of EWEs and students' adaptation and coping strategies.

TABLE 1
EVALUATION AND SCORING PROCEDURE FOR PHYSICAL AND EMOTIONAL IMPACTS OF EWES AND STUDENTS' ADAPTATION AND COPING STRATEGIES

Assigned Points	Numerical Range	Physical & Emotional Impacts of EWEs	Adaptation and Coping Strategies
4	3.25–4.00	Very High Impact	Very High Level of Adaptation
3	2.50–3.24	High Impact	High Level of Adaptation
2	1.75–2.49	Low Impact	Low Level of Adaptation
1	1.00–1.74	Very Low Impact	Very Low Level of Adaptation

Note. All indicators were measured using a 4-point Likert scale, where higher mean scores indicate greater perceived physical and emotional impacts of Extreme Weather Events (EWEs) and higher levels of students' adaptation and coping strategies.

Data Source. Primary data were obtained from randomly selected students of Catanduanes National High School (CNHS), Virac, Catanduanes. Students served as the primary source of information regarding their demographic characteristics, the physical and emotional impacts of

Extreme Weather Events (EWEs), and the adaptation and coping strategies they employed in response to such events. Data were gathered through a structured researcher-made questionnaire, enabling the examination of relationships among demographic factors, EWE impacts, and adaptive strategies within a quantitative framework (Creswell & Creswell, 2018; Cohen et al., 2018). This approach is consistent with previous empirical studies utilizing student self-reported data to investigate disaster-related impacts and resilience among school-aged populations (Muttarak & Lutz, 2014; Cénat et al., 2020).

Data Collection. Data collection followed established quantitative procedures for descriptive–correlational research (Creswell & Creswell, 2018; Fraenkel et al., 2019). After obtaining approval from the Schools Division Office of Catanduanes and the administration of Catanduanes National High School (CNHS), the researcher personally administered a validated researcher-made questionnaire to randomly selected students. Prior to survey administration, respondents were informed of the study's purpose, and ethical principles, including voluntary participation, informed consent, anonymity, and confidentiality, were strictly observed (American Psychological Association [APA], 2020). Completed questionnaires were immediately retrieved, encoded, and verified using Microsoft Excel before statistical treatment. The systematic data collection procedure ensured data quality and suitability for descriptive and correlational analyses.

Data Analysis. The study used descriptive and inferential statistical tools to analyze the data on students' experiences of Extreme Weather Events (EWEs) and their coping responses. Frequency and percentage were used to describe the respondents' demographic profile, while weighted mean was applied to determine the extent of physical and emotional impacts of EWEs and the level of students' adaptation and coping strategies, supported by ranking to identify the most and least observed indicators. For inferential analysis, correlation tests were used to examine the relationships among demographic characteristics, EWE impacts, and coping strategies. Prior to testing, assumptions of normality and homogeneity of variance were checked to ensure the appropriateness of statistical procedures, with non-parametric alternatives considered when

necessary, thereby ensuring the validity and robustness of the results (Field, 2020; Creswell & Creswell, 2018).

Ethical Considerations. Ethical standards were strictly observed throughout the study. Approval was obtained from the Department of Education through the Schools Division Office of Catanduanes and the administration of Catanduanes National High School prior to data collection. Written informed consent from parents or legal guardians and informed assent from student participants were secured to ensure voluntary participation. Participants were informed of the study's purpose, their right to withdraw at any time without penalty, and the confidentiality and anonymity of their responses. Considering the study's focus on the physical and emotional impacts of Extreme Weather Events (EWEs), the survey was administered with sensitivity, allowing participants to skip questions or discontinue participation if they experienced discomfort. All data were used solely for academic purposes, securely stored, and reported with honesty, accuracy, and transparency in accordance with established ethical research principles (American Psychological Association [APA], 2020; Mertens, 2020; Israel & Hay, 2021).

III. RESULTS

This section presents the results of the study in accordance with the sequence of the research questions. The findings are analyzed and interpreted using appropriate statistical tools and are discussed in relation to relevant theories, empirical studies, and existing literature. The chapter begins with the demographic profile of the student respondents, followed by the extent of the physical and emotional impacts of extreme weather events (EWEs), students' adaptation and coping strategies, and the relationships among the study variables.

Demographic Profile of the Student Respondents

Table 2 summarizes the demographic characteristics of the 275 student respondents. The sample was nearly evenly distributed by sex, with 50.5% females ($n = 139$) and 49.5% males ($n = 136$), indicating balanced representation. Nearly half of the respondents (48.0%, $n = 132$) belonged to households with a monthly income of less than ₱10,000, while 32.0% ($n = 88$) reported incomes of ₱10,000–₱29,999 and 20.0% ($n = 55$) had household incomes of ₱30,000 or higher, suggesting that a considerable proportion came from low-income families. Most respondents resided in downtown areas (72.0%, $n = 198$), followed by upland (23.3%, $n = 64$) and mountainous areas (4.7%, $n = 13$). In terms of hazard exposure, typhoons were the most commonly reported extreme weather event (50.9%, $n = 140$), followed by flooding (41.8%, $n = 115$), storm surges (6.9%, $n = 19$), and extreme heat (0.4%, $n = 1$). Overall, the demographic profile indicates that the respondents were predominantly from low-income households residing in downtown communities and were primarily exposed to typhoons and flooding, providing an appropriate context for examining the impacts of extreme weather events and students' adaptation and coping strategies.

TABLE 2
DEMOGRAPHIC PROFILE OF STUDENT RESPONDENTS (N= 275)

Variable	Category	n	%
Sex	Male	136	49.5
	Female	139	50.5
	Total	275	100.0
Monthly Household Income (PhP)	Less than ₱10,000	132	48.0
	₱10,000–₱29,999	88	32.0
	₱30,000 and above	55	20.0

	Total	275	100.0
Residential Location	Downtown	198	72.0
	Upland Area	64	23.3
	Mountainous Area	13	4.7
	Total	275	100.0
Predominant Hazard Exposure	Typhoon	140	50.9
	Flooding	115	41.8
	Storm Surge	19	6.9
	Extreme Heat	1	0.4
	Total	275	100.0

Note. n = 275. Percentages may not total exactly 100 due to rounding.

Extent of the Physical and Emotional Impacts of Extreme Weather Events (EWEs) on Students

Tables 3.1 and 3.2 present the extent of the physical and emotional impacts of extreme weather events (EWEs) on the student respondents. Overall, the physical impacts were rated as having a Very High Impact ($M = 3.25$), indicating that EWEs substantially disrupted students' daily functioning and academic activities. Among the physical indicators, physical discomfort such as headaches and fatigue received the highest mean score ($M = 3.38$), followed by difficulty focusing on school tasks ($M = 3.28$), temporary displacement or evacuation ($M = 3.26$), and difficulty maintaining study habits ($M = 3.25$), all interpreted as having a Very High Impact. Meanwhile, disruption of electricity and internet services ($M = 3.23$), transportation disruption ($M = 3.17$), and prolonged school absence ($M = 3.16$) were assessed as having a High Impact. These

findings suggest that EWEs considerably affected students' physical well-being and learning continuity.

TABLE 3.1
EXTENT OF THE PHYSICAL IMPACTS OF EXTREME WEATHER EVENTS ON
STUDENTS (N = 275)

Indicator	Mean	Interpretation
1. Physical discomfort (e.g., headaches, fatigue)	3.38	Very High Impact
2. Difficulty focusing on school tasks	3.28	Very High Impact
3. Temporary displacement or evacuation	3.26	Very High Impact
4. Difficulty maintaining study habits	3.25	Very High Impact
5. Disruption of electricity/internet	3.23	High Impact
6. Transportation disruption	3.17	High Impact
7. Prolonged school absence	3.16	High Impact
Overall Mean	3.25	Very High Impact

Similarly, the emotional impacts of EWEs were perceived to have a Very High Impact overall ($M = 3.76$), reflecting the substantial psychological effects of recurring weather-related hazards on students. The highest-rated indicator was decreased motivation to study ($M = 3.87$), followed by affected participation in school activities ($M = 3.81$), worry about family safety ($M = 3.79$), anxiety when EWEs are forecast ($M = 3.78$), and sadness when school facilities are damaged ($M = 3.78$). Other indicators, including emotional overwhelm from weather news ($M = 3.74$), physical stress when thinking about future EWEs ($M = 3.71$), emotional distress due to class suspension ($M = 3.71$), and academic uncertainty ($M = 3.70$), were likewise interpreted as having

a Very High Impact. Collectively, these results indicate that extreme weather events exert a more pronounced emotional than physical impact on students, highlighting their considerable influence on students' psychological well-being, academic motivation, and engagement in school activities.

TABLE 3.2
EXTENT OF THE EMOTIONAL IMPACTS OF EXTREME WEATHER EVENTS ON STUDENTS (N = 275)

Indicator	Mean	Interpretation
1. Motivation to study decreases	3.87	Very High Impact
2. Participation in school activities is affected	3.81	Very High Impact
3. Worry about family safety	3.79	Very High Impact
4. Anxiety when EWEs are forecast	3.78	Very High Impact
5. Sadness when school facilities are damaged	3.78	Very High Impact
6. Physical stress thinking about future EWEs	3.71	Very High Impact
7. Emotional distress due to class suspension	3.71	Very High Impact
8. Academic uncertainty	3.70	Very High Impact
9. Emotional overwhelm from weather news	3.74	Very High Impact
Overall Mean	3.76	Very High Impact

Students' Adaptation and Coping Strategies in Response to Extreme Weather Events

Table 4 presents the extent of students' adaptation and coping strategies toward extreme weather events (EWEs). Overall, the respondents demonstrated a **Very High Level of Adaptation** ($M = 3.59$), indicating that they consistently employed adaptive and coping behaviors to manage the challenges posed by EWEs. The highest-rated strategy was helping their families secure their homes and belongings before or during EWEs ($M = 3.70$), followed by adjusting study schedules to cope with academic disruptions ($M = 3.69$), regularly following safety instructions provided by school authorities ($M = 3.65$), and practicing safe evacuation procedures when instructed ($M = 3.63$). Students also reported a Very High Level of Adaptation **in** seeking emotional support from family, teachers, or friends ($M = 3.60$), keeping themselves informed through credible sources about upcoming EWEs ($M = 3.59$), taking proactive steps to continue learning during class suspensions ($M = 3.59$), actively participating in school disaster preparedness activities and drills ($M = 3.56$), and applying coping strategies such as relaxation and positive thinking to manage fear or anxiety ($M = 3.56$). Although preparing emergency supplies when an EWE was expected received the lowest mean score ($M = 3.42$), it was still interpreted as a Very High Level of Adaptation. Overall, these findings suggest that students exhibited strong adaptive capacities and proactive coping behaviors, reflecting a high level of preparedness and resilience in responding to the physical, emotional, and academic challenges associated with extreme weather events.

TABLE 4
EXTENT OF STUDENTS' ADAPTATION AND COPING STRATEGIES TOWARD
EXTREME WEATHER EVENTS (N = 275)

Indicator	Mean	Interpretation
1. I help my family secure our home and belongings before or during EWEs.	3.70	Very High Level of Adaptation
2. I adjust my study schedule to cope with academic disruptions caused by EWEs.	3.69	Very High Level of Adaptation
3. I regularly follow safety instructions provided by school authorities.	3.65	Very High Level of Adaptation
4. I practice safe evacuation procedures when instructed.	3.63	Very High Level of Adaptation
5. I seek emotional support from family, teachers, or friends.	3.60	Very High Level of Adaptation
6. I keep myself informed through credible sources about upcoming EWEs.	3.59	Very High Level of Adaptation
7. I take proactive steps to continue learning during class suspensions.	3.59	Very High Level of Adaptation
8. I actively participate in school disaster preparedness activities and drills.	3.56	Very High Level of Adaptation
9. I apply coping strategies (e.g., relaxation and positive thinking) to manage fear or anxiety.	3.56	Very High Level of Adaptation
10. I prepare emergency supplies when an EWE is expected.	3.42	Very High Level of Adaptation
Overall Mean	3.59	Very High Level of Adaptation

Relationship Between Students' Demographic Characteristics and the Physical and Emotional Impacts of Extreme Weather Events

Table 5 presents the relationship between students' demographic characteristics and the physical and emotional impacts of extreme weather events (EWEs). The findings indicate that **sex** was not significantly associated with either the physical impacts (Cramér's $V = .136, p = .134$) or emotional impacts (Cramér's $V = .114, p = .113$) of EWEs, suggesting that male and female students experienced comparable levels of physical and emotional effects. In contrast, monthly household income showed a moderate positive and statistically significant relationship with both physical impacts (Spearman's $\rho = .500, p < .001$) and emotional impacts (Spearman's $\rho = .409, p < .001$), indicating that variations in household income were associated with differences in students' experiences of EWEs. Likewise, residential location demonstrated a moderate and significant association with physical impacts (Cramér's $V = .434, p < .001$) and emotional impacts (Cramér's $V = .422, p < .001$), suggesting that students' place of residence influenced the extent to which they were affected by extreme weather events. Furthermore, predominant hazard exposure exhibited weak but statistically significant associations with both physical impacts (Cramér's $V = .214, p < .001$) and emotional impacts (Cramér's $V = .256, p < .001$), indicating that students exposed to different types of hazards experienced varying levels of physical and emotional consequences. Overall, the results suggest that socioeconomic and environmental factors, particularly household income, residential location, and hazard exposure, were significantly related to the impacts of EWEs, whereas sex was not a significant determinant of students' physical and emotional experiences.

TABLE 5
RELATIONSHIP BETWEEN STUDENTS' DEMOGRAPHIC CHARACTERISTICS
AND THE PHYSICAL AND EMOTIONAL IMPACTS OF EXTREME WEATHER
EVENTS

Demographic Variable	Outcome Variable	Statistical Test	Coefficient	p	Decision	Interpretation
Sex	Physical Impacts	Cramér's V	.136	.134	Do not reject H_0	Weak association, not significant
	Emotional Impacts	Cramér's V	.114	.113	Do not reject H_0	Weak association, not significant
Monthly Household Income	Physical Impacts	Spearman's ρ	.500	< .001	Reject H_0	Moderate positive relationship
	Emotional Impacts	Spearman's ρ	.409	< .001	Reject H_0	Moderate positive relationship
Residential Location	Physical Impacts	Cramér's V	.434	< .001	Reject H_0	Moderate association, significant
	Emotional Impacts	Cramér's V	.422	< .001	Reject H_0	Moderate association, significant
Predominant Hazard Exposure	Physical Impacts	Cramér's V	.214	< .001	Reject H_0	Weak association, significant
	Emotional Impacts	Cramér's V	.256	< .001	Reject H_0	Weak association, significant

***Note.** Cramér's V was used to estimate the strength of association for Chi-square analyses, whereas Spearman's rank-order correlation coefficient (ρ) was used to assess the relationship involving the ordinal variable of monthly household income. Statistical significance was evaluated at $\alpha = .05$. H_0 = There is no significant relationship between students' demographic characteristics and the physical and emotional impacts of Extreme Weather Events.*

Relationship Between Students' Demographic Characteristics and Their Adaptation and Coping Strategies Toward Extreme Weather Events

Table 6 shows the relationship between students' demographic characteristics and their adaptation and coping strategies toward extreme weather events (EWEs). Sex was not significantly associated with adaptation and coping strategies (Cramér's $V = .137$, $p = .077$), indicating similar adaptive behaviors among male and female students. In contrast, monthly household income had a moderate positive and significant relationship with adaptation and coping strategies (Spearman's $\rho = .313$, $p < .001$), while residential location demonstrated a moderate and significant association (Cramér's $V = .344$, $p < .001$). Predominant hazard exposure also showed a weak to moderate but significant association with adaptation and coping strategies (Cramér's $V = .267$, $p < .001$). Overall, the findings suggest that household income, residential location, and hazard exposure were significantly related to students' adaptation and coping strategies, whereas sex was not a significant factor.

TABLE 6
RELATIONSHIP BETWEEN STUDENTS' DEMOGRAPHIC CHARACTERISTICS
AND THEIR ADAPTATION AND COPING STRATEGIES TOWARD EXTREME
WEATHER EVENTS

Demographic Variable	Statistical Test	Coefficient	p	Decision	Interpretation
Sex	Cramér's V	.137	.077	Do not reject H_0	Weak association, not significant
Monthly Household Income	Spearman's ρ	.313	< .001	Reject H_0	Moderate positive relationship, significant
Residential Location	Cramér's V	.344	< .001	Reject H_0	Moderate association, significant
Predominant Hazard Exposure	Cramér's V	.267	< .001	Reject H_0	Weak to moderate association, significant

Note. Cramér's V was used to estimate the strength of association for Chi-square analyses, whereas Spearman's rank-order correlation coefficient (ρ) was used to assess the relationship involving the ordinal variable of monthly household income. Statistical significance was evaluated at $\alpha = .05$. H_0 = There is no significant relationship between students' demographic characteristics and their adaptation and coping strategies toward Extreme Weather Events (EWEs).

Relationship Between the Physical and Emotional Impacts of Extreme Weather Events and Students' Adaptation and Coping Strategies

Table 7 presents the relationship between the physical and emotional impacts of extreme weather events (EWEs) and students' adaptation and coping strategies. The findings indicate that the physical impacts of EWEs had a weak but statistically significant positive relationship with students' adaptation and coping strategies (Spearman's $\rho = .307, p < .001$), suggesting that students who experienced greater physical impacts were more likely to employ adaptive and coping behaviors. In comparison, the emotional impacts of EWEs exhibited a strong and statistically significant positive relationship with students' adaptation and coping strategies (Spearman's $\rho = .677, p < .001$), indicating that students who experienced higher levels of emotional distress were substantially more likely to adopt various coping and adaptation measures. Overall, the results demonstrate that both the physical and emotional impacts of extreme weather events were significantly associated with students' adaptation and coping strategies, with emotional impacts showing a considerably stronger relationship than physical impacts. These findings suggest that students' adaptive responses are influenced not only by the physical consequences of extreme weather events but, more importantly, by the emotional challenges they experience during and after such events.

TABLE 7
RELATIONSHIP BETWEEN THE PHYSICAL AND EMOTIONAL IMPACTS OF
EXTREME WEATHER EVENTS AND STUDENTS' ADAPTATION AND COPING
STRATEGIES

Variables	Statistical Test	Coefficient (ρ)	p	Decision	Interpretation
Physical Impacts of EWEs $\times$ Students' Adaptation and Coping Strategies	Spearman's rank-order correlation	.307	< .001	Reject H_0	Weak positive relationship, significant
Emotional Impacts of EWEs $\times$ Students' Adaptation and Coping Strategies	Spearman's rank-order correlation	.677	< .001	Reject H_0	Strong positive relationship, significant

Note. Spearman's rank-order correlation coefficient (ρ) was used to determine the relationship between the physical and emotional impacts of Extreme Weather Events (EWEs) and students' adaptation and coping strategies. Statistical significance was evaluated at $\alpha = .05$. H_0 = There is no significant relationship between the physical and emotional impacts of EWEs and students' adaptation and coping strategies.

IV. DISCUSSION

The present study provides critical empirical evidence on the multifaceted impacts of extreme weather events (EWEs) on students in a disaster-prone island province of the Philippines, while simultaneously highlighting their adaptive capacities and the socioeconomic determinants of vulnerability. The findings contribute to the growing body of literature on climate-related educational disruptions by demonstrating that students from low-income, flood-prone communities experience compounded physical and psychological burdens, yet exhibit remarkable resilience through proactive coping behaviors.

The demographic context of the study characterized by predominantly low-income households and frequent exposure to typhoons and flooding establishes a clear vulnerability profile consistent with theoretical frameworks positing that disaster impacts are unevenly distributed across populations (Wisner et al., 2014). Students residing in downtown and coastal areas faced heightened risks due to infrastructural deficits and limited household resources, factors previously identified as key barriers to accessing healthcare, educational continuity, and psychosocial support during crises (Kousky, 2016; Shultz et al., 2019). The predominance of typhoons and flooding as the most commonly reported hazards further underscores the geographical realities of island provinces, where recurrent climate events threaten both physical safety and academic progression.

The study reveals that emotional impacts of EWEs ($M=3.76$) were perceived more severely than physical impacts ($M=3.25$), indicating that psychological distress—rather than physical injury—constitutes the primary burden for students. Physical discomfort, difficulty focusing, and temporary displacement were rated as highly impactful, corroborating evidence that flooding and heatwaves exacerbate health conditions while school closures disrupt learning continuity (Xu et al., 2020; Anderson, 2020). However, the more pronounced emotional toll, including decreased motivation, anxiety over family safety, and academic uncertainty, aligns with prior research documenting elevated depression and post-traumatic stress among disaster-exposed youth (Tang et al., 2018; Pfefferbaum et al., 2019). These findings suggest that EWEs impair not only students' physical functioning but also their psychological capacity to engage meaningfully in educational activities.

Despite these challenges, students demonstrated a Very High Level of Adaptation ($M=3.59$), engaging in a combination of problem-focused strategies such as home preparedness and evacuation compliance, and emotion-focused coping mechanisms including social support and relaxation techniques. This adaptive behavior reflects successful integration of school-based disaster risk reduction education and community resilience practices, which are critical for fostering psychological resilience and proactive risk management (Peek et al., 2018; Bonanno et al., 2018; UNICEF, 2019). Notably, students proactively adjusted study schedules and continued learning during class suspensions, indicating strong academic commitment and self-directed learning behaviors that mitigate educational losses in resource-constrained settings.

The relationship between demographic characteristics and disaster impacts revealed that sex was not significantly associated with either physical or emotional consequences, contrasting with studies suggesting gender-based differences in distress and risk-taking (Fothergill & Peek, 2015). However, monthly household income and residential location exhibited significant associations with both impacts and coping strategies, affirming that socioeconomic status and geographic exposure are critical determinants of vulnerability and adaptive capacity (Kousky, 2016; Wisner et al., 2014). Students from lower-income households and those residing in hazard-prone areas experienced greater physical and emotional effects, likely due to limited access to recovery resources and heightened exposure to flood and typhoon risks, consistent with disparities documented in marginalized communities (Masten & Motti-Stefanidi, 2020).

Interestingly, the study found that emotional impacts exhibited a significantly stronger correlation with coping strategies ($\rho=0.677$) than physical impacts ($\rho=0.307$), suggesting that psychological distress serves as a more powerful catalyst for adaptive behavior. This indicates that students who experience heightened anxiety, worry, and academic uncertainty are more likely to seek social support, engage in preparedness activities, and apply psychological coping mechanisms, perhaps because emotional challenges are more personally salient and actionable than physical disruptions. This finding underscores the importance of addressing mental health in resilience-building programs, as emotional well-being appears central to motivating proactive responses to environmental hazards.

Collectively, these findings advance disaster resilience research by integrating physical, psychological, and educational dimensions into a holistic assessment of student experiences, moving beyond fragmented approaches that treat these aspects in isolation (Kousky, 2016; Anderson, 2020). The study contributes localized empirical evidence to international frameworks advocating for child-centered disaster risk reduction, demonstrating that students in marginalized island communities possess existing strengths that can be leveraged through sustained school-based preparedness, mental health support, and community engagement initiatives.

This study concludes that extreme weather events impose a greater emotional than physical burden on students, manifesting as reduced motivation, family safety anxiety, and academic uncertainty. Despite this, students exhibit strong adaptive capacity through problem- and emotion-focused coping, reflecting effective school preparedness and community support. Socioeconomic status and geographic location critically shape vulnerability and resilience, compounding risks for low-income, hazard-exposed students, whereas sex is not a significant differentiator. Crucially, emotional distress drives adaptive behavior more strongly than physical impacts, underscoring the centrality of psychological well-being in fostering resilience. Thus, integrated, context-responsive interventions addressing physical safety, mental health, and educational continuity are essential to strengthen student resilience against escalating climate threats.

To enhance resilience and educational continuity, multi-stakeholder action is imperative. Students and families should sustain household preparedness and cultivate emotionally supportive environments. Schools must institutionalize disaster risk reduction education, emergency drills, trauma-informed pedagogy, and clear academic continuity protocols. Local governments should implement child-centered policies, including inclusive early warnings, protective evacuation measures, and psychosocially responsive relief. National policymakers must develop a robust continuity framework integrating flexible learning, climate-resilient infrastructure, and mandatory climate competencies across the curriculum. Finally, future research should employ mixed-methods and longitudinal designs, conduct comparative hazard and regional studies, and rigorously evaluate school-based interventions to inform evidence-based policy and practice.

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