

## Climate change anxiety and its effect on emotional and functional health: Regional analysis

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### ABSTRACT

This study examines the impact of climate change anxiety on emotional and functional health across diverse demographic groups. Using Erbil, Sulaymaniyah, and Duhok as a case study, demographic predictors, and functional impairments, were assessed by the Climate Change Anxiety Scale (CCAS). A cross-sectional study was conducted between July 28, 2024, and January 28, 2025, in the three main cities of the Kurdistan Region, using a convenience sampling method. Data were collected using the 13-item Climate Change Anxiety Scale (CCAS), translated into Kurdish and Arabic. The tool measured cognitive-emotional and functional impairment domains. Statistical analysis was performed using SPSS version 29. Chi-square, Kruskal–Wallis, Mann–Whitney U, Pearson correlation, and regression analyses were used to examine associations and predictors of climate anxiety. The results show that cognitive-emotional factors significantly predicted functional impairment, explaining 70.3 % of the variance, with a strong correlation ( $r = 0.838$ ). The findings suggest that climate change anxiety negatively affects emotional and functional well-being, particularly among older individuals, urban residents, and those in financially precarious situations. This study concludes that high levels of climate anxiety are influenced by age, geography, and housing. Interventions should promote resilience, awareness, and sustainable urban planning. Integrated policies and further research are essential to address these challenges.

### 1. Introduction

Climate change is a growing global concern, yet its psychological consequences, particularly climate change anxiety, remain poorly understood (Mohammed et al., 2025). Climate anxiety, resulting from recent climatic changes and characterized by persistent worry about their effects, has become a major mental health concern (Clayton, 2020; Clayton et al., 2023b). There is overwhelming evidence that since 1973, temperatures in the Kurdistan Region of Iraq (KRI) have risen by nearly 2 °C twice the global average, thereby increasing climate-related risks

(Ara Begum et al., 2022; Aziz, Rasheed, & Ahmed, 2022; Pörtner et al., 2022). Rainfall has declined in Erbil and across the KRI, placing additional stress on the population (Aziz et al., 2022; Yousuf et al., 2018). Water supply in the KRI has declined by approximately 40 % (Yousuf et al., 2018). However, Sulaymaniyah demonstrates greater adaptability due to its mountainous terrain compared to Erbil (Al-Hussein, Hamed, Al-Ozeer, Gentilucci, & Bouri, 2024; Gaznayee et al., 2022). Also termed eco-anxiety, climate change anxiety is a persistent dread of environmental doom resulting from witnessing the apparently unstoppable advance of climate-related dangers. According to the American

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Psychological Association (APA, 2017), eco-anxiety is defined as a chronic fear of environmental cataclysm resulting from observing the seemingly irrevocable impacts of climate change and the associated worry for one's own future and that of subsequent generations (Clayton et al., 2023a; Gago, Sargisson, & Milfont, 2024). In Africa, the psychological toll of climate change is closely related to the climate crisis which many African communities suffer through. A study by Cunsolo and Ellis emphasized how communities subjected to ongoing climate events frequently mourn the loss of cultural legacy, traditional lifestyles, and their relationship to place (Cunsolo & Ellis, 2018; Cunsolo, Harper, & Berry, 2024). Droughts deplete land and water supplies in pastoralist and agricultural communities throughout East and West Africa, compromising food security as well as causing cultural and environmental sorrow (Ayanlade et al., 2022; Ayanlade, Radeny, Morton, & Muchaba, 2018; Gautier, Denis, & Locatelli, 2016). Climate anxiety may impair cognitive and emotional performance and increase mental health difficulties by causing helplessness, worry, and overthinking (Ali, Jahan, & Enaas, 2024; Clayton et al., 2023b). Although climate change and mental health concerns have been raised (Mohammed et al., 2025), no prior studies have validated the Climate Change Anxiety Scale (CCAS) in Kurdish and Arabic. This gap limits the availability of reliable data to inform interventions (IOM, 2024). Despite the rising concern on climate change and mental health issues raised by Mohammed et al. (2025), no studies have measured anxiety by validating climate change anxiety scale (CCAS) to make it more reliable for future interventions (Clayton et al., 2023b; Clayton & Karazsia, 2020).

Eco-anxiety has been officially recognized by the American Psychological Association as a legitimate mental health concern since 2017, though diagnostic classifications are still debated (Pihkala, 2020). This makes climate change anxiety the most overlooked mental health challenge of the climate crisis. Unlike typical anxiety disorders, climate change anxiety however is driven by anticipatory fears of irreversible planetary damage and existential threat, potentially leading to chronic emotional dysregulation. Many psychologically resilient individuals may remain symptom-free or experience transient distress, such as worry, helplessness, and mood fluctuation (Budziszewska & Jonsson, 2021). Others, particularly those with prior mental health vulnerabilities, may suffer from profound functional impairment, including sleep disruption, academic withdrawal, or persistent panic. According to a 2023 systematic review, individuals with pre-existing anxiety or depressive disorders are nearly twice as likely to develop climate-related emotional distress (Pitt, Norris, & Pecl, 2023). High-risk groups include adolescents, activists, and disaster-exposed communities, all of whom may internalize environmental grief and loss, contributing to psychosomatic and behavioral disturbances (Osikwemh, 2022; Scott et al., 2014). Additionally, climate-related trauma, such as displacement due to floods or wildfires, has been shown to increase the incidence of PTSD by 30 % among survivors, with lasting effects for years (Mohammadi et al., 2023). When left unmanaged, these symptoms may escalate into major depressive episodes, burnout, or suicidal ideation, with recent case reviews suggesting serious outcomes in over 80 % of clinical presentations (Clifton & Fletcher, 2025). In recent years, climate change anxiety (CCA) studies has gained attention globally (Chan, Tam, & Clayton, 2024; Clayton, 2020; Clayton & Karazsia, 2020), especially across the Middle East and neighboring regions (Abou Jaoude et al., 2024; Chan et al., 2024; Fekih-Romdhane et al., 2024). For example in Turkey, a study has examined climate anxiety's among nursing students (Doğan & Buz, 2024; Ediz & Yanik, 2023; Güler & Günday, 2024) and youth activists (Ediz & Yanik, 2023). However, these studies excluded the general population, limiting to assess CCA to specific groups.

Despite growing recognition of climate anxiety worldwide, little is known about its prevalence in the Middle East, particularly within Iraq's Kurdistan Region, which faces both political instability and environmental stressors. This study addresses this critical gap by validating the Climate Change Anxiety Scale (CCAS) in Kurdish and Arabic and examining demographic predictors of climate-related psychological

distress. Considering current scientific understanding, this is the first systematic analysis of climate anxiety in the Kurdistan Region, offering insights that can inform both global eco-anxiety research and local mental health policy.

This study examines climate change anxiety in the Kurdistan Region of Iraq (KRI) by using the Climate Change Anxiety Scale (CCAS) to assess its prevalence and demographic predictors. Developing sociocultural policies and interventions, addressing the environmental and psychological problems, and improving world research by means of statistical information from an understudied geographic location in KRI. This study focuses at assessing the levels of climate change anxiety among residents of the Kurdistan Region of Iraq (KRI) using the Climate Change Anxiety Scale (CCAS). This was based on comparing the mean levels of climate change anxiety among demographic subgroups (e.g., gender, age, education, and geographic location) within the Kurdistan Region. The study was guided by three major research questions: (1) What are the levels of cognitive-emotional and functional impairments associated with climate change anxiety among residents of the Kurdistan Region of Iraq (KRI), as measured by the Climate Change Anxiety Scale (CCAS)? (2) Are there significant differences in the levels of cognitive-emotional and functional impairments between demographic subgroups, such as gender, age, education level, and geographic location (urban, suburban, rural) within KRI?; and (3) How does climate change anxiety mediate or moderate the relationship between environmental vulnerabilities (e.g., geographic location, type of residence) and mental health outcomes in the Kurdistan Region? These research questions were set out with aim of assessing the role of climate change anxiety in the relationship between environmental vulnerabilities and mental health outcomes, focusing on emotional and functional impairments.

## 2. Methodology

### 2.1. Study area, inclusion and exclusion criteria

This cross-sectional study was conducted in the Kurdistan Region of Iraq (KRI), involving the three major cities: Erbil, Sulaymaniyah, and Duhok. The convenience sampling method was used to collect data from July 28, 2024, to January 28, 2025. The Kurdistan Region of Iraq (KRI) comprises the governorates of Erbil, Duhok, and Sulaymaniyah, each characterized by distinct environmental conditions. The capital, Erbil, is located on flat, arid land, with July temperatures exceeding 47 °C. The city experiences significant traffic and industrial pollution, while suburban areas (10–15 km away) struggle with waste management, and rural areas (20–30 km away) suffer from drought (Aziz et al., 2022; Hama-Aziz, 2022). Sulaymaniyah experiences urban pollution, with suburbs (5–10 km away) generating large amounts of waste, while rural areas (15–25 km away) face fertilizer contamination and climate-related hazards (Gaznayee et al., 2022). In northwest Duhok, rising temperatures have reduced greenery and agricultural productivity. Additionally, construction and traffic pollution affect Duhok City, its suburbs (5–10 km away), and rural areas (20–30 km away) (Yousuf et al., 2018).

In this study, we focused on population with age  $\geq 18$  years old in KRI. A pilot study (July 28–August 28, 2024) was conducted with 25 participants from (Erbil = 10, Sulaymaniyah = 10, Duhok = 5) to evaluate the questionnaire's clarity, cultural and linguistic relevance, and reliability. (Taber, 2018a). Participant feedback led to minor revisions in question phrasing, and Cronbach's alpha (0.969) confirmed the excellent reliability of the CCAS Pilot study data were excluded from the final analysis. The inclusion criteria for participants included adults aged 18 years and older, who had been residents of the Kurdistan Region for at least one year and were fluent in Kurdish or Arabic. Additionally, they needed to provide informed consent to participate in the study. On the other hand, individuals with mental or physical disabilities that prevented completion of the survey were excluded from the study.

2.2. Data collection and statistical analysis

Data were collected through structured questionnaire, face-to-face interviews and an online Google Form survey. Each participant was allotted a total of 20–30 min to complete the questionnaire. The questionnaire consisted of two main parts. The first section collected demographic data, including age, gender, education level, occupation, type of residence (urban, suburban, rural), city (Erbil, Sulaymaniyah, Duhok), and housing ownership status. The second part was the Climate Change Anxiety Scale (CCAS), consisting of 13 items, was pilot-tested with 25 participants to ensure clarity and cultural relevance. The instrument demonstrated excellent reliability, with Cronbach’s alpha values of 0.89 overall, 0.85 for the cognitive-emotional domain, and 0.81 for the functional impairment domain. The questionnaire was provided in Kurdish and Arabic, and any unclear questions were clarified by the researchers. The study took place between July 28th and August 28th, 2024, and aimed to assess the internal consistency and reliability of the questionnaire items before using them in the actual study. The internal consistency of the items was calculated using Cronbach’s alpha (Taber, 2018b). The overall Cronbach’s alpha for the total CCAS scale was 0.89, indicating excellent reliability, with cognitive-emotional and functional impairment domains showing  $\alpha = 0.85$  and  $\alpha = 0.81$ , respectively. It is important to note that the data from this initial study were excluded from the final analysis.

To assess climate-related psychological distress, we used the 13-item CCAS, which evaluates two domains: cognitive-emotional impairment and functional impairment. The cognitive-emotional domain (Items 1–8) assesses worry and focus problems related to climate change, while the functional domain (Items 9–13) evaluates how anxiety impacts

social and professional life. Responses were recorded on a 5-point Likert scale ranging from 0 (Never) to 4 (Almost Always). Higher scores indicate greater anxiety levels. The reliability of the CCAS was thoroughly evaluated. To ensure the instrument’s reliability, a Cronbach’s alpha test was conducted (Taber, 2018b), resulting in an excellent alpha coefficient of 0.89. The sample size was determined based on the total population of the Kurdistan Region of Iraq (approximately 6,556,752 residents). Using Epi Info version 7.2.6.0, with a 50 % expected prevalence, 95 % confidence interval, and 5 % margin of error, the sample size was calculated as 385 participants. The sample was proportionally distributed across Erbil (44.8 %), Sulaymaniyah (35.2 %), and Duhok (19.9 %) (Fig. 1).

Ethical approval was granted by the Scientific and Ethical Committee of the College of Health Science, Hawler Medical University (ethical code: Sc.E.C-8B; approval date: June 27, 2024). Written informed consent was obtained from all participants after a clear explaining the study’s purpose, procedures, and confidentiality measures. Participation was voluntary, with the right to withdraw at any time. Online survey participants provided electronic consent.

Data analysis was performed using IBM SPSS version 29 (IBM Corp., Armonk, NY), with significance levels considered at  $p < 0.05$ . Data were summarized and reported with frequency and percentage for qualitative variables. Quantitative variables were presented with mean and standard deviations. The Kolmogorov–Smirnov test indicated non-normal distribution of major variables; therefore, non-parametric methods were applied. To assess climate-related psychological distress among the general population in the Kurdistan Region, we used the CCAS. This questionnaire, consisting of 13 items, was carefully designed to evaluate two dimensions: cognitive-emotional impairment and functional

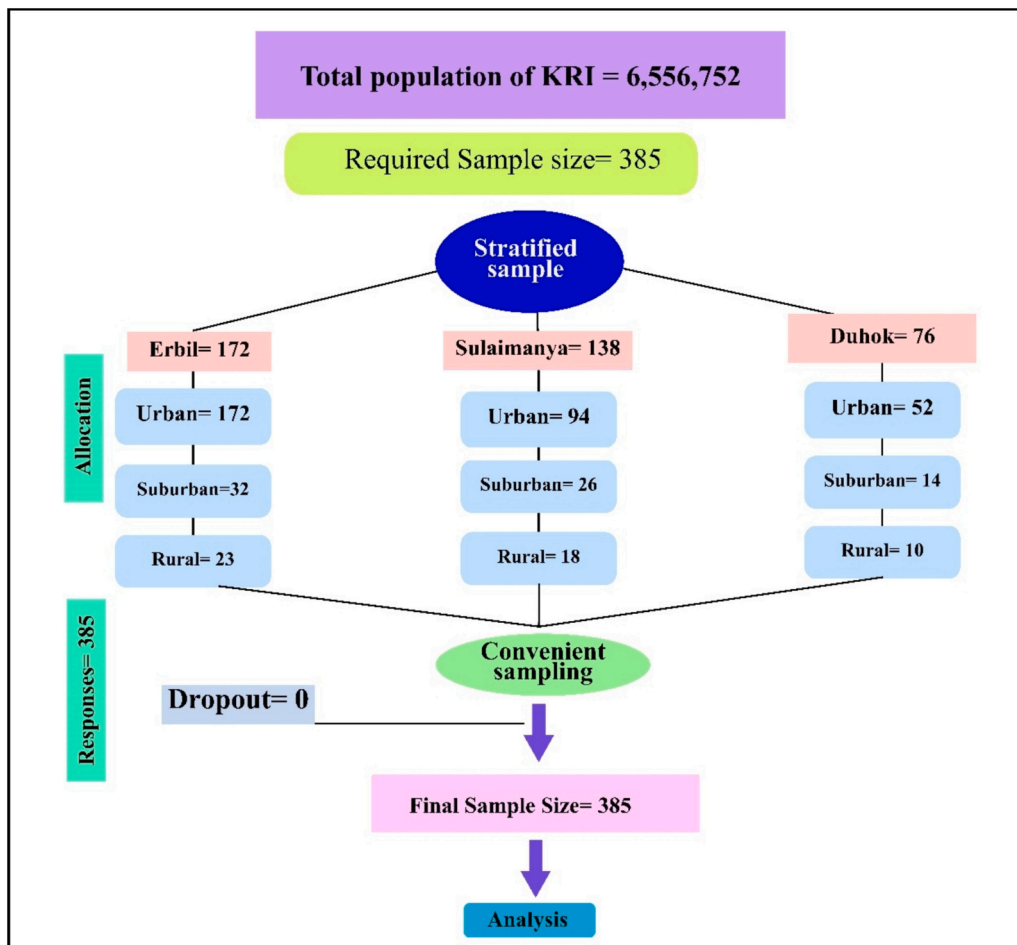


Fig. 1. The sampling methodology used in a study conducted, outlining the process of obtaining a representative sample of 385 respondents from total population.

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In all, the relationships between cognitive-emotional anxiety, functional impairment, and demographic factors were assessed using chi-square tests, Mann–Whitney *U* tests, Kruskal–Wallis tests, Pearson correlation, simple linear regression, and multiple linear regression. The Mann–Whitney *U* test, a non-parametric equivalent of the independent *t*-test, was used to compare two independent groups. The Kruskal–Wallis test, a non-parametric alternative to one-way ANOVA, was applied for comparisons across more than two groups when data were not normally distributed.

### 3. Results and discussion

#### 3.1. Socio-demographic characteristics of the study participants

The sociodemographic distribution of participants (*N* = 385) was relatively balanced across age groups. The largest proportion was in the 26–35 age group (25.97 %), follow by the 18–25 and 36–50 groups (both 22.08 %) ([Fig. 2](#)). Notably, 15.84 % of respondents were over 50, while 14.03 % were under 18. The overall mean age of the sample was 31.65 years. The majority of respondents were female (58.5 %), while males accounted for 41.5 % of the sample (*N* = 385; [Fig. 2](#)).

Educational levels varied, 5.97 % held graduate or postgraduate degrees, while more than half (51.95 %) had completed college or university. A small proportion were illiterate (3.90 %) or had only basic education (8.05 %), whereas 14.03 % had completed high school. The majority of them are educated individuals, potentially influencing their perspectives associated with functional impairments as measured by the

Climate Change Anxiety Scale (CCAS). Employment status varied as about 26 % of them were part-time workers, 19.7 % students, and 17.1 % full-time. Most of the participants held part-time jobs, possibly due to students balancing work and studies; and self-employed individuals also contribute significantly.

It is obvious that Erbil has the highest representation, with nearly 45 % of respondents coming from this city ([Fig. 2](#)). This could be due to factors like population density and economic activity in the region. Sulaimanya has a moderate percentage of 30 % respondents, while Duhok has the lowest representation, possibly due to smaller population size, lower engagement, or geographic constraints ([Fig. 2](#)). Most participants lived in urban areas (64.5 %), though 26.9 % lived in suburban and rural (8.5 %) settings, while 68.1 % resided in single-family homes. Ownership status included renting (41.5 %), owning with a mortgage (32.4 %), and living with family or friends (26.2 %).

#### 3.2. Relationship between climate change anxiety, cognitive emotional and functional impairment

It is apparent that age, type of residence, and city of residence have significant relationships with climate change anxiety, cognitive, emotional, and functional impairment ([Table 1](#)). Here, we examined how demographics affect cognitive-emotional and functional deficits. No significant gender differences were seen in any category (Cognitive-Emotional: Male = 194.77, Female = 192.80;  $\chi^2 = 0.189$ , *p* = 0.860; Functional: Male = 197.95, Female = 190.35;  $\chi^2 = 0.862$ , *p* = 0.508). Age greatly affected both deficits. Participants aged 36–50 (Mean Rank = 217.38) and over 50 (Mean Rank = 217.26) showed the highest levels of impairment. Older participants revealed higher impairment. In contrast, younger respondents showed lower levels of impairment, which increased with age and peaked in the over-50 category. Gender does not significantly influence impairment levels, but climate change anxiety can vary across genders, with women reporting higher environmental concerns. The psychological burden of climate change may influence emotional resilience differently in men and women ([Clayton et al., 2023b](#); [Stone, Blinn, & Spencer, 2022](#)).

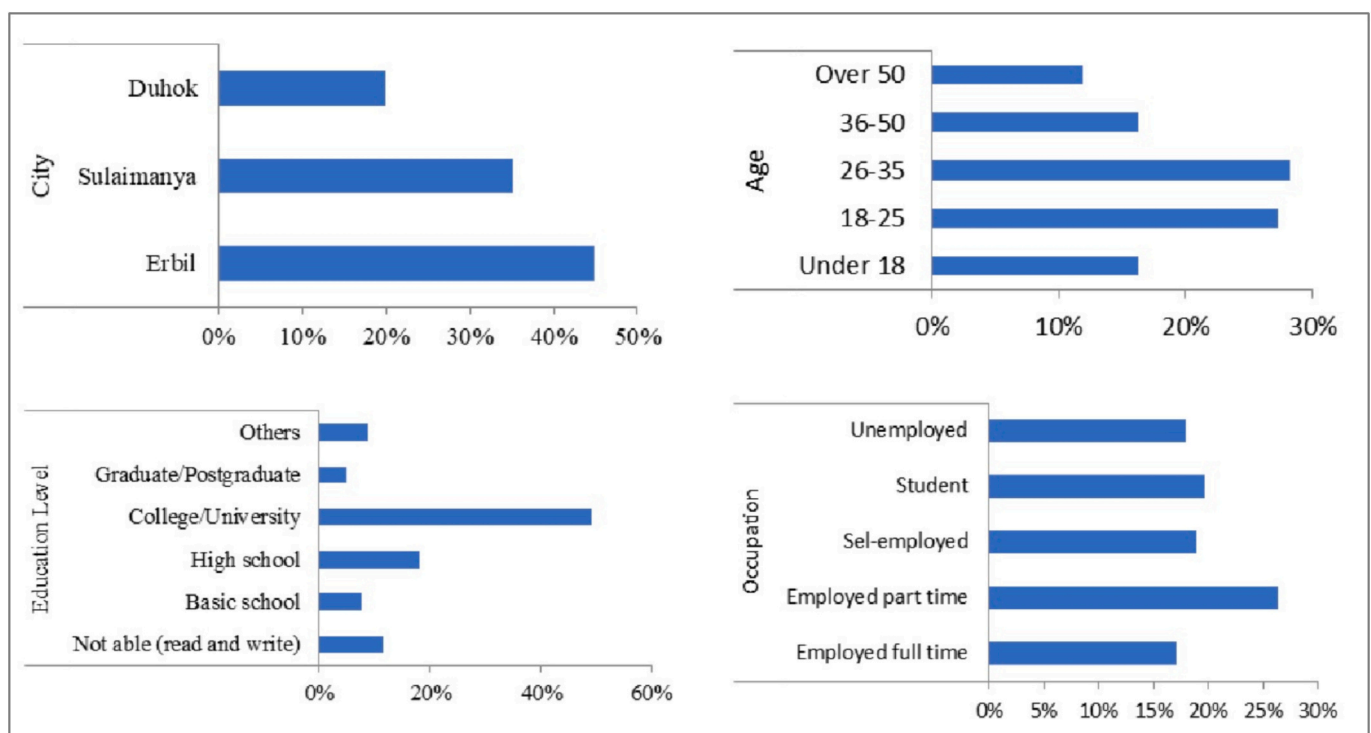


Fig. 2. Socio-demographic distributions of the participants.

**Table 1**  
Relationship between cognitive, emotional, and functional impairment with demographic characteristics and climate change anxiety Domains (N = 385).

Variables	Groups	N	Cognitive Mean Rank	Chi-Square	p-Value	Functional Mean Rank	Chi-Square	p-Value
Gender	Male	160	194.77	0.19	0.86	197.95	0.86	0.51
	Female	228	192.80			190.35		
Age	Under 18	63	153.71	15.12	0.004	161.00	10.52	0.03
	18–25	105	201.38			190.76		
	26–35	109	183.64			191.09		
	36–50	63	216.21			217.38		
	Over 50	46	222.26			217.26		
Level of Education	Not able (read and write)	44	173.36	9.30	0.10	177.02	6.99	0.22
	Basic school	29	163.12			166.88		
	High school	70	184.08			189.02		
	College/University	190	209.95			207.63		
	Graduate/Postgraduate	19	168.82			176.45		
	Others	34	186.75			177.32		
Occupation	Employed full time	66	197.77	6.88	0.14	211.38	8.89	0.06
	Employed part time	102	189.93			190.77		
	Self-employed	73	220.60			215.63		
	Student	76	175.20			168.90		
	Unemployed	69	186.18			184.11		
Residence	Urban	249	194.28	1.15	0.56	195.21	1.36	0.51
	Suburban	104	186.42			184.54		
	Rural	33	209.92			208.80		
Type of Residence	Single family house	263	189.46	11.00	0.004	191.19	13.37	< 0.01
	Apartment or condominium	72	228.73			228.86		
	Townhouse or new house	51	164.58			155.51		
Ownership Status	Own with mortgage	125	196.45	3.04	0.22	197.44	5.65	0.06
	Rent	160	201.43			204.33		
	Living with family/friends	101	177.28			171.48		
City	Erbil	173	197.77	6.31	0.04	198.45	9.98	< 0.01
	Sulaimanya	136	176.15			171.96		
	Duhok	77	214.56			220.42		

Significant associations - where  $p < 0.05$ . "Functional" refers to functional impairment domain of climate anxiety. Chi-square and p-values are shown for each group comparison.

Education levels appear not to predict cognitive-emotional or functional impairment ( $p = 0.098$  and  $0.221$ , respectively). However, housing type and location greatly affect both dimensions. Apartment and condominium residents had greater cognitive-emotional and functional impairments (Mean Rank = 228.73;  $\chi^2 = 10.995$ ,  $p = 0.004$ ) compared to single-family homes or townhouses (Table 2). Place of residence affects psychological effects. Duhok people show the most impairments (Cognitive-Emotional: Mean Rank = 214.56;  $\chi^2 = 6.314$ ,  $p = 0.043$ ; Functional: Mean Rank = 220.42;  $\chi^2 = 9.975$ ,  $p = 0.007$ ), follow by Sulaymaniyah. More so, we further examined the linear regression analysis of cognitive-emotional variables and functional impairment. Both the constant ( $B = 0.595$ ,  $t = 2.159$ ,  $p = 0.032$ ) and cognitive-emotional predictor ( $B = 0.593$ ,  $t = 29.335$ ,  $p < 0.001$ ) were significant, confirming their role of contribution (Table 3). The model explains 70.3 % of the variation in functional impairment ( $R^2 = 0.703$ ) and validated a strong positive correlation ( $R = 0.838$ ). ANOVA results confirm the model's significance ( $F = 860.561$ ,  $p < 0.001$ ). The results proposed that individuals with climate change anxiety, characterized by cognitive and emotional distress, are more likely to report functional impairments, a correlation with reduced daily functioning, productivity, and mental health challenges, suggesting that addressing these issues could mitigate their impact.

The results showed several significant correlations among the study variables. Notably, the cognitive-emotional and functional impairment domains were strongly correlated ( $r = 0.84$ ,  $p < 0.01$ ), and both were

**Table 2**  
Impact of climate change anxiety, cognitive-emotional factors on functional impairment.

	Coefficients			Model Summary		ANOVA	
	B	t	p-Value	Correlation	R-square	F	p-Value
(Constant)	0.595	2.159	0.032	0.838	0.703	860.561	0.001
cognitive emotional	0.593	29.335	0.000				

Note: Regression equation:  $Y = 0.595 + 0.593x$ . Model fit:  $R^2 = 0.703$ ,  $r = 0.838$ . ANOVA:  $F = 860.561$ ,  $p < 0.001$ , confirming significance ( $p < 0.05$ ).

**Table 3**  
Correlation matrix of study variables (N = 385).

Variables	1	2	3	4	5	6	7
Age	1						
Education Level	-0.23*	1					
Income / SES	-0.18	0.29**	1				
Cognitive-Emotional Domain	0.14	0.11	0.09	1			
Functional Impairment Domain	0.17	0.10	0.07	<b>0.84</b>	1		
Total Climate Anxiety	0.16	0.12	0.08	<b>0.93</b>	<b>0.91</b>	1	
Environmental Behavior/Coping	-0.07	0.09	0.05	0.22*	0.20*	0.24*	1

Note: All values represent Pearson correlation coefficients. SES = Socioeconomic Status. Values in bold reflect strong correlations.

\*  $p < 0.05$ .  
\*\*  $p < 0.01$ .

highly associated with the total climate change anxiety score ( $r = 0.93$  and  $r = 0.91$ , respectively, both  $p < 0.01$ ), indicated consistent interdependence among these domains. Weak but significant positive correlations were also found between cognitive-emotional anxiety and environmental behavior/coping ( $r = 0.22$ ,  $p < 0.05$ ), as well as between

functional impairment and coping behaviors ( $r = 0.20, p < 0.05$ ). Additionally, age was negatively correlated with both education level ( $r = -0.23, p < 0.05$ ) and income ( $r = -0.18$ ), suggesting older participants tended to report lower levels of education and socioeconomic status. (Table 3).

The results revealed that several demographic variables significantly predicted both cognitive-emotional and functional impairment domains of climate change anxiety. For the cognitive-emotional domain (Table 4), significant predictors included age ( $\beta = 0.17, p = 0.001$ ), education level ( $\beta = -0.13, p = 0.015$ ), city of residence specifically Sulaimanya ( $\beta = -0.10, p = 0.046$ ) and Duhok ( $\beta = 0.15, p = 0.004$ ) and type of residence ( $\beta = -0.12, p = 0.020$ ). Similar patterns were observed for the functional impairment domain, where age ( $\beta = 0.14, p = 0.008$ ), education level ( $\beta = -0.11, p = 0.044$ ), Sulaimanya ( $\beta = -0.13, p = 0.008$ ), Duhok ( $\beta = 0.18, p < 0.01$ ), and residence type ( $\beta = -0.16, p = 0.002$ ) were significant. Gender was not a significant predictor in either model. The models were statistically significant overall ( $p < 0.01$ ), explaining 32.8 % and 35.6 % of the variance in cognitive-emotional and functional impairment anxiety, respectively. For more details, refer to Table 4.

### 3.3. Severity of climate change anxiety and reliability of the climate change anxiety scale

The results of this study illustrated significant demographic differences across the severity levels of climate change anxiety. It is obvious from the results that participants with severe anxiety had the highest average age ( $35.74 \pm 9.68$  years), while those with minimal anxiety were the youngest ( $29.45 \pm 8.24$  years), with the difference being statistically significant ( $F = 6.74, p = 0.002$ ). Gender distribution also varied significantly ( $\chi^2 = 14.29, p = 0.003$ ), as females were more likely to experience moderate (35.1 %) and severe anxiety (28.1 %), compared to males who were more represented in the minimal (22.5 %) and mild (32.5 %) categories (Table 5). Regarding education, those with university-level education or higher were more frequently represented in the moderate (39.7 %) and severe (28.2 %) anxiety groups (Table 5), while participants with high school education or below were concentrated in the minimal (30.8 %) and mild (34.6 %) groups ( $\chi^2 = 17.58, p < 0.01$ ).

The findings revealed that the overall Climate Change Anxiety Scale demonstrated high internal consistency, with a Cronbach's  $\alpha$  of 0.89 and a 95 % confidence interval ranging from 0.87 to 0.91, indicating excellent reliability (Table 6). The mean total score was  $38.21 \pm 9.87$ ,

**Table 4**  
Multiple regression analysis predicting climate change anxiety ( $N = 385$ ).

Predictors	Cognitive-Emotional Domain			Functional Impairment Domain		
	$\beta$	t	p-Value	$\beta$	t	p-Value
Age	0.17	3.21	0.001	0.14	2.65	0.008
Gender (Female vs Male)	0.06	1.12	0.264	0.08	1.57	0.117
Education Level	-0.13	-2.45	0.015	-0.11	-2.02	0.044
City (Ref: Erbil)						
- Sulaimanya	-0.10	-2.00	0.046	-0.13	-2.66	0.008
- Duhok	0.15	2.89	0.004	0.18	3.52	< 0.01
Residence Type	-0.12	-2.34	0.020	-0.16	-3.12	0.002
Model Summary						
R <sup>2</sup>	0.328			0.356		
Adjusted R <sup>2</sup>	0.315			0.344		
F-statistic	25.63			29.42		
p-value	< 0.01			< 0.01		

**Note:**  $\beta$  = standardized regression coefficient. Significant predictors ( $p < 0.05$ ).

**Table 5**  
Climate change anxiety severity categories and associated characteristics ( $N = 385$ ).

Severity Level	N (%)	Age Mean $\pm$ SD	Male n (%)	Female N (%)	$\leq$ High School n (%)	$\geq$ University N (%)
Minimal Anxiety	64 (16.6 %)	29.45 $\pm$ 8.24	36 (22.5 %)	28 (12.3 %)	40 (30.8 %)	24 (9.5 %)
Mild Anxiety	105 (27.3 %)	30.82 $\pm$ 7.91	52 (32.5 %)	53 (23.2 %)	45 (34.6 %)	60 (23.8 %)
Moderate Anxiety	132 (34.3 %)	32.91 $\pm$ 9.02	52 (32.5 %)	80 (35.1 %)	32 (24.6 %)	100 (39.7 %)
Severe Anxiety	84 (21.8 %)	35.74 $\pm$ 9.68	20 (12.5 %)	64 (28.1 %)	13 (10.0 %)	71 (28.2 %)

**Note:** Values are presented as frequency (n) and percentage (%). Age is reported as mean  $\pm$  standard deviation. Statistical significance was assessed using one-way ANOVA for age ( $F = 6.74, p = 0.002$ ) and Chi-square tests for gender ( $\chi^2 = 14.29, p = 0.003$ ) and education level ( $\chi^2 = 17.58, p < 0.01$ ). Significance was set at  $p < 0.05$ .

**Table 6**  
Reliability analysis of climate change anxiety scale ( $N = 385$ ).

Scale/Domain	No. of Items	Mean $\pm$ SD	Range	Cronbach's $\alpha$	95 % CI
Climate Change Anxiety Total Scale	13	38.21 $\pm$ 9.87	14-70	0.89	0.87-0.91
Cognitive-Emotional Domain	8	20.12 $\pm$ 5.35	8-40	0.85	0.82-0.88
Functional Impairment Domain	5	18.09 $\pm$ 5.02	5-25	0.81	0.78-0.84

**Note:** CI = Confidence Interval. Cronbach's  $\alpha$  values  $\geq 0.70$  indicate acceptable internal consistency.

within a possible range of 14 to 70, indicating a moderate level of anxiety among participants. Both subdomains also showed strong psychometric properties: the cognitive-emotional domain had a mean score of  $20.12 \pm 5.35$  with a Cronbach's  $\alpha$  of 0.85, while the functional impairment domain had a mean of  $18.09 \pm 5.02$  and an  $\alpha$  of 0.81. (Table 6).

## 4. Discussion

This study demonstrated the significant implications of climate change anxiety in the Kurdistan Region, using statistical and psychometric analyses to evaluate emotional and functional domains. Findings indicated that climate anxiety was prevalent at moderate levels, with an overall moderate level observed across the sample. High anxiety scores were associated with functional health impairments, where cognitive-emotional distress explained 70.3 % of the variance in daily dysfunction. Significant demographic differences were found, particularly among older adults and apartment residents, who showed the highest anxiety levels. Participants from Duhok reported notably elevated scores in both emotional and functional domains. According to regression models, climate-related anxiety was most strongly predicted by age, education level, type of residence, and city of residence. These effects were particularly pronounced in the functional impairment dimension, where urban environmental factors might have intensified perceived threats from climate-related phenomena.

The study revealed significant regional disparities in exposure and coping mechanisms, with urban and apartment-dwelling individuals experiencing higher levels of helplessness and chronic worry. Climate

disruptions like droughts, floods, and heatwaves are becoming more visible, exacerbated psychological vulnerabilities, particularly in regions already grappling with infrastructural limitations. For example, compared with residents of Sulaimanya and Erbil, participants from Duhok showed greater emotional reactivity, possibly due to less-developed public health infrastructure and higher climate-related exposure. These findings are aligned with previous literature, which has documented higher eco-anxiety levels in areas with limited environmental resilience and preparedness (Cosh et al., 2025). In parallel, the consistent association between older age and elevated anxiety levels may reflect a growing awareness of irreversible environmental degradation and diminished adaptability to change (Helm, Pollitt, Barnett, Curran, & Craig, 2018).

Thus, psychological impact of climate change should be considered beyond immediate disaster trauma, encompassing emotional and functional disruptions across the continuum. Climate anxiety appears to be shaped not just by exposure to natural events but also by an individual's sense of agency, social context, and environmental stability. For example, recent studies suggest that individuals who perceive climate threats as uncontrollable exhibit a 34 % higher risk of generalized anxiety disorder (Isham, Jefferies, Blackburn, Fisher, & Kemp, 2025; Taylor, 2020). Additionally, low-income urban residents exposed to chronic environmental stress have shown up to a 29 % increase in functional health complaints (Disch, Schensul, Radda, & Robison, 2007). In our sample, apartment dwellers—who typically have limited access to green space—reported significantly higher levels of both anxiety domains. Similarly, education emerged as a protective factor, with each higher level of education associated with an 11 % reduction in anxiety-related dysfunction. Participants with lower education levels were overrepresented in the moderate-to-severe anxiety groups, highlighting a knowledge gap in understanding and coping with climate risks.

Prior studies have also emphasized that perceived lack of control and diminished coping abilities exacerbate climate-related psychological distress (Seth, Maxwell, Dey, Le Feuvre, & Patrick, 2023). In our study, the strong correlation ( $r = 0.84$ ) between cognitive-emotional anxiety and functional impairment underlines the interconnected nature of these experiences. Regression analysis further revealed that cognitive-emotional symptoms alone could predict 70.3 % of the variance in functional impairment ( $R^2 = 0.703$ ), echoing research suggesting that chronic worry may act as a precursor to psychosomatic and behavioral dysfunction. A study in Europe found that 63 % of individuals with high climate anxiety reported sleep disturbance, irritability, or work absenteeism (Collery & Niedzwiedz, 2025). Consistent with this, our results showed that functional consequences included social withdrawal and reduced performance. Moreover, the strongest predictors of anxiety severity included older age ( $\beta = 0.17$ ), low education ( $\beta = -0.13$ ), and residence in Duhok ( $\beta = 0.15$ ), indicating structural and cognitive vulnerabilities as primary factors.

In all, the findings from this study are broadly consistent with previous studies, yet they expand the understanding of climate anxiety by revealing the dual contribution of cognitive and environmental factors. Earlier studies have focused primarily on the emotional component, but our regression results show that environmental settings such as type of residence and geographic location play an equally important role. These social and spatial determinants may either buffer or amplify psychological stress. While younger participants expressed concern, older participants showed more entrenched anxiety patterns, possibly reflecting accumulated environmental grief and chronic exposure (Comtesse, Ertl, Hengst, Rosner, & Smid, 2021). Importantly, education level had a buffering effect, suggesting that public awareness campaigns may reduce emotional vulnerability. Furthermore, while gender was not a statistically significant predictor in regression models, descriptive analyses showed females were more likely to report moderate-to-severe symptoms.

Following the identification of severe anxiety in 28.1 % of

participants, particularly those with lower educational attainment, immediate public health interventions should prioritize psychoeducation and adaptive coping strategies. Without such interventions, persistent anxiety may evolve into long-term psychological disorders, impairing both individual well-being and societal productivity. Environmental psychologists have warned that unmanaged eco-anxiety may trigger maladaptive behaviors, including denial, avoidance, and fatalism, further reducing community resilience (Aston, 2022). The short-term, medium-term, and long-term consequences could affect mental health infrastructure, workplace performance, and educational attainment, especially in underserved areas.

Addressing climate change anxiety, however, requires a multidimensional approach, including urban planning, green space development, and educational outreach, in addition to mental health interventions. Some countries have initiated national eco-anxiety response programs, including Canada, Germany, and Australia, which combine counseling, community engagement, and climate education (Brophy, Olson, & Paul, 2023). Despite growing recognition, many developing regions remain without structured mental health frameworks tailored to climate distress. For example, a regional health assessment in 2024 reported that only 27 % of public health units had training modules addressing climate-related psychological impacts (Perreault-Carranza et al., 2024). Without scalable models, the mental health burden linked to climate change may intensify, disproportionately affecting vulnerable populations with low socioeconomic and educational capital.

The results from the present study reveal a significant rise in anxiety severity among individuals aged 35 and above, indicating a cumulative psychological burden from prolonged exposure and perceived helplessness. From 2000 to 2023, global climate disasters increased from 340 to 665 annually, doubling public exposure to environmental stressors (Collazo, Barriopedro, García-Herrera, & Beguería, 2025). The findings suggest that these escalating threats are mirrored in elevated emotional and functional symptoms, particularly in densely populated and less-resourced urban settings. Without policy-level action and community-based support systems, the psychological resilience of affected populations may deteriorate, making it increasingly difficult if not impossible to ensure emotional well-being in the face of climate disruption and to meet Sustainable Development Goal 3.4.

The major limitations of this study can be seen in three major ways. First, the cross-sectional design restricts the interpretation of causal relationships between climate change anxiety and its emotional or functional impacts. Second, although the sample included participants from three major cities, it may not fully represent rural or highly climate-exposed populations, which could yield different anxiety patterns. Additionally, cultural factors specific to the Kurdistan Region may limit the generalizability of findings to other settings. On the cultural prospective, complex understanding of the participants may require qualitative research conduction for a deeper insight of the issue. Future research should consider longitudinal designs to track the progression and long-term effects of climate-related anxiety over time. It is also recommended that future studies explore intervention strategies—such as resilience-building programs or psycho-educational campaigns—tailored to different demographic and geographic groups.

## 5. Conclusion

In this study, the climate change anxiety and its effect on emotional and functional health were examined. This research provides light on climate anxiety in the Kurdistan Region of Iraq (KRI) by examining demographic, regional, and environmental aspects. This study reveals that climate change anxiety is prevalent in KRI, with emotional distress strongly linked to functional impairments. Key socio-demographic factors such as age, location, and housing type play a significant role. The results establish the need for integrated mental health and environmental policies that promote public knowledge, resilience, and

sustainable urban development. To better understand and educate culturally appropriate climate-related psychological therapies, longitudinal research should include contextual stressors.

Addressing the psychological effects of climate change requires comprehensive policies in the KRI. Education should improve understanding of climate change and adaptive coping skills. Medical professionals have to evaluate climate anxiety and equip mental health professionals in culturally appropriate treatment. Urban planning and sustainable development also play a vital role. Expanding access to green spaces, reducing pollution, and improving infrastructure can alleviate both environmental and psychological stressors. Vulnerable populations, such as apartment residents and individuals in high-risk areas, require targeted support. The findings suggest that Kurdistan Region mental health providers should investigate climate anxiety as a role in functional impairments, particularly in middle-aged and older persons. Cognitive-emotional distress is strongly linked to daily disruptions; therefore, targeted therapies should incorporate resilience and stress management strategies. Healthcare practitioners can also promote sustainable urban planning to reduce environmental stresses that disproportionately affect apartment inhabitants and high-risk locations. Policy responses should systematically integrate climate-related psychological distress into mental health frameworks. Culturally tailored psychoeducation, resilience-building programs, and climate-adaptive urban planning can help mitigate the mental health burden. Without such measures, climate change anxiety may intensify, further affecting individual well-being and societal resilience.

#### CRedit authorship contribution statement

**Muzhda Qasim Qader:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Oluwatoyin 'Seun Ayanlade:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Formal analysis. **Ahmed Naif Ali:** Writing – review & editing, Writing – original draft, Methodology. **Eunice Wangui Stuhlhofer:** Writing – review & editing, Writing – original draft, Visualization. **Hazhar Talaat Abubaker Bilbas:** Writing – review & editing, Writing – original draft, Formal analysis. **Abdulmalik Fareeq Saber:** Writing – review & editing, Writing – original draft, Formal analysis. **Ayansina Ayanlade:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Formal analysis.

#### Declaration of competing interest

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

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#### Data availability

Data will be made available on request.

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