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PSYCHOMETRIC ANALYSIS OF ENVIRONMENTAL ANXIETY IN ISLAND AND COASTAL POPULATIONS

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ABSTRACT

Eco-anxiety, or environmental anxiety, is an emerging psychological issue, especially for those living in island and coastal communities at risk of climate change impacts, including rising sea levels, erosion, and severe weather. The goal of this study was to create and assess a specific psychometric scale for measuring environmental anxiety in these at-risk populations. A cross-sectional survey of participants from targeted islands and coastal areas, totaling 312, was conducted. The scale underwent extensive testing including exploratory and confirmatory factor analyses to assess structural validity. Findings revealed the existence of a three-factor model made up of Emotional Distress, Cognitive Concern, and Behavioral Response which accounts for a significant amount of variance in the environmental anxiety response. Internal consistency was supported as evidenced by high Cronbach's alpha, and strong construct reliability was supported by Composite Reliability and Average Variance Extracted metrics. The scale demonstrated significant correlations with general anxiety, confirming convergent validity. The results illustrate the lack of specific psychological instruments designed to evaluate the impacts of environmental factors on health. The scale can be utilized by mental health professionals, climate change adaptation planners, and decision makers for tackling environmental anxiety in places with the highest risks.

KEYWORDS: environmental anxiety, psychometric validation, coastal populations, island communities, climate change, mental health, eco-anxiety

I. INTRODUCTION

Eco-anxiety refers to the persistent dread of environmental calamity stemming from the knowledge of climate change, increasing sea levels, loss of biodiversity, and other ecological crises [1][2]. This form of anxiety is more common among people who live in island and coastal areas which are more likely to suffer from climate change [8]. These communities deal with worsening exposure due to their location and remain prone to experiencing severe storms, shoreline erosion, saltwater intrusion, and in the case of low-lying islands, permanent submersion. Thus, for these people, environmental anxiety is not simply about what is likely to happen in the future.

Grasping the mental health impacts of the environment's changes on these groups is crucial for health and the environment [3][4][7]. Nevertheless, systematic studies which measure and validate such anxieties employing robust psychological instruments are sparse [10]. It is especially important to capture anxiety around the environment in particular groups accurately, and to develop different instruments tailored for specific populations. This is essential for mental health in areas facing existing environmental distress when advancing tailored mental health response, resilience building, and culturally appropriate communication plans [5][6][9].

This study's goal is to conduct a psychometric study of environmental anxiety in insular and coastal populations. The goal of the current research is to develop or validate an anxiety measuring scale specific to these communities so as to provide an evidence-based understanding of the psychological processes involved in the internalization of environmental threats. The study findings are anticipated to advance the frameworks in place for climate adaptation planning and mental health support in a meaningful way in relation to the intertwined challenges of nature and human well-being.

KEY CONTRIBUTIONS:

1. Created and verified a psychometric scale measuring environmental anxiety uniquely tailored for islands and coastal communities vulnerable to climate change impacts and psychosocial stressors.
2. Formulated and corroborated a three-factor model: Emotional Distress, Cognitive Concern, and Behavioral Response which systematically entitled a model for evaluating the psychosocial consequences of environmental change.

The paper can be accessed in five major parts. It starts with the Introduction which discusses the non-negligible aspect of concern on the issue of environmental anxiety on the ecologically fragile communities. Following it is the Literature Survey which summarizes the available literature on eco-anxiety and the gap concerning localized psychometric tools. The Methodology part explains the study's design sampling method, scale construction, and the statistical methods used. The Results and Discussion section presents the findings that include the psychometric data, confirmatory factor analysis, reliability tests, and their theoretical relationships. The paper closes with a Conclusion and Future Work that discusses the importance of the scale validation while suggesting further research on the application of the research findings on the wider and different contexts.

II. LITERATURE SURVEY

The increasingly evident global climate change and ecological deterioration has given rise to a new class of psychological research: environmental anxiety. It integrates an individual's 'anxiety' and 'cognitive elicits and emotions' and "existential dread" that is being fostered by environmental unpredictability [11]. Initial researches focused on eco-anxiety of the general populace. In comparison to earlier works, the recent works dwelled on high-risk populations, particularly those residing in island and coastal regions [12]. These regions exhibit heightened vulnerability to climate change impacts, including sea-level rise, coastal flooding, erosion, and extreme weather events, thus predisposing residents to psychological distress [13].

Research shows that those residing in ecologically sensitive areas are more likely to encounter emotional stress because of the proximity of such areas [14]. In such areas, environmental worry is almost always combined with financial insecurity, cultural change, forced migration, and the resultant displacement from a historically significant territory [15]. This intricate psychological trauma is believed to contribute to higher rates of depression, post-trauma stress reactions, and anxiety disorders. This, however, is not the case, as the psychological tools that are available do not have contextual relevance to this community.

There have been attempts to create or adapt psychometric tools that assess the multifaceted nature of environmental anxiety, but most are either culturally myopic or ecologically irrelevant. There is a growing demand for culturally appropriate instruments that are both psychometrically rigorous and attuned to the realities of the affected communities. In addition, the incorporation of psychological measures within the context of environmental impact evaluation is increasingly viewed as an essential element of climate adaptation planning. In this regard, psychometric evaluation specific to insular and coastal communities is a significant development in climate psychology research.

III. METHODOLOGY

This research utilized a cross-sectional survey design to create and validate a psychometric scale measuring environmental anxiety for populations living in islands and coastal areas. The focus of this study was on middle-aged and older residents of coastal and island communities considered ecologically fragile due to the threats of rising seas, flooding, and erosion. This study utilized a stratified random sampling technique to achieve a balanced representation across different ages, sex and socio-economic status. Ethical approval was secured, and data collection commenced after informed consent was obtained from all participants.

A systematic questionnaire was created based on the available eco-anxiety tools which were adjusted to fit the relevant culture and environment of the study group. The scale included Likert-type items measuring emotional, cognitive, and behavioral reactions to eco-anxiety. A pilot study conducted with 30 participants was intended to test issues related to the items' precision as well as the content validity of the questionnaire. The raw data were analyzed and based on the analysis, some modifications were made prior to the distribution of the final questionnaire.

Data collection was done both online and in person based on participants' availability and their technical know-how. Each survey took around 15–20 minutes. Following the screening process for missing responses, complete and valid data from 312 participants were selected for analysis.

Exploratory and confirmatory factor analyses were performed in order to evaluate the underlying structure of the scale in the psychometric evaluation. Measurement of internal consistency was based on the response pattern of each subscale's items and was calculated using Cronbach's alpha. The equation used for this is:

$$\alpha = \frac{N.\bar{c}}{\bar{v} + (N-1).\bar{c}} \qquad Eq(1)$$

In Eq (1), where N is the number of items, $\bar{c}$ is the average covariance between item pairs, and $\bar{v}$ is the average variance. A value of $\alpha \geq 0.70$ was considered acceptable for internal reliability.

Moreover, construct validity and convergent reliability were checked by calculating Composite Reliability (CR) and Average Variance Extracted (AVE) during Confirmatory Factor Analysis. The study's quantitative factors were analyzed with SPSS and AMOS software which offers a robust environment for confirming the psychometric properties of the scale.

IV. RESULT AND DISCUSSION

The psychometric evaluation provided a trustworthy and accurate scale for assessing environmental anxiety among island and coastal populations. Information was gathered from 312 individuals in one island community and three coastal districts. The demographic breakdown further balanced representation across various age groups, gender, and socio-economic strata, thereby strengthening the generalizability of the results.

Exploratory Factor Analysis (EFA) identified a three-factor structure: Emotional Distress, Cognitive Concern, and Behavioral Response. These factors accounted for 67.4% of the total variance, suggesting a strong construct. The confirmatory Factor Analysis (CFA) validation reinforced the model's adequacy with acceptable indices (CFI = 0.94, RMSEA = 0.052), confirming the model's hypothesis that the scale and underlying construct of environmental anxiety measure the same latent variable.

The internal consistency measured by Cronbach's Alpha showed Emotional Distress ($\alpha = 0.88$), Cognitive Concern ($\alpha = 0.84$), and Behavioral Response ($\alpha = 0.81$) all high, indicating strong reliability. In addition, the scale demonstrated an important positive correlation with a general anxiety scale ($r = 0.62$, $p < 0.01$), which additionally supports the convergent validity of the scale.

In Eq (2), it is used to assess scale construct validity is the Composite Reliability (CR):

$$CR = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + \sum \theta_i}$$

Where:

$$\lambda_i = Standardized\ factor\ loading\ for\ item\ i$$

$$\theta_i = Error\ variance\ for\ item\ i$$

CR values above 0.70 were observed for all factors, confirming good construct reliability.

Table 1. Psychometric Properties of the Environmental Anxiety Scale

Subscale	No. of Items	Cronbach's Alpha	Composite Reliability (CR)	AVE
Emotional Distress	6	0.88	0.89	0.61
Cognitive Concern	5	0.84	0.85	0.59
Behavioral Response	4	0.81	0.83	0.57

The results confirm the psychometric rigor of the scale as well as its relevance pertaining to measuring environmental anxiety in communities that are ecologically vulnerable. This underscores the necessity of incorporating mental health evaluation in the climate adaptation strategies and in the local governance systems.

V. CONCLUSION AND FUTURE WORK

In this study, we created and validated a psychometric scale specifically designed to measure environmental anxiety for island and coastal populations. The scale underwent rigorous evaluation, including factor analysis and reliability testing, demonstrating strong internal consistency, structural validity, and ecological relevance to those experiencing environmental stressors. The three-factor structure Emotional Distress, Cognitive Concern, and Behavioral Response reflects the intricacies of environmental anxiety, and has been contextualized culturally and ecologically. These results underscore the critically important gap of the psychosocial impacts of climate change, specifically for populations most affected by climate change impacts.

The verified scale offers a useful framework for researchers and policymakers looking to assess the mental health impacts in a particular area and incorporate psychosocial indicators into the wider climate resilience and public health policies. It can aid in the mental health outreach and education campaigns in the sensitive ecological which regions as a diagnostic framework.

Subsequent efforts should focus on this psychometric evaluation in other high-risk coastal and island areas around the world. Over time, changes in relationship to environmental events, or policy changes, could be monitored with longitudinal studies. Also, the use of qualitative methods, including interviews and focus groups, would help capture and enrich understanding of environmentally related distress of specific cultures. Adapting the scale for the younger age groups and translating it to be more age-appropriate, coupled with providing the appropriate vernaculars, will broaden the impact and applicability of the scale.

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