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SOCIOECONOMIC DETERMINANTS OF ENVIRONMENTAL CONCERN FOR MARINE BIODIVERSITY CONSERVATION: EVIDENCE FROM COASTAL BALOCHISTAN, PAKISTAN

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KEYWORDS	ABSTRACT
Marine environment, socioeconomic factors, environmental concern, Balochistan.	The joint effect of socioeconomic characteristics and environmental concern on public for marine biodiversity conservation in coastal area of Balochistan, Pakistan is investigated in this study. A structured questionnaire was used to collect primary data from 410 respondents from five coastal localities of Balochistan. The data was analysed using descriptive statistics, principal component analysis (PCA), cluster analysis and binary logistic regression. The overall results indicate that concern about the environment is moderate, with significant differences among the age, marital status, beach-visitation groups and household income categories. Three worldviews in relation to the environment were detected: Human domination of Nature, Anti-anthropocentrism and Limits to Growth. The logistic regression shows that a person's age, marital status and household income are the most significant socioeconomic factors influencing WTP, and that environmental attitudes support their financial commitment to conservation after these factors are controlled for. The model has an adequate explanatory power of a significant proportion of the WTP (Nagelkerke $R^2 = 0.742$). The study finds that the combination of socioeconomic factors and environmental worldview explains the willingness to pay for the conservation of marine biodiversity in Balochistan and proposes a concept of financing conservation efforts based on income-generating strategies and community-based methods along with targeted environmental education initiatives.
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Introduction

Background of the Study

Coastal economies and areas are highly dependent on the surrounding marine environment. The perception of the sea is formed based on socioeconomic factors, environmental policy, and the condition of nature and affects support for nature conservation (Gelcich et al., 2014). Many of these services are under threat from human activities such as overfishing, and the occurrence of lost and discarded fishing gear (LDFGs), lost and abandoned fishing gear (LAFGs), and abandoned fishing gear (AFG) in the marine environment, which are part of the marine ecosystem services (Macfadyen et al., 2009; Ankamah-Yeboah et al., 2020). Public perception of the marine environment is the sum of the attitudes, beliefs, and awareness held by individuals and groups of people regarding the ocean and coastal ecosystems, and is influenced by culture, socioeconomic status, education and personal experiences with the coast (Gelcich et al., 2014).

Positive perceptions are associated with the recreational, aesthetic and economic value of the ocean (Jobstvogt et al., 2014; White et al., 2014) and negative perceptions are related to pollution, overfishing, habitat loss and climate change. Awareness of public concern is crucial for developing support for Marine Protected Areas (MPAs) and related conservation actions as it is likely to result in policy support (Said et al., 2017). In general, fishing communities living near the coast are more environmentally conscious than non-fishing communities living in urban areas with little direct contact with the sea, indicating that socioeconomic exposure affects environmental concern (Jefferson et al., 2015; Gelcich et al., 2014).

Willingness to pay (WTP) values for marine biodiversity conservation reflect the value placed by the individual or society on the preservation and rehabilitation of marine biodiversity and are a widely used technique in environmental economics that estimates public preferences for conservation policy (Carson, 2012). Environmental concern, income, education, and occupation dependence on marine resources (Hanley et al., 2015) are factors that influence WTP, with individuals who are environmentally concerned, are more likely to express higher WTP, and those with more higher levels of income and education more likely to express higher WTP (Jobstvogt et al., 2014; Tisdell and Wilson, 2001).

Balochistan, being an arid province of Pakistan, has a coastline of approximately 770 kilometers along the Arabian Sea, which abounds with mangrove forests, coral reefs and fisheries, providing fish, turtles, dolphins and sustaining the livelihood of the people of the coastal areas in Gwadar, Pasni, Ormara, Kund Malir and Gaddani. The region is also home to strategically significant Gwadar Port, which is a deep-sea trade port connected with CPEC infrastructure. The coast is already water-stressed, environmentally neglected, and is under pressure for sustainable development to benefit the local community and its economy despite its wealth and importance.

Statement of the Problem

The marine life, especially along the coast of Balochistan, is under threat due to overfishing and habitat loss, which consequently affects the livelihood of these communities relying on fishing for livelihood. There is limited research that has looked at levels of public awareness of the marine environment or how funding for conservation activities could be made available in this particular environment. This is a gap that is important because socioeconomic characteristics like age, occupation, education and place of residence can influence how an individual perceives the sea and thus influence their capacity and willingness to participate in marine conservation. Despite the ecological and economic significance of the coastal areas of Balochistan, there is a lack of studies which integrate socioeconomic factors with the willingness-to-pay data of the coastal region, and therefore, it is difficult for the policy makers to develop conservation strategies based on the data of their region which is both socially acceptable and economically realistic.

Research Objective

1. To explore interaction between socioeconomic attributes and environmental concern on public attitudes towards marine biodiversity conservation in coastal area of Balochistan.

Research Question

1. What are the impacts of socioeconomic factors and environmental concern on the people for conservation of marine biodiversity in the coastal area of Balochistan?

Research Hypothesis

- H_0 : There is no significant relationship between socioeconomic characteristics and environmental concern with regard to willingness to pay for marine biodiversity conservation in coastal region of Balochistan.

Significance of the Research

The findings of this study will provide evidence for the Southeast region of the United States of how socioeconomic background interacts with environmental attitudes to create financial support for marine conservation in an under-studied coastal region. The results can guide the drawing of policy, conservation financing plans, EE programmes and community engagement plans that are responsive to the economic and ecological worldview in coastal Balochistan.

Literature Review

Theoretical Perspectives

Environmental attitudes study is based on the sociology and psychology of attitudes, which are used to explain the nature and the development of people's attitudes and behaviors towards nature. Public concern about the environment is integral to environmental social research as the

basis for environmental legislation development (Marquart-Pyatt, 2007), and conservation psychology and eco-psychology are based on the moral and emotional motivations for environmental decisions (Clayton & Myers, 2010; Doherty & Clayton, 2011).

It is generally accepted that beliefs, attitudes, and perceived behavioral control are linked to environmentally relevant actions, such as willingness to pay, as described in the Theory of Reasoned Action (Ajzen & Fishbein, 1980) and its extension, the Theory of Planned Behaviour (Ajzen, 1991). While TPB has been used in the context of diver behaviour and attitudes in recreational fishery poaching and in citizen science, it has not yet been used in the marine public perception research context (Bergseth & Roscher, 2018).

Marine biodiversity is vital for primary production, nutrient cycling, climate regulation and cultural and educational benefits, yet is at risk from land-use change and climate change from polar to tropical ecosystems (Beaugrand et al., 2018; Mi et al., 2021). Marine governance has been influenced by the extension of the Pakistan's continental shelf under UNCLOS in 2017, and the seasonality and climatic conditions in the coastal region, particularly in Balochistan where the coastline stretches about 770 kilometres (Ullah et al., 2017; Khan et al., 2021).

Theory that explains the willingness to pay for marine biodiversity is supported by theory in environmental economics, behavioural economics and social psychology as well as human geography (Muljaningsih et al., 2023). WTP is considered a measure of the value consumers have on non-marketed ecological goods, and higher income is related to higher capacity and propensity to pay (Mamboleo & Adem, 2023) while higher education is related to a higher appreciation of the ecological and economic value (Xu et al., 2022).

Non-rational determinants of WTP, like the “warm-glow” satisfaction that comes from contributing to conservation, and the framing and cultural norms are among the things that behavioral economics emphasizes (Ogiemwonyi, 2022). Social-psychological approaches highlight the importance of social norms and perceived behavioral control on intention to support conservation (Si et al., 2022), whereas human-geography approaches on place-based identity reveal that living near and relying on the coast leads to stronger feelings and greater WTP (Mamboleo & Adem, 2023).

Empirical Evidence

A number of earlier studies have shown that environmental awareness, socioeconomic factors and ecological values have an important influence on the willingness-to-pay for marine conservation. Contact with and reliance on the coastal environment can reinforce environmental awareness: Gelcich et al (2014) showed that the higher the environmental concern in Chile, the more pro marine-reserve sentiment; and Hynes et al (2014) reported that in Ireland, more frequent contact with the coast was correlated with greater appreciation of marine ecosystems. Likewise, there is evidence that environmental degradation, such as pollution and habitat degradation, are associated with increased support for conservation (Jobstvogt et al., 2014).

In addition, socioeconomic factors affect WTP, with Börger et al. (2014) reporting higher incomes to be correlated with higher WTP for marine ecosystem services in the UK, and Lew and Larson (2012) reporting an increase in WTP for conservation projects as a result of environmental education. However, the effects of occupational dependence on marine resources could be positive or negative, as conservation policies can either facilitate or hinder the livelihoods of fishers and tourists (Arbizu et al., 2022), and age and gender has also been found to affect WTP, with younger participants and with women sometimes being more willing to pay (Togridou et al., 2006). Besides, the NEP scale is a commonly used measure of pro environmental worldviews, and studies have consistently related higher NEP scores to greater conservation support and WTP. The relationship between scores of NEP and financial support for marine protected areas has been reported as positive (Dunlap et al. 2000; McFarlane and Boxall 2000) as has been the relationship between NEP scores and pro environmental behavior across countries (Milfont and Hawcroft 2010). Likewise, Amburgey and Thoman (2012) showed that more general measures of sustainable consumer behaviour are predicted by NEP based environmental values.

Research Gap

Although there is a growing body of literature on the relationship between socioeconomic status, environmental attitudes and WTP across the world, there is little such research taking place in Balochistan, a coastal province which has a unique socioeconomic and cultural profile and high reliance on marine resources. Previous studies typically do not integrate attitudinal measures (e.g., NEP scale) with socioeconomic profiling and a formal WTP model in a single coastal-Pakistan context. The present study fills that gap by combining environmental concern and socioeconomic factors into a single model which explains the willingness to pay to conserve biodiversity in coastal Balochistan.

Research Methodology

Research Design

The research design adopted in this study is quantitative with the aim of exploring the relationship between socioeconomic characteristics and environmental concern with regard to willingness to pay for marine biodiversity conservation in coastal Balochistan. Since there was no information available about the target population, non-probability cluster sampling was used and the study area was divided into five clusters of coastal areas such as Gwadar, Pasni, Ormara, Kund Malir and Gaddani which were selected based on their coastal status and relevance to marine livelihoods and marine biodiversity.

For each cluster, respondents were selected using simple random sampling which yielded 410 valid responses. A structured questionnaire based on Halkos and Matsiori (2017) was used to collect the data as the sample size was determined with 95% confidence level and 5% margin of error.

Demographic and socioeconomic characteristics of the respondents were summarized using descriptive statistics and 15 NEP items were analysed for underlying dimensions of environmental concern using Principal Component Analysis with varimax rotation, the sampling adequacy determined by the KMO measure and Bartlett test of sphericity.

The Mann Whitney U test was used to compare environmental attitudes between the different socioeconomic groups, K means cluster analysis was used to classify the demographic and socioeconomic groups, and finally binary logistic regression was used to evaluate the effect of demographic and socioeconomic factors and the behavioral factors on the willingness to pay.

Empirical Model

Following Halkos and Matsiori (2014), willingness to pay was modelled as a binary logistic regression:

$$\begin{aligned} \text{Logit} [\text{Pr}(Y = 1)] \\ = \beta^0 + \beta_1 \text{Gen} + \beta_2 \text{Age} + \beta_3 \text{Edu} + \beta_4 \text{Inc} + \beta_5 \text{Marital} \\ + \beta_6 \text{Sit} + \beta_7 \text{Occu} + \beta_8 \text{Fre} + \beta_9 \text{Act} + \varepsilon_i \end{aligned}$$

Where Y equals 1 if the respondent is willing to pay for marine biodiversity conservation and 0 otherwise; Gen, Age, Marital, Edu, Inc, Occu, Sit, Fre, and Act denote gender, age, marital status, education, household income, occupation, setting (urban/rural residence), frequency of beach visits, and type of beach activity respectively; and ε_i is the error term.

Results and Discussion

The chapter provides the evidence necessary to respond to the study's research question, starting with a demographic and attitudinal profile of respondents, then the socioeconomic patterning of environmental concern, and lastly the joint socioeconomic and attitudinal determinants of willingness to pay.

Demographic and Socioeconomic Profile

The sample consisted of 410 respondents of which 60.7% were male and 39.3% were female, and predominantly young (42.2% aged 18–29). Sixty-seven percent of respondents were married. There was a mix of educational levels (39.5% had university education, 20.0% had no education) and monthly income was very different (34.4% earned Rs.10,000–24,999 monthly), resulting in significant economic inequality among the sample.

Respondents were mostly engaged in diverse occupations (25.9% employed, 25.4% fishermen, 21.5% student, 15.4% businessmen and 12.0% unemployed) and 56.3% people were residing in urban areas. Residents of the coast also report that they live or work on the beach – just more than half (53.4%) – and that mostly for work, not leisure (52.4%) indicating the economic importance of the coast in daily life.

Table 1: Demographic and Socioeconomic Profile of Respondents

Variable	Percentage	Variable	Percentage
Gender: Male	69.3%	HH income: Rs.10,000–24,999	35.3%
Gender: Female	21.7%	HH income: Rs.25,000–49,999	26.4%
Age: 18–29	39.0%	HH income: Rs.50,000–74,999	22.2%
Age: 30–39	25.0%	HH Income Above 74,999	7.3%
Age: 40–49	22.7%	HH income: Prefer not to answer	9.6%
Above 40	13.3%	Occupation: Student	15.3%
Marital status: Unmarried	25.4%	Occupation: Fishermen	35.2%
Marital status: Married	75.6%	Occupation: Businessmen	17.2%
Education: Primary	15.3%	Occupation: Employed	22.7%
Education: Secondary	10.5%	Occupation: Unemployed	9.6%
Education: College	17.8%	Setting: Urban	45.0%
Education: University	33.3%	Setting: Rural	55.0%
Education: No education	23.4%		

Source: Authors' calculations based on field survey.

Overall Level of Environmental Concern

The NEP scores for the aggregates were grouped together, with the majority falling within the range of 50–60, reflecting moderate-to-strong environmental concern on the part of most respondents, similar to the results of Halkos and Matsiori (2012), who reported high levels of environmental awareness among the people in the Mediterranean despite mixed levels of financial commitment. Fewer respondents scored below 40, indicating that a minority have a more economically oriented worldview, valuing development over conservation (Dunlap, 2008). A change in WTP in Balochistan from low to moderate to high awareness is not a blank slate beginning, but a stepping up of existing moderate financial commitment to a high level of commitment, which is the nexus the research question in this study seeks to discuss.

Dimensions of Environmental Concern

The 3 reliable dimensions of environmental worldview, which collectively account for 55.97% of variance, define the “environmental concern” side of the research question in this study: principal component analysis revealed them (KMO = 0.920; Bartlett's $\chi^2 = 2241.35$, df = 105, $p < .001$).

Table 2: Principal Component Analysis of NEP Scale Items (Summary)

Factor	Eigenvalue	Cronbach's α
F1 — Human Domination of Nature	5.865	0.791

Overall Cronbach's $\alpha = 0.886$; total variance explained = 55.97%. Source: Authors' calculations based on field survey.

Factor 1 (Human Domination of Nature) loads on items related to resource limits and human developments (e.g., “we are approaching the limit of the number of people the earth can support”, loading 0.692), and there is a perception that using resources is becoming an increasing risk to humans.

Factor 2 (Anti-anthropocentrism) factors items that tend to reject human superiority over nature (e.g., “plants and animals do not have equal rights as humans to exist” loading 0.813), consistent with Dunlap et al. (2000), who relate rejection of human superiority to stronger pro-environmental behavior. Factor 3 (Limits to Growth) shows that awareness of ecological fragility and impending crisis is high (loading 0.773), similar to Halkos and Matsiori's (2017) results on disaster-risk awareness.

Socioeconomic Patterning of Environmental Concern

The environmental-concern factor scores vary significantly ($p < 0.05$) by age, marital status, household income, frequency of visits, and activity groups; and, for the Human Domination factor only, by gender. There was no significant difference in attitudes toward the environment between education, occupation and urban and rural living. This is similar to Garcia et al. (2023) and Smith et al. (2024) who also conclude that age, gender and socioeconomic status are better indicators of attitudes towards the environment than education and location.

Table 3: Mann-Whitney U Test Statistics (2-tailed p-values) by Environmental Concern Factor

Grouping variable	Human Domination	Anti-anthropocentrism	Limits to Growth
Gender	0.000*	0.315	0.457
Age	0.000*	0.000*	0.000*
Marital status	0.000*	0.034*	0.000*
Education	0.584	0.417	0.561
HH monthly income	0.000*	0.000*	0.002*
Occupation	0.497	0.072	0.382
Setting	0.815	0.629	0.068
Frequency	0.000*	0.067	0.014*
Activity	0.000*	0.024*	0.397

**Significant at the 5% level. Source: Authors' calculations based on field survey.*

This pattern is confirmed by K-means cluster analysis: age, marital status, education, household income, occupation, gender, frequency and activity all cluster significantly between the resulting clusters of respondents (Sig. = .000, except for education at .034); urban/rural setting does not (Sig. = .124). This indicates that the socioeconomic environment has more influence on the relationship between coastal Balochistan residents and the marine environment than the geographic environment (Johnson et al., 2024).

Determinants of Willingness to Pay for Marine Biodiversity Conservation

The ability of the binary logistic regression model to answer the study's research question relies on the model predicting the willingness to pay for the subjects based on the combination of attitudinal and behavioral indicators of environmental concern and socioeconomic characteristics.

Table 4: Logistic Regression Model of Willingness to Pay

Variable	B
Gender	0.543*** (0.034)
Marital status	1.021** (0.014)
Age	-1.287*** (0.32)
Education	0.611 (0.042)
HH monthly income	0.294** (0.135)
Occupation	-0.125 (0.081)
Setting	-0.942*** (0.235)
Frequency	-0.813* (0.257)
Activity	-0.453 (0.298)
Constant	2.762*** (1.461)

*, ** & *** represents Significant at the 10%, 5% & 1% level respectively. Nagelkerke $R^2 = 0.742$; Cox & Snell $R^2 = 0.538$; Hosmer-Lemeshow = 12.664; Log-Likelihood = 213.600; N = 410. Source: Authors' calculations based on field survey.*

The most positive factor that influences WTP is marital status ($p = 0.007$; odds ratio = 4.060), which can be plausibly explained by the fact that this group of individuals is less likely to be willing to pay than the non-married group, possibly because they have a larger household to support and a longer time horizon for planning purposes (Halkos & Matsiori, 2020). The relationship between age and WTP is statistically significant and is negative ($p < 0.001$, odds ratio = 0.152): older respondents are significantly less likely to express willingness to pay, which is consistent with a feeling of reduced benefits of long-term conservation and lower disposable incomes among the elderly (Halkos & Matsiori, 2020). Household income is a strong positive predictor ($p = 0.044$; odds ratio = 1.291), which is consistent with previous studies linking increased income with increased willingness to pay (Carson et al., 2020; Hanley et al., 2019).

Two of the behavioral indicators linked to environmental concern are significantly negative: urban/rural setting ($p = 0.007$; odds ratio = 0.356) and frequency of coastal exposure ($p = 0.033$;

odds ratio = 0.467); this suggests that the more passive or habituated the coastal exposure, the lower the WTP will be, which may be because frequent users or residents expect coastal access to be given for free and therefore do not perceive the need to pay for coastal protection but rather believe that it is the government or external bodies' responsibility to do so (Torgler & García-Valiñas, 2007). Gender ($p = 0.083$), education ($p = 0.270$), occupation ($p = 0.284$) and activity type ($p = 0.179$) were not statistically significant and therefore do not add much additional explanatory power once the other variables have been considered. Overall, the model is able to explain the data well (Nagelkerke $R^2 = 0.742$), indicating that the overall socioeconomic factors (with age and marital status being particularly important) and the behavioral proxies of the coastal people's engagement with the environment are the primary determinants of their willingness to pay for the conservation of marine biodiversity in the coastal region of Balochistan.

Conclusion and Recommendations

Conclusion

The result of this study reveals that environmental concerns along with socio-economic attributes collectively influence willingness to pay for the conservation of marine biodiversity in coastal Balochistan. Age, marital status, household income, and moderate level of environmental concern are the most powerful predictors of willingness to pay while frequent or passive coastal use is correlated with lower willingness to pay. In general, the amount of commitment to marine conservation in terms of financial contributions is dependent on financial capacity and family circumstances.

Recommendations

Creating sustainable marine conservation in Balochistan involves an integrated approach which includes socioeconomic conditions and awareness of the environment and community participation. The funding for conservation should be flexible and should include livelihood and income diversification programmes, especially for fishermen. Schools and universities, community programmes and local media can help foster awareness of sustainable resource use, and bringing fishermen, local leaders and community groups into Marine Protected Area management can help increase ownership and financial responsibility. Outreach would also need to be targeted at age and marital status groups to promote ongoing community conservation funding.

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