

KAP Survey on Biodiversity Conservation among Communities in Zhejiang Qingliangfeng National Nature Reserve

Xiang HAN, Sijie DAI, Jin MA *

College of Landscape Architecture and Architecture, Zhejiang A&F University, Hangzhou 311300, China

Abstract [Objectives] To assess the current Knowledge, Attitude, and Practice (KAP) regarding biodiversity conservation among communities within the Zhejiang Qingliangfeng National Nature Reserve. [Methods] Questionnaire survey was conducted. [Results] The mean scores for knowledge, attitude, and practice were (2.72 ± 0.16) , (3.69 ± 0.21) , and (3.10 ± 0.41) points, respectively. Knowledge and practice scores fell within the intermediate range, whereas attitude scores reached a high level. Significant positive correlations were observed among all three KAP dimensions. Educational attainment emerged as a shared independent determinant of KAP scores. Occupational category independently influenced knowledge and attitude scores, while age independently affected attitude scores, and annual household income independently influenced practice scores. [Conclusions] These findings underscore the necessity of strengthening science-based outreach and interpretive programs to enhance community awareness and foster pro-environmental attitudes toward biodiversity conservation. Furthermore, promoting ecologically sound agricultural practices for specialty crops is recommended to improve product value while aligning with conservation objectives.

Key words Nature reserve community, KAP survey, Current status, Analysis, Biodiversity conservation

0 Introduction

Biodiversity conservation is intrinsically linked to human well-being^[1], serving as a fundamental natural capital upon which human survival and socio-economic development depend. The establishment of protected areas not only constitutes a critical strategy for safeguarding species diversity and maintaining ecosystem integrity^[2], but also represents one of the most effective interventions to mitigate the accelerating global loss of biodiversity^[3]. Nevertheless, protected areas and their adjacent communities have long been confronted with multifaceted conflicts concerning resource utilization, land tenure regimes, benefit distribution, and human-wildlife interactions^[4]. Resolving these tensions in a scientifically sound manner remains a central challenge in China's biodiversity conservation agenda.

As key stakeholders and active participants in conservation governance within protected areas, local communities exert a pivotal influence on biodiversity outcomes through their levels of awareness, environmental attitudes, and behavioral practices^[5]. The Knowledge, Attitude, and Practice (KAP) model a behavioral intervention framework comprising three interrelated components: knowledge acquisition, attitude formation, and practice implementation^[6] has been extensively employed internationally to assess and interpret health-related behaviors and attitudes^[7–8]. In recent years, this theoretical construct has also demonstrated considerable applicability in environmental management and conserva-

tion research^[9–10]. However, empirical investigations utilizing the KAP framework to examine community-level responses to biodiversity conservation within China's nature reserves remain conspicuously scarce.

Against this background, the present study takes the communities surrounding the Qingliangfeng National Nature Reserve as a case study to operationalize the KAP model. Specifically, we aim to: (i) evaluate the current status of community knowledge, attitudes, and practices pertaining to biodiversity conservation; (ii) examine the interrelationships among these three dimensions; and (iii) identify the socio-demographic determinants influencing each component. Based on these empirical findings, we propose targeted and actionable recommendations, with the overarching goal of furnishing a scientific rationale for the formulation of conservation strategies that simultaneously advance both biodiversity protection and community livelihood enhancement within protected area systems.

1 Study area description

The study area is situated within Lin'an District, Hangzhou City, in the northwestern part of Zhejiang Province, China. It comprises the Qingliangfeng National Nature Reserve, a state-level protected area designated primarily for forest ecosystems and wildlife conservation. The reserve encompasses three distinct sectors Longtangshan, Qiantangqing, and Shunxiwu covering a total area of approximately 11 252 ha. The reserve-adjacent communities consist of 13 administrative villages, namely Baiguo, Shunxi, Yulingguan, Jiufu, Zhechuan, Langguang, Shichangcheng, Tao-huaxi, Daxiagu, Jiulong, Lianmeng, Houge, and Yuxi.

2 Methods

2.1 Questionnaire design The questionnaire comprised two principal sections. The first section collected demographic characteristics of the responding community residents, including gender,

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* Corresponding author. Jin MA, doctoral degree, associate professor, landscape plant application.

age, educational attainment, occupational category, and annual household income. The second section was devoted to KAP assessment, encompassing three dimensions (knowledge, attitude, and practice), each consisting of five items measured on a 5-point Likert scale. Response options were converted into assigned scores for respondent selection. For the knowledge dimension, scores were assigned as follows: 1 = not concerned, 2 = never heard of, 3 = heard of, 4 = somewhat familiar, and 5 = relatively familiar. The attitude dimension employed reverse scoring, with responses coded as: 1 = strongly disagree, 2 = disagree, 3 = somewhat agree, 4 = agree, and 5 = strongly agree. For the practice dimension, scores were allocated as: 1 = never, 2 = rarely, 3 = occasionally, 4 = sometimes, and 5 = frequently.

2.2 Questionnaire survey Between July and August 2025, a cross-sectional household survey was conducted using random sampling across the 13 communities. One eligible resident aged 18 years or above per household was invited to participate. A total of 252 questionnaires were distributed, yielding 217 valid responses, corresponding to a response validity rate of 86.11%.

2.3 Data processing Statistical analyses were performed using Jamovi software. Variables were described using mean values $\pm$ standard deviations. Scores for each KAP dimension were categorized into three levels: low (1.00 – 2.49) points, moderate (2.50 – 3.49) points, and high (3.50 – 5.00) points. All Cronbach’s alpha coefficients for KAP three dimensions exceeded 0.80, indicating satisfactory internal consistency. Bartlett’s test of sphericity reached statistical significance ($\chi^2 = 1\,807$, $df = 91$, $p < 0.001$), and the Kaiser-Meyer-Olkin (KMO) measure was 0.897, confirming the reliability of the questionnaire instrument and the robustness of the sample data quality. Pearson correlation analysis was employed to examine the interrelationships among KAP dimensions. Multicollinearity diagnostics were performed on the independent variables, and multiple linear regression modeling was applied to identify the associations between demographic factors and KAP scores.

3 Results and analysis

3.1 Demographic characteristics of respondents As presented in Table 1, the demographic profile of the 217 respondents revealed a marked trend toward population aging, with individuals aged 50 years and above constituting 58.52% of the total sample. In terms of educational attainment, 57.56% of respondents had completed education below the junior high school level. Agricultural activities served as the primary household income source for 56.22% of respondents. Regarding annual household income, 70.97% of respondents reported earnings exceeding 100 000 yuan, whereas only 5.07% reported annual household incomes below 50 000 yuan.

3.2 KAP scores of respondents regarding biodiversity conservation As presented in Table 2, the mean scores for the 217 respondents across the three KAP dimensions were as follows: knowledge (2.72 ± 0.16) points, attitude (3.69 ± 0.21) points,

and practice (3.10 ± 0.41) points, yielding an overall mean KAP score of (3.17 ± 0.58) points. According to the predefined scoring intervals, knowledge and practice fell within the moderate range, whereas attitude attained a high level. In particular, the knowledge dimension registered the lowest mean score among the three components, while attitude exhibited the highest.

Table 1 Demographic characteristics of survey respondents ($n = 217$)

Variable	Category	Frequency	Percentage//%
Gender	Male	113	52.07
	Female	104	47.93
Age group (years)	18 – 20	4	1.84
	21 – 29	23	10.60
	30 – 49	63	29.03
	50 – 65	102	47.00
	> 65	25	11.52
Educational attainment	Illiterate	45	20.74
	Primary school	52	23.96
	Junior high school	93	42.86
	Senior high school	22	10.14
	College degree or above	5	2.30
Occupational category	Agritourism operation	56	25.81
	Farming	122	56.22
	Wage employment	24	11.06
	Other	15	6.91
Annual household income	< 5.0	11	5.07
	5.0 – 10.0	52	23.96
	> 10.0	154	70.97

Table 2 KAP scores of respondents regarding biodiversity conservation ($n = 217$)

Dimension	Mean	Variance	Level
Knowledge (K)	2.72	0.16	Moderate
Attitude (A)	3.69	0.21	High
Practice (P)	3.10	0.41	Moderate
KAP	3.17	0.58	Moderate

3.3 Correlation and regression analyses of KAP dimensions Pearson correlation analysis was conducted to examine the interrelationships among the three KAP dimensions. The results revealed statistically significant positive correlations between knowledge and attitude ($r = 0.378$), attitude and practice ($r = 0.433$), and knowledge and practice ($r = 0.403$), all at the $p < 0.01$ level. To further elucidate the factors influencing each KAP dimension, multiple linear regression analysis was performed, with knowledge, attitude, and practice scores as the dependent variables, and gender, age, educational attainment, occupational category, and annual household income as the independent variables. The regression results are summarized in Table 3. Educational attainment ($\beta = 0.37$, $p < 0.01$) and occupational category ($\beta = 0.14$, $p < 0.05$) emerged as significant determinants of knowledge scores. Attitude scores were significantly influenced by age ($\beta = -0.09$, $P < 0.05$) and educational attainment ($\beta = 0.35$, $p < 0.01$). Notably, educational attainment ($\beta = 0.47$, $p < 0.01$) was identified as the sole significant predictor of practice scores.

Table 3 Multiple linear regression analysis of factors influencing KAP dimensions regarding biodiversity conservation among community residents

Dimension	Independent variable	<i>B</i>	<i>SE</i>	β	<i>t</i>	<i>p</i>
Knowledge (K)	Gender	-0.07	0.09	-0.05	-0.73	0.47
	Age	-0.04	0.05	-0.05	-0.80	0.43
	Educational attainment	0.27	0.05	0.37	5.75	<0.01 **
	Occupational category	0.13	0.06	0.14	2.29	0.02 *
	Annual household income	0.16	0.09	0.12	1.87	0.06
Attitude (A)	Gender	0.09	0.08	0.07	1.13	0.26
	Age	-0.09	0.04	-0.13	-2.11	0.04 *
	Educational attainment	0.23	0.04	0.35	5.74	<0.01 **
	Occupational category	0.05	0.05	0.07	1.13	0.26
	Annual household income	0.28	0.07	0.24	3.86	<0.01 **
Practice (P)	Gender	-0.15	0.10	-0.09	-1.55	0.12
	Age	-0.06	0.06	-0.06	-1.07	0.29
	Educational attainment	0.40	0.05	0.47	7.69	<0.01 **
	Occupational category	0.06	0.06	0.06	0.95	0.34
	Annual household income	0.17	0.09	0.12	1.86	0.03 *

NOTE * $p < 0.05$; ** $p < 0.01$.

4 Conclusions and recommendations

This study investigated the current status of KAP regarding biodiversity conservation among communities adjacent to the Qingliangfeng National Nature Reserve, and identified the principal socio-demographic factors influencing each dimension. The findings are intended to provide a scientific basis for the formulation of evidence-based conservation strategies and management interventions that reconcile biodiversity protection with community livelihood enhancement within protected area systems. The mean scores for knowledge, attitude, and practice were (2.72 ± 0.16) , (3.69 ± 0.21) , and (3.10 ± 0.41) points, respectively. Knowledge and practice fell within the moderate range, whereas attitude attained a high level. Significant positive correlations were observed among all three KAP dimensions. Multiple linear regression analysis revealed that occupational category exerted an independent influence on knowledge and attitude scores, while age independently affected attitude scores ($p < 0.05$). Educational attainment emerged as a shared independent determinant across all three KAP dimensions, and annual household income independently influenced practice scores.

Based on these empirical findings, the following recommendations are proposed. First, diversified outreach initiatives employing both new media and conventional communication channels should be implemented to deliver regular, audience-tailored educational programs on biodiversity conservation, thereby enhancing community awareness and fostering pro-environmental attitudes. Second, in light of the natural resources surrounding the reserve, careful coordination between ecotourism development and conservation objectives should be pursued to ensure mutual compatibility. Third, for specialty agricultural products cultivated in the region, the adoption of eco-friendly green production practices should be promoted, with the aim of increasing product value-added while minimizing adverse environmental impacts. Collectively, these measures are expected to contribute to the synergistic ad-

vancement of biodiversity conservation and sustainable community development.

References

- [1] Srivathsa A, Vasudev D, Nair T, *et al.* Prioritizing India's landscapes for biodiversity, ecosystem services and human well-being[J]. *Nature Sustainability*, 2023, 6: 568–577.
- [2] Hua T, Zhao W, Cherubini F, *et al.* Upgrading protected areas can improve or reverse the decline in conservation effectiveness: Evidence from the Tibetan Plateau, China[J]. *Science of the Total Environment*, 2023, 873: 162345.
- [3] Chen G, Zhang R, Guo X, *et al.* Comparative evaluation on municipal sewage sludge utilization processes for sustainable management in Tibet [J]. *Science of the Total Environment*. 2021, 765: 142676.
- [4] NYHUS P J. Human_wildlife conflict and coexistence[J]. *Annual Review of Environment and Resources*, 2016, 41: 143–171.
- [5] Deng H, Chen Z, Cao H, *et al.* Perceptions and attitudes of local residents on a nature reserve: A case study in Baimaxueshan National Nature Reserve[J]. *International Journal of Sustainable Development & World Ecology*, 2014, 22(2):165–170.
- [6] Ibrahim MSN, Assim MISA, Johari S, *et al.* Public awareness on biodiversity conservation and well-being: Case of Gunung Mulu National Park, Sarawak[J]. *GeoJournal*, 2023, 88: 3471–3496.
- [7] AERTS C, REVILLA M, DUVAL L, *et al.* Understanding the role of disease knowledge and risk perception in shaping preventive behavior for selected vector-borne diseases in Guyana [J]. *PLoS Neglected Tropical Diseases*, 2020, 14: e0008149.
- [8] MUMENA W A. Maternal knowledge, attitude and practices toward free sugar and the associations with free sugar intake in children[J]. *Nutrients*, 2021, 13: 403.
- [9] WANG K, ZHANG L. The impact of ecological civilization theory on university students' pro-environmental behavior: An application of knowledge-attitude-practice theoretical model [J]. *Frontiers in Psychology*, 2021, 12: 681409.
- [10] SARKIS, AM. A comparative study of theoretical behavior change models predicting empirical evidence for residential energy conservation behaviours[J]. *Journal of Cleaner Production*, 2017, 141: 526–537.