PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 22 ISSUE 6 (2024), Page 276 – 289

REGRESSION ANALYSIS ON THE RELATIONSHIP OF LOCAL COMMUNITY ATTITUDE AND INTENTION TOWARDS MANGROVE CONSERVATION

Nurul Asyqin Ramli[1], Gobi Krishna A/L Sinniah[2], AK Mohd Rafiq AK Matusin[3], Li Xiangyu[4]

[1,2,3,4]*Faculty of Built Environment and Surveying,*
UNIVERSITI TEKNOLOGI MALAYSIA

Abstract

Mangrove forests are among the most productive environments. It also provides another valuable service as part of the Blue Carbon Initiative. It focuses on carbon in coastal ecosystems as a possible solution to global climate change. Nonetheless, mangrove degradation remains a significant environmental issue. Estimated 147,771 km of mangroves in 2020, around half the total loss of mangrove area between 2000 and 2020 (6,769 km). The local community is integral to conservation efforts, as evidenced by all legislation and regulations to reduce mangrove damage. The attitude and desire toward mangrove protection are critical for long-term management and preservation. This study examines the relationship between local community attitudes and mangrove conservation intentions. Questionnaires were distributed to the 217 respondents living near mangrove forests in Kuala Selangor. Descriptive, Pearson correlations and regression analyses were used to show how attitude affects local community intention to conserve mangroves. This study found that local community attitudes positively and significantly affected the intentions to conserve mangroves ($r=0.764$, $p<0.01$). A positive attitude will result in a positive intention for conservation. Significantly, this study can serve as a guideline for fostering a good attitude and awareness of mangrove conservation within the local community. Minimal contact with the local community resulted in limited participation in mangrove conservation initiatives. In summary, strong local support for sustainable mangrove forest management can be fostered when a positive relationship exists between attitudes and intentions toward mangrove conservation.

***Keywords*:** Community-Based Management, Mangrove Conservation, Environmental Psychology, Attitude, Intention

[2] Corresponding Author: sgobi@utm.my

INTRODUCTION

Mangroves are a vital part of the blue carbon ecosystem, offering significant potential to combat climate change. Research by Taillardat, Friess, and Lupascu (2018) and Alongi (2020) confirms that mangroves are the most effective ecosystems for carbon sequestration, especially in countries with extensive coastlines. With the highest carbon densities in both above-ground and below-ground biomass, mangrove forests are essential for conservation, restoration, and sustainable management to enhance carbon storage and mitigate climate change (Kauffman et al., 2020; Hagger et al., 2022; Richards et al., 2020).

Protecting mangrove biodiversity strengthens their role as carbon sinks, provides natural defenses against storms and monsoons, prevents soil erosion, and serves as a barrier against rising sea levels (Rahman et al., 2021; Sandilyan, 2012). Mangroves also deliver flood protection benefits, regulating water flow and protecting an estimated 15 million people worldwide each year (Menéndez et al., 2020). Beyond environmental benefits, they support local economies by providing forestry and fishing resources, contributing to sustainable livelihoods.

The importance of mangrove ecosystems is often undervalued, and public awareness remains low, posing a significant risk to their survival. According to the New State of the World's Mangroves Report 2024, Southeast Asia hosts one-third of the world's mangroves and the most diverse mangrove forests globally, covering approximately 50,000 km² and containing over 50 species. However, this region also suffers from some of the most severe rates of mangrove degradation (Spalding & Leal, 2021; Bhowmik et al., 2022). Studies on deforestation in Southeast Asia reveal that aquaculture followed by natural retraction and oil palm, are the primary threats to mangrove conservation (Spalding, M.D., & Leal, M.,2024) **(Figure 1).**

© 2024 by MIP

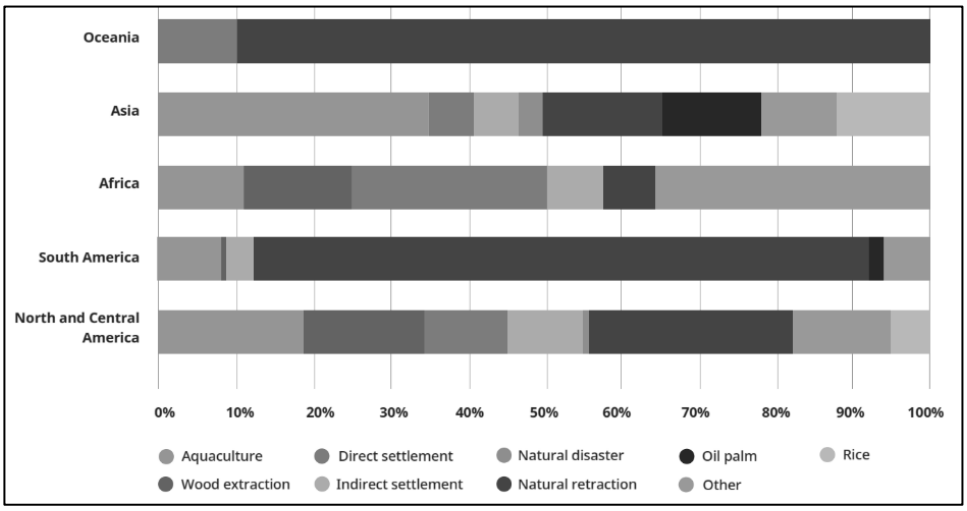

Figure 1: Composition of Drives of Mangrove Loss, by Region, 2000-2020
Source: Food and Agriculture Organization of the United Nation (FAO), 2023

Significant efforts and commitments have been made to ensure the effective management of mangrove ecosystems through policies and conservation programs, with mangrove forests being a national conservation priority in several countries, including Malaysia. The Malaysian government, for example, has committed to conserving mangroves as part of its national climate action and biodiversity strategies through the National Mangrove Replanting Program. Additionally, new community conservation strategies have developed over the past two decades. A community-based mangrove management approach has been introduced to strengthen local capacity for mangrove management (Gevana et al., 2018).

The local community plays an essential role in conservation efforts, making it important to assess the effectiveness of community-based conservation. Initiatives such as community education and tree-planting programs are being implemented to restore damaged mangrove areas (Tavita & Amir, 2023). Understanding community attitudes can make management efforts more effective and may further improve these attitudes (Allendorf et al., 2006; Sarker & Roskaft, 2011). According to Schultz et al. (2004), environmental attitude is the "collection of beliefs" that shapes a person's behavioural intentions toward environmentally related actions or situations.

This paper aims to explore the relationship between local community attitudes and intentions toward mangrove conservation. It seeks to raise awareness, foster connections between stakeholders and the local community for effective information sharing and create additional impacts on mangrove

conservation management. The insights gained from this study will help shape initiatives and interventions for conserving mangroves.

LITERATURE REVIEW

Theoretical Framework

Community-Based Conservation (CBC) is a widely adopted approach for mangrove protection. Many Southeast Asian countries, such as Malaysia, the Philippines, and Indonesia, have applied this model under various terms, including Community-Based Mangrove Management (CBMM), Community-Based Mangrove Rehabilitation (CBMR) (Datta et al., 2012), and Community-Based Natural Resources Management (CBNRM) (On-Prom, 2014). CBC operates on three fundamental theoretical frameworks: ecological, institutional, and psychological (Baral & Stern, 2011). Understanding and evaluating local community behaviour forms a critical part of the psychological dimension within CBC.

Conservation psychology plays an essential role in examining attitudes and how they shape conservation policies and practices (A. Fernandez-Llamazares, 2020). Social psychology, the scientific study of human behaviour, provides valuable insights here. The most frequently applied model for behavioural studies is the Theory of Planned Behaviour (TPB), which evolved from the Theory of Reasoned Action (TRA), developed by Martin Fishbein and Icek Ajzen in 1980 to predict human intention, leading to specific actions in particular contexts (Fishbein & Ajzen, 1975; Ajzen & Madden, 1986; Ajzen, 1991). The Theory of Reasoned Action evaluates attitudes and subjective norms related to intention and how these are linked to actual behaviour (Ajzen, 1980) **(Figure 2)**. This framework supports a hypothesis suggesting that positive attitudes significantly influence conservation behaviour in mangrove ecosystems.

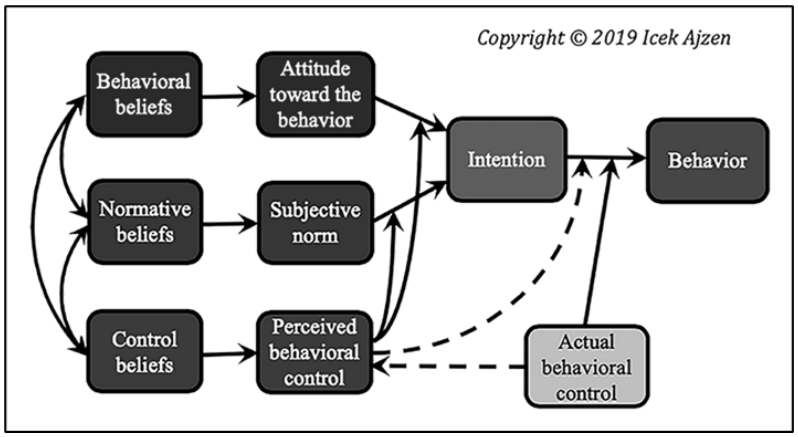

Figure 2: Theory of Planned Behaviour Diagram

© 2024 by MIP

Attitude towards Mangrove Conservation

In conservation psychology research, attitudes are commonly used as psychological indicators of program effectiveness. However, a key limitation of this approach is that attitudes do not always translate into behaviour, which may lead to an inaccurate assessment of a program's impact. Given that understanding and influencing human behaviour is crucial to achieving conservation goals, we propose that behaviour, rather than opinions, should be the basis for predicting conservation outcomes. Psychological theory distinguishes between behaviours and attitudes while acknowledging their interconnection. Strong attitudes, especially those formed through direct experience and closely related to specific behaviours, are more likely to exhibit a consistent link between attitude and action (Ajzen, 1991).

Measuring conservation behaviours involves defining the target behaviour(s), identifying the optimal timing for assessment, and selecting the most suitable measurement method—whether direct observation, objective indicators, self-reported behaviour, or behavioural intentions—by considering each approach's strengths and limitations (Nilsson et al., 2020). Research on the impact of human values on attitudes and behaviours toward forest conservation in Sub-Saharan Africa found that anthropocentric and relational value orientations were predominant. These value orientations shaped both positive and negative attitudes and behaviours toward forest conservation. Positive outcomes included utilitarian motivations and cultural beliefs, such as community support for conservation, adherence to forest norms, sustainable forest use, and active involvement in forest management. Notably, positive influences on behaviour appeared to outweigh negative ones (Ihemezie et al., 2021).

Behavioural Intention on Mangrove Conservation

A person's intention toward conservation is described as the determination and readiness to engage in pro-environmental behaviour, shaped by three factors: personal attitudes, perceived behavioural control, and social norms (Bamberg & Moser, 2007; Ajzen, 1991). In the Theory of Planned Behaviour, intention is a direct precursor to behaviour, with positive intentions generally leading to positive actions.

Awareness of environmental issues is closely linked to intent. Villagers are aware of the mangrove degradation problem in their region; however, there is a lack of consistent conservation programs that actively involve the local community. Programs that have taken place tend to be isolated events involving specific organizations, such as school initiatives or tree-planting activities organized by government bodies. Villagers have limited opportunities to participate, and there is insufficient funding or expertise to establish their own conservation and monitoring programs. Additionally, villagers must obtain

approval for any mangrove rehabilitation efforts, which influences their attitudes toward participating in conservation programs. Effective management of community-based conservation is essential to foster engagement and support among the local community.

RESEARCH METHODOLOGY

Description of Study Area

Urbanization has degraded forestland and disrupted ecological networks and biodiversity in Kuala Selangor (Ma, T.Z. et al., 2024). Urban expansion, conservation efforts, and community involvement all influence the state of mangroves in Kuala Selangor. Rapid urban growth has driven significant land use changes, including habitat fragmentation and a reduction in mangrove areas (Ma, T.Z. et al., 2024). Nonetheless, efforts are underway to restore and protect mangrove ecosystems, underscoring their ecological and economic importance (Tavita & Amir, 2023).

Community participation in conservation activities has been notably enthusiastic, reflecting a positive trend toward mangrove preservation. Despite these efforts, urban pressures and land use changes continue to impact Kuala Selangor's mangrove habitats, emphasizing the need for sustainable conservation policies.

The study's respondents were local community residing near mangrove forests, primarily from coastal fishing villages. The research area is located in Kuala Selangor, situated in the western part of Selangor, along the Selangor River estuary. This region has one of the densest mangrove forests in Kuala Selangor, including the well-known Kuala Selangor Nature Park, or Taman Alam Kuala Selangor. Located near the Selangor River's mouth, the park spans roughly 800 hectares, with 95 hectares dedicated to mangrove swamp forest, making it a popular eco-tourism site. It serves as an ideal location to learn about mangrove ecosystems and has hosted numerous mangrove rehabilitation programs. However, mangrove coverage has declined significantly in the area, from 24.29 percent in 1989 to 15.57 percent in 2008 and further down to 13.12 percent in 2021, as shown by Sayad Romli et al. (2021).

The research area includes Kg. Tg. Keramat and Kg. Sungai Yu, coastal villages near the mangrove forest, which heavily depend on mangroves for resources like food. Given the extensive mangrove swamp forest in this part of Peninsular Malaysia, the local community plays a crucial role in conservation efforts, particularly in Taman Alam, Kuala Selangor. **Figure 3** shows an image of mangrove degradation in Kuala Selangor, located near the study area.

© 2024 by MIP

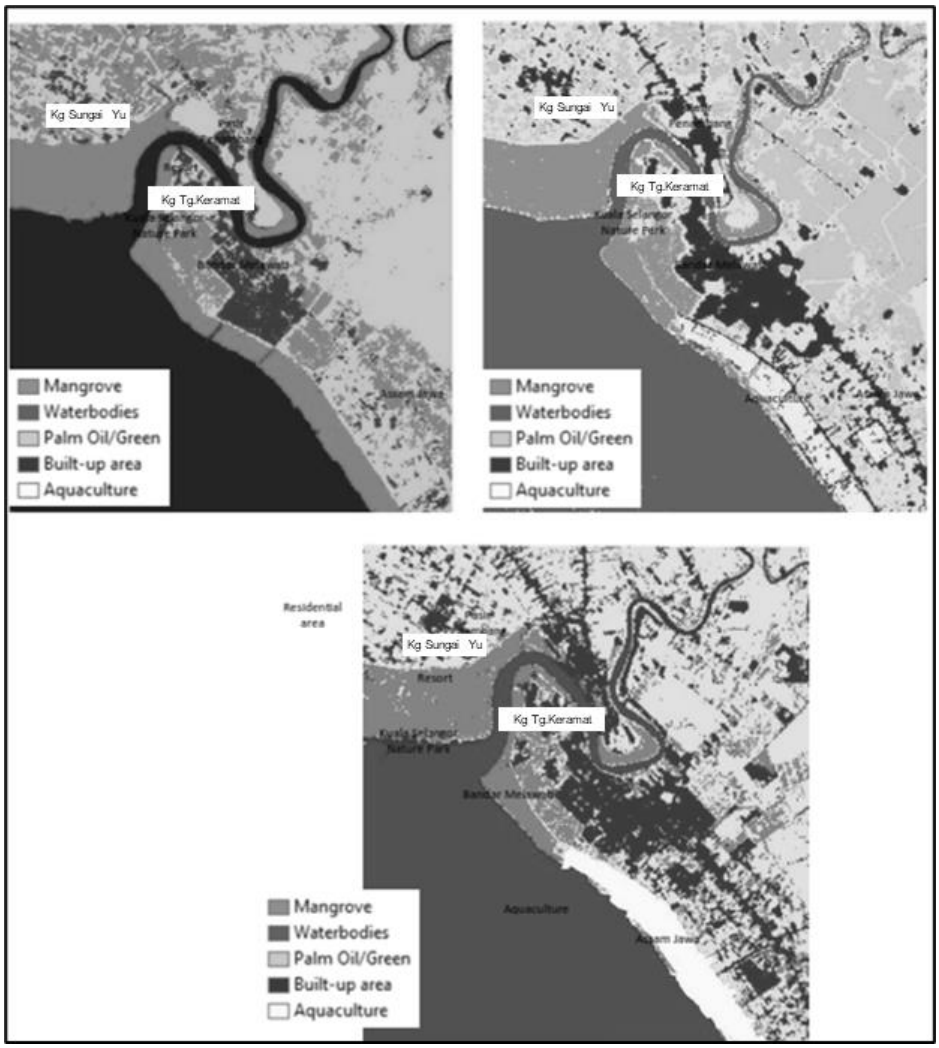

Figure 3: Image for Landsat 8 in 1989 (left), 2008 (right) and 2021 (below)
Source: Romli et al. (2021)

Data Collection and Analysis

This study examines local community intentions and attitudes toward mangrove forest conservation. Structured interviews were conducted with 217 respondents selected through simple random sampling, achieving a 90% confidence level and a 5% margin of error from a total population of 1,065. The questionnaire included both open-ended and closed-ended questions, with each item designed based on prior research and adapted to local conditions. Respondents selected the response category that best reflected their view on the closed-ended questions, which

utilized a Likert scale ranging from strongly disagree, disagree, neutral/no opinion, agree, to strongly agree. The Likert scale approach is commonly used to gauge sensitivity and assess attitude levels (Secor, 2010).

Pearson correlation and regression analysis was conducted to examine the relationship between attitude and intention toward mangrove conservation. A Pearson correlation analysis was conducted, where $r>0.5$ indicates a relationship and $r>0.7$ reflects a strong relationship between two continuous variables (Evans, 1996). A regression analysis was then performed to examine the relationship between attitude and intention toward mangrove conservation. To assess the strength and direction between these variables and to understand how changes in one variable affect the other. According to established guidelines, a P-value of $P< 0.01$ provides strong evidence of significance (Cohen, 1992). Assumptions of normality, linearity, homoscedasticity, and independence of residuals were verified, confirming that the residuals are normally distributed (Tabachnick & Fidell, 1996). Assumptions of normality, linearity, homoscedasticity, and independence of residuals were tested, showing that residuals are normally distributed (Tabachnick & Fidell, 1996). Descriptive statistics were used to analyse respondents' socio-economic and demographic characteristics within the study area.

Two hypotheses were developed for this study:

- H_0: There is no relationship between Attitude and Intention ($\beta 1 = 0$).
- H_1: There is a relationship between Attitude and Intention ($\beta 1 \neq 0$).

ANALYSIS AND DISCUSSION

Characteristics of Respondents

Table 1: Socio-demographic characteristics

Socio-Economic Variables	
Gender	
Female	35%
Male	65%
Age	
18-29	34.5%
30-39	19%
40-49	27.5%
50-59	15%
>50	4%
Length of stay	
<5 years	10.5%
5-9 years	0.5%

© 2024 by MIP

Socio-Economic Variables	
10-14 years	10%
15-20 years	13.5%
>21 years	65.5%
Education level	
No School	3%
Elementary	10.5%
Secondary	55.5%
College	22%
University	9%
The Main Occupation	
Government sector	9%
Private sector	23%
Self-employed	47%
Unemployed	21%

Table 1 summarizes the socio-economic characteristics of the sample. Most respondents are male, accounting for 65% of the total. The largest age group is 18-29, representing 34.5% of respondents, followed by the 40-49 age group at 27.5%. A majority, 65.5%, are over 21 years old and are part of the local population, while 10.5% have relocated from other areas and have lived in the community for less than five years.

Regarding education, a substantial portion of respondents (55.5%) have completed secondary school. Only a small percentage, 3%, have no formal education, while 22% hold a college degree, indicating an overall moderate to high education level among respondents.

The primary occupations of the respondents include self-employment roles, such as fishermen, farmers, and small business owners. Government sector employment is minimal, comprising just 9% of the sample.

Factor Analysis

Table 2: Descriptive statistics for the items of Intention

		Mean	SD
1	I am willing to participate in a mangrove conservation program.	3.27	1.120
2	I am willing to monitor mangrove rehabilitation projects.	3.23	1.071
3	I am committed to participating in mangrove conservation over the long term.	3.37	1.082
4	I am willing to discuss the mangrove conservation program with other community members.	3.56	1.017
5	I am willing to volunteer my time for mangrove conservation without pay.	3.18	1.147
6	I am willing to share my knowledge and skills in mangrove rehabilitation.	3.58	1.108
7	I am prepared to dedicate my time to the mangrove rehabilitation program.	3.42	1.065
8	I am willing to contribute manpower to ensure the program's future success.	3.45	1.142

Table 3: Descriptive statistics for the items of Attitude

		Mean	SD
1	Conserving mangroves means ensuring my activities are environmentally friendly and do not contribute to global warming.	3.68	1.061
2	Mangrove conservation involves dedicating my time to volunteer work.	3.33	1.031
3	I am interested in participating in any mangrove conservation program.	3.51	.996
4	I believe my time will be well-spent in any mangrove conservation program.	3.50	1.147
5	My involvement in a mangrove conservation program will help reduce the rate of mangrove degradation.	3.52	1.167
6	Participating in mangrove conservation programs will support the project's long-term success.	3.77	1.041
7	I believe I play an important role in mangrove conservation.	3.49	1.093
8	I agree that the role of mangrove forests is vital, and conservation efforts should be taken seriously.	4.19	.962

Table 4: KMO and Bartlett's Test

Variables	**KMO**	**Bartlett's**
Atitude	0.839	0.000
Intention	0.927	0.000

© 2024 by MIP

This study employed the KMO and Bartlett's Test to assess sampling adequacy. Kaiser (1974) recommended a minimum acceptable KMO value of 0.5 and a significance level below 0.05. As shown in **Table 4**, the KMO values for both variables, Attitude and Intention, exceed 0.5, with a p-value of 0.000. This indicates that the relationships among the variables are strong enough to proceed with reliable factor identification.

Attitude Towards Mangrove Forest Conservation Intention

Table 5. Pearson Correlations

Intention	Pearson Correlation	1	.764
	Sig. (2-tailed)		.000
	N	217	217
Attitude	Pearson Correlation	.764	1
	Sig. (2-tailed)	.000	
	N	217	217

** Correlation is significant at the 0.01 level (2-tailed)

Table 6. Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients		
		ß	Std. Error	Beta	t	Sig.
1	Constant	.065	0.195		0.333	.739
	Attitude	.916	0.053	.764	17.377	.000

Dependent Variable: Intention

Pearson correlation and regression analyses were conducted to examine the relationship between attitude and intention toward conservation. As shown in **Table 5**, there is a statistically significant positive correlation (r=0.764, p = 0.01), indicating that more positive attitudes are closely associated with higher intentions. In **Table 6**, a linear regression was calculated to predict intention based on respondents' attitudes. Respondents predicted intention is equal to 0.065 +0.916 (attitude). This result shows that respondents' intention increases by 0.916 for each unit increase in attitude, confirming that attitude significantly predicts intention toward mangrove conservation.

According to these results, attitude is significantly associated with intention toward mangrove conservation, with a p-value of 0.000. The analysis also found that attitude is a key factor influencing conservation intentions, with a standardized coefficient of β=0.764, indicating a strong predictive relationship (β>0.6). The positive and substantial impact of attitude on intention is statistically significant (p = 0.000), reinforcing the idea that improvements in attitude would likely enhance conservation intentions.

CONCLUSION

The study rejects the null hypothesis, revealing that positive attitudes among local people lead to positive intentions toward mangrove conservation. Local communities show strong concern for preserving their natural habitat, with attitudes shaped by their close connection to and dependence on it. They recognize the indirect benefits, such as coastal protection as a natural barrier against storms, hurricanes, and tidal surges, as well as the safeguarding of marine species and enhanced fishery productivity. To ensure effective conservation, local communities must be empowered. Enforcement efforts should be strengthened through community involvement, with support provided to village leaders in managing local resources. Empowered communities are more likely to adopt sustainable development practices and should be incentivized to protect their natural resources for future generations. This approach fosters a positive attitude, a crucial factor influencing mangrove conservation behaviour. These findings have implications for conservation program design and implementation, underscoring the importance of building conservation awareness within the community.

DISCLOSURE STATEMENT

The article represents original work, that has not been published or under consideration for publication elsewhere. There are no financial conflicts of interest to disclose.

REFERENCES

Ajzen, I. & Fishbein, M. (1980). Understanding attitudes and predicting social behavior. Englewood Cliffs, NJ: Prentice-Hall.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211.

Ajzen, I., & Fishbein, M. (1975). A Bayesian analysis of attribution processes. *Psychological bulletin*, *82*(2), 261.

Alongi, D. M. (2020). The global significance of mangrove blue carbon in climate change mitigation. *Sci*, *2*(3), 67.

Bamberg, S., & Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology*, *27*(1), 14-25.

Baral, N., & Stern, M. J. (2011). A comparative study of two community-based conservation models in Nepal. *Biodiversity and Conservation*, *20*, 2407-2426.

Bhowmik, A. K., Padmanaban, R., Cabral, P., & Romeiras, M. M. (2022). Global mangrove deforestation and its interacting social-ecological drivers: A systematic review and synthesis. *Sustainability*, *14*(8), 4433.

Chidakel, A. (2011). Conservation Attitudes and Community-Based Natural Resource Management in an Understocked Game Management Area of Zambia.

 © 2024 by MIP

Daniel C.D, Kauffman J.B, Murdiyarso D, Kurnianto S, Stidham M and Kanninen M 2011. Mangroves are Among the Most Carbon-Rich Forests in The Tropics. Nature Geoscience Letters, NGEO1123. p 5

Datta, D., Chattopadhyay, R. N., & Guha, P. (2012). Community-based mangrove management: A review on Status and Sustainability. *Journal of Environmental Management*, *107*, 84-95.

Evans, J. D. (1996). *Straightforward Statistics for the Behavioral sciences*. Thomson Brooks/Cole Publishing Co.

Fauzi, A. I., Sakti, A. D., Yayusman, L. F., Harto, A. B., Prasetyo, L. B., Irawan, B., & Wikantika, K. (2018, October). Evaluating Mangrove Forest Deforestation Causes in Southeast Asia by Analyzing Recent Environment and Socio-Economic Data Products. In *Proceedings Asian Conference on Remote Sensing 2018* (Vol. 2, pp. 880-889).

Fernández-Llamazares, Á., Garteizgogeascoa, M., Basu, N., Brondizio, E. S., Cabeza, M., Martínez-Alier, J., & Reyes-García, V. (2020). A state-of-the-art review of indigenous peoples and environmental pollution. *Integrated Environmental Assessment and Management*, *16*(3), 324-341.

Gevaña, D. T., Camacho, L. D., & Pulhin, J. M. (2018). Conserving mangroves for their blue carbon: Insights and prospects for community-based mangrove management in Southeast Asia. *Threats to Mangrove Forests: Hazards, Vulnerability, and Management*, 579-588.

Ihemezie, E. J., Nawrath, M., Strauß, L., Stringer, L. C., & Dallimer, M. (2021). The influence of human values on attitudes and behaviours towards forest conservation. *Journal of Environmental Management*, *292*, 112857.

Ma, T. Z., Teh, B. T., & Kho, M. Y. (2024). Land use change and Ecological Network in rapid urban growth region in Selangor region, Malaysia. *Scientific Reports*, *14*(1), 16470.

Nilsson, D., Fielding, K., & Dean, A. J. (2020). Achieving conservation impact by shifting focus from human attitudes to behaviors. *Conservation Biology*, *34*(1), 93-102.

On-prom, S. (2014). Community-based mangrove forest management in Thailand: key lesson learned for environmental risk management. *Sustainable Living with Environmental Risks*, 87-96.

Rahman, M.M., Zimmer, M., Ahmed, I., Donato, D., Kanzaki, M., & Xu, M. (2021). Co-benefits of protecting mangroves for biodiversity conservation and carbon storage. *Nature Communications*, *12*(1), 1-9

Sandilyan, S., & Kathiresan, K. (2012). Mangrove conservation: a global perspective. *Biodiversity and Conservation*, *21*, 3523-3542.

Sayad Romli, S. M. I., Ibrahim, I., Asmawi, M., & Abu Samah, A. (2021). Application of remote sensing in mangroves at the surrounding of Sungai Selangor Estuary in Kuala Selangor. *Built Environment Journal*, *18*(2), 38-46.

Schultz, P. W., Shriver, C., Tabanico, J. J., & Khazian, A. M. (2004). Implicit connections with nature. *Journal of environmental psychology*, *24*(1), 31-42.

Secor, A. J. (2010). Social surveys, interviews, and focus groups. *Research methods in geography: A critical introduction*, *6*, 194-205.

Spalding, M. D., & Leal, M. The State of the World's Mangroves; Global Mangrove Alliance. 2021.

Tabachnick, B. G., & Fidell, L. S. (1996). Using multivariate statistics. New York, NY: HarperCollins.

Taillardat, P., Friess, D. A., & Lupascu, M. (2018). Mangrove blue carbon strategies for climate change mitigation are most effective at the national scale. *Biology letters*, *14*(10), 20180251.

Tavita, G. E., & Amir, A. (2023). Edukasi Dan Sosialisasi Pelestarian Hutan Mangrove Pada Masyarakat di Wilayah Mangrove Kuala, Kabupaten Mempawah. Jurnal PKM Bina Bahari, 2(2), 14–21.

Ward, R. D., Friess, D. A., Day, R. H., & Mackenzie, R. A. (2016). Impacts of Climate Change On Mangrove Ecosystems: A Region-By-Region Overview. *Ecosystem Health and sustainability*, *2*(4), e01211.

Worthington, T., & Spalding, M. (2018). Mangrove Restoration Potential: A global map highlighting a critical opportunity.

Kauffman, J. B., Adame, M. F., Arifanti, V. B., Schile-Beers, L. M., Bernardino, A. F., Bhomia, R. K., ... & Hernández Trejo, H. (2020). Total ecosystem carbon stocks of mangroves across broad global environmental and physical gradients. *Ecological Monographs*, *90*(2), e01405.

Hagger, M. S., Cheung, M. W. L., Ajzen, I., & Hamilton, K. (2022). Perceived behavioral control moderating effects in the theory of planned behavior: A meta-analysis. *Health Psychology*, *41*(2), 155.

Richards, D. R., Belcher, R. N., Carrasco, L. R., Edwards, P. J., Fatichi, S., Hamel, P., ... & Stanley, M. C. (2022). Global variation in contributions to human well-being from urban vegetation ecosystem services. *One Earth*, *5*(5), 522-533.

Spalding, M. D., & Leal, M. (2024). The State of the World's Mangroves 2024.

Sayad Romli, S. M. I., Ibrahim, I., Asmawi, M., & Abu Samah, A. (2021). Application of remote sensing in mangroves at the surrounding of Sungai Selangor Estuary in Kuala Selangor. *Built Environment Journal*, *18*(2), 38-46.

Received: 11th June 2024. Accepted: 17th October 2024

© 2024 by MIP