Journal of Tourism, Hospitality and Environment Management
JTHEM
EISSN: 0128-178X
Volume 9 Issue 36 (June 2024) PP. 125-134
DOI 10/35631/JTHEM.936010

JOURNAL OF TOURISM, HOSPITALITY AND ENVIRONMENT MANAGEMENT (JTHEM)
www.jthem.com

ENHANCING COMMUNITY ENGAGEMENT FOR CONSERVATION AND REHABILITATION THROUGH A CASE STUDY IN SUNGAI JERNIH GEO PARK PERLIS

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Article Info:

Article history:
Received date: 18.04.2024
Revised date: 13.05.2024
Accepted date: 15.06.2024
Published date: 30.06.2024

To cite this document:

Kassim, S. A., Noor, N. M., Nazri, R., Ahmad, Z., Fuad, N., & Azizan, F. L. (2024). Enhancing Community Engagement for Conservation and Rehabilitation Through a Case Study in Sungai Jernih, Geo Park Perlis. *Journal of Tourism Hospitality and Environment Management, 9* (36), 125-134.

Abstract:

This study underscores the pivotal role of community awareness, knowledge, effectiveness, and engagement in driving successful environmental conservation efforts, with a specific focus on Sungai Bukit Jernih Geo Park, Perlis and its surrounding ecosystems. By fostering a deeper understanding of environmental issues and promoting collective engagement, communities can significantly contribute to the preservation and revitalization of fragile ecosystems like Sungai Bukit Jernih. Through a combination of surveys, interviews, and on-site inspections, a comprehensive examination of the situation was conducted. The findings indicate a noteworthy enhancement in the Sungai Jernih community's understanding of the geopark's challenges. This underscores the transformative potential of community involvement in environmental preservation.

Keywords:

Community Engagement, Conservation, Rehabilitation, Sustainable Practices

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Introduction

In Malaysia, rivers and streams play a crucial role, supplying approximately 97% of the nation's water needs. River water serves as a crucial resource, providing essential support for drinking water supply, hydropower generation, agriculture, industrial activities, livestock production, and various other economic sectors. (Efendi H, 2016). However, the quality of Malaysia's rivers remains a concern, particularly those flowing through densely populated urban areas.

The water quality of rivers can be significantly impacted by environmental pollution resulting from human activities. These activities include industrial, municipal, and agricultural production and waste disposal, animal husbandry, mining, sedimentation, and soil erosion due to rapid land use changes (Uddin MG, Nash S, Olbert AI, 2021). Additionally, the introduction of heavy metals into the water bodies further degrades water quality. Furthermore, urbanization within community areas has led to the conversion of vegetated spaces into impervious surfaces, including parking lots, roads, and rooftops (Mangangka, 2013).

Among these impacted water sources are the Perlis River and Sungai Jernih. Sungai Bukit Jernih, a watercourse nestled in Perlis, Malaysia, holds profound significance as it intertwines with the fate of the local community. Urgent conservation efforts are imperative for Sungai Bukit Jernih due to the looming threats of pollution, habitat destruction, and deteriorating water quality.

Water quality monitoring is a critical measure for managing this valuable resource. For instance, integrated river basin management, which encompasses the comprehensive management of water resources, must meet several specified criteria to ensure that the river basin complies with water quality standards. This approach also considers the protection of aquatic ecology and its habitats (Pak HY et al., 2021)

Moreover, Sungai Bukit Jernih boasts numerous notable geological features, including the ancient Chuping Formation limestone, dating back approximately 240 million years, which harbours a diverse array of fossils and trails. As a result of these significant geological attributes, Bukit Jernih Recreation Park has been rightfully designated as one of Malaysia's Geosites.

At Bukit Jernih Recreation Park, visitors are afforded a plethora of recreational opportunities, including hiking along Bukit Jernih, engaging in rock climbing on the hillside, exploring caves, camping, leisurely jogging, picnicking, bathing, and kayaking in Sungai Jernih. However, recent media reports have cast a shadow over the suitability of Sungai Jernih for leisure activities. It is reported that the river's water quality has significantly deteriorated, rendering it unsuitable for recreational purposes. In many rivers, high-density settlements have resulted in pollution, which compromises the ecological functions and services provided by lotic ecosystems (Malmqvist and Rundle, 2002).

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The degradation of Sungai Jernih's water quality can be attributed to various factors, including runoff from agricultural and urban areas carrying excessive amounts of nitrate, oil, and solid waste. Additionally, direct discharges of sewage into water bodies further contribute to the

deterioration of water quality. Agricultural activities, particularly the use of fertilizers and pesticides in fields such as paddy fields, pose significant threats as these contaminants can enter the water through surface runoff.

The presence of these pollutants not only diminishes the aesthetic appeal of Sungai Jernih but also poses potential health risks to individuals engaging in recreational activities. As such, urgent measures are warranted to address the sources of contamination and restore the water quality of Sungai Jernih to a level conducive for leisure activities at Bukit Jernih Recreation Park.

According to Chin and Ng (2015), previous research has highlighted several key challenges in the realm of environmental sustainability, including limited public participation (Chun et al., 2012), negative perceptions towards sustainability efforts, inadequate enforcement mechanisms (Chun et al., 2012), and a lack of structured monitoring approaches for plan implementation (Tan, 2013). Additionally, the occurrence of river surge phenomena poses potential risks and instils fear among visitors at Forest Eco-Parks. Understanding public perceptions of these risks is crucial for agencies to address concerns associated with river surge incidents (Azmi et al., 2022).

In response to these challenges, the " Enhancing Community Engagement for Conservation and Rehabilitation " program is proposed as a collaborative initiative involving governmental entities, environmental organizations, and local communities. This study adopts a comprehensive pre- and post-study methodology to assess the tangible impacts of awareness, knowledge, and experience, as well as the sources of information and effectiveness of community-led initiatives. The ultimate goal is to foster a harmonious relationship between human activities and the fragile ecosystem of Sungai Bukit Jernih.

Through rigorous examination and evaluation, this research endeavours to shed light on the efficacy of community-driven approaches in enhancing environmental sustainability and promoting the resilience of Sungai Bukit Jernih's ecosystem. By addressing the identified challenges and leveraging the collective efforts of various stakeholders, the program seeks to empower communities and facilitate the restoration and revitalization of Sungai Bukit Jernih's natural environment.

Therefore, the efficacy and cost-effectiveness of community-based conservation initiatives in preserving and sustaining river water quality are evident when compared to the costly alternative of mechanical river cleaning methods. This assertion is substantiated by the research conducted by Leng, Weng, and Samat (2020), which emphasizes the pivotal role of community involvement in addressing river water pollution. By actively engaging communities residing near rivers, who possess intimate knowledge of their local environments, early detection and prompt intervention measures can be implemented, thereby mitigating the impacts of pollution more efficiently. Consequently, prioritizing community-based conservation strategies not only harnesses local expertise and resources but also fosters a sense of ownership and responsibility among community members towards safeguarding their natural surroundings. Thus, embracing

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community engagement emerges as a cornerstone in the endeavour to combat river water pollution and ensure the long-term sustainability of freshwater ecosystems.

Literature Review

Awareness, knowledge, and effectiveness are crucial components in the realm of community engagement for environmental conservation efforts, particularly in the context of rivers and water bodies such as Sungai Jernih as shown in Figure 1.

Conservation efforts aimed at rehabilitating large rivers are challenging, given the extensive nature of issues such as conflicting policy directions, substantial data requirements for informed decision-making, and the diverse perspectives, goals, and values of various stakeholders. Nonetheless, once these complex issues are identified and clearly defined, innovative approaches can uncover previously unrecognized opportunities for conservation, rehabilitation, and protection (Skidmore and Wheaton, 2022; Wiley et al., 2013; Wohl et al., 2015)

Community Awareness

Awareness serves as the foundation for fostering community involvement and active participation in environmental conservation efforts (Koh et al., 2017). Studies have underscored the importance of raising awareness among local communities regarding the environmental challenges faced by rivers like Sungai Jernih, including pollution, habitat degradation, and declining water quality (Chin & Ng, 2015). Furthermore, research suggests that heightened awareness can lead to increased public concern and engagement in conservation activities (Tan, 2013).

Community Knowledge

Knowledge acquisition plays a pivotal role in empowering communities to make informed decisions and take effective actions towards environmental conservation (Azmi et al., 2022). Studies have emphasized the need for enhancing community knowledge regarding the ecological significance of Sungai Jernih and the impacts of human activities on its ecosystem (Chun et al., 2012). By providing access to scientific information and educational resources, efforts can be made to bridge the knowledge gap and empower communities to adopt sustainable practices (Koh et al., 2017).

Community Effectiveness

Effectiveness refers to the capacity of community-led initiatives to produce tangible outcomes and achieve desired conservation goals (Chin & Ng, 2015). Research has highlighted the importance of evaluating the effectiveness of conservation interventions in terms of their impact on improving the health and resilience of Sungai Jernih's ecosystem (Tan, 2013). Assessing the effectiveness of community-based approaches involves measuring the extent to which awareness and knowledge translate into meaningful actions and positive outcomes for the river's conservation (Azmi et al., 2022).

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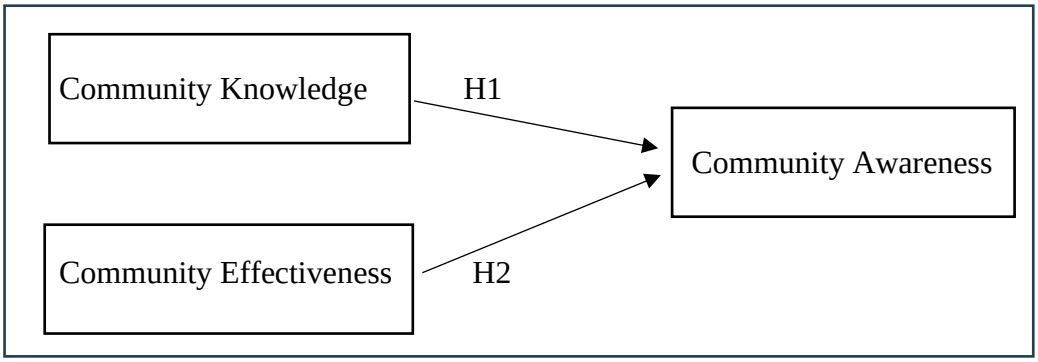

Figure 1: Research Framework

Research Methodology

The research focuses on Sungai Bukit Jernih Recreation Park in Perlis, Malaysia, involving 1,000 communities along the river. The majority of respondents were from this community, from other communities, from the public in Perlis and beyond, as well as from local and foreign visitors to Sungai Jernih Recreation Park. The study's uniqueness lies in its comprehensive pre- and post-study design, allowing a meticulous analysis of changes over time. Through workshops, educational campaigns, and participatory research, the program aims to bring tangible benefits to these communities by fostering environmental awareness and building capacity for sustainable practices. The number of populations is based on community at Sungai Jernih consisting of 1,000 community. The appropriate sample size was 278 respondents involved in this project (Krecjie and Morgan, 1970).

The questionnaire consists of open ended, ordinal scale questionnaire and interview questions. The Research Ethics Committee (REC) has approved the use of this questionnaire. A random sampling of survey questionnaire was generated and disseminated to 278 respondents. The target respondents were categorised into age groups with equal distribution of gender group to gain diverse opinions on river restoration improvement areas. The survey questionnaire aimed to (1) investigates the underlying causes of river pollution, (2) public's awareness, knowledge, knowledge, effectiveness (3) to rehabilitate the river by improving its water quality conditions and its environment as a natural recreation area, (4) to conserve the valuable asset of the river by restoring two native species (udang padang and lampam fish) in the river and (4) the recommended methods to improve community participation in river restoration programmes.

A Cronbach's Alpha coefficient of 0.84 was obtained, to validate the survey questionnaire reliability in the pilot test prior to its distribution and results were analysed using SPSS version 27, Statistical software. The survey was pretested among 30 respondents ranging from community Persatuan Rekreasi Bukit Jernih, community Sungai Jernih and personal contacts of the first author. All respondents were asked to identify confusing concepts or wording and to provide suggestions for alternative wording. Upon their feedback, minor changes were made to the questionnaire. The back-translation method revealed no problems pertaining to the English wording of the questions and suggested consistency of the items across languages.

The pre and post test survey took place at Sungai Jernih Geo Park and included Corporate Social Responsibility (CSR) activities, in Bukit Jernih Recreation Park, Perlis, Malaysia. The Department of Irrigation and Drainage, Perlis, Department of Fishery, Jitra, Kedah, Perlis State

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Forestry Department, and Persatuan Rekreasi Bukit Jernih are among the state agencies that have approved partnership for this program, which is being conducted by a research group from UiTM Perlis branch. The project aimed to help restore and protect the river and its surroundings, including enhancing water quality and preserving Sungai Jernih. It also aimed to restore the river by enhancing its environment as a natural leisure area and its water quality conditions. The CSR endeavour was a component of a larger research study in which UiTM students, the neighbourhood represented by Persatuan Rekreasi Bukit Jernih, the Department of Fishery, Jitra, Kedah, and the Perlis State Forestry Department all actively participated. The main goal of this initiative was to contribute to ecological conservation efforts by repopulating freshwater species that had suffered from habitat loss and water pollution, as well as to protect the natural habitat of recreational areas. The implementation plan involves the many stakeholders stated above and actively involves local people in seminars, educational initiatives, and conservation efforts. Governmental entities support regulations, scientific expertise is provided by environmental organizations, and financial ramifications are addressed using a multifaceted approach.

The initiative's lifeblood—communication and awareness campaigns—serve as a mechanism for ensuring its exposure. A detailed pre- and post-study approach is used in the study to document changes both before and after community-driven initiatives are put into action. In order to raise awareness and carry out conservation and restoration efforts for the Sungai Jernih Recreation Park, the program is one of the stages of research efforts. Participating in this study are six (6) researchers from the UiTM Perlis Branch.

By planting forest trees like Rashtrapati, Meranti Temak, Merawan Siput, and Bunga Tanjung, which are donated by the Perlis State Forestry Department, the program aims to expose the community and students to the process of producing natural cleaning enzymes for the purification of equipment and toxins from natural insects, river water, and trees. Through the Jitra Aquaculture Development Center, community, researchers and students at the UiTM Perlis Branch also released 1,000 squid seeds, 20,000 seeds, and 5,000 shrimp that were provided by the Department of Fisheries. Through environmental awareness boards and waste cleanup events, the Sungai Jernih community has also collaborated with UiTM students at the Perlis branch. Researchers from Perlis Branch's UiTM expect that a community-wide effort of this kind can be sustained to guarantee that the recreational area in question remains clean and operational all the time.

Findings

A total of 213 completed responses were collected, comprising 102 (47.9%) female and 109 (51.2%) male respondents. The respondents also comprised individuals aged between 18 to 70 years old, with most respondents between the ages of 18 to 60. A total of 226 respondents indicated they had visited at least one.

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Pre- and Post-Results

Only 70% of respondents to the pre-survey were aware of the state of Sungai Jernih. Only 42% of respondents are aware of the primary pollution sources in Sungai Jernih. 93% of respondents knew of the Sungai Jernih community's current problems, according to the post-survey results. 96% of respondents agree that the Sungai Jernih Recreation Park should be more widely known and understood in the community. The majority of respondents expressed concern about the need for educational programs and CSR initiatives to be implemented by UiTM, universities, and state government agencies in order to permanently restore and conserve the Sungai Jernih Recreation Park.

Correlation Analysis

Table 1: Pearson Correlation Coefficients

Variables	CK	CE	CA
Community Knowledge (CK)	1		
Community Effectiveness (CE)	1.00**	1	
Community Awareness (CA)	1.00**	1.00**	1

*Note: N= 213, *p<0.05, **p<0.01*

In this study, all independent variables were correlated with the dependent variable, awareness. Table 1 demonstrates substantial positive connection between awareness, knowledge, and effectiveness.

Regression Analysis

Table 2: Regression Analysis

Variables	Beta (β)	Significance value
Dependent: Community Awareness (CA)		
Community Knowledge (CK)	1.000	0.000**
Community Effectiveness (CE)	1.000	0.000**
R Square	1.000	
Adjusted R Square	1.000	

*Note: N= 213, *p<0.05, **p<0.01*

Results of regression analysis in Table 2 indicated that community knowledge and community effectiveness were significant with dependent variable (community awareness). As shown in Table 2, community knowledge (CK) and community effectiveness (CE) are found significant

influencing community awareness with Beta value (β =1.000**). In other words, independent variables are significantly related to dependent variable when the p value is less than 0.01. The

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R square and adjusted R square of 1.000 explains 100% of variability contributing to community awareness.

Discussions

The outcomes of this extensive pre- and post-study confirm the commendable success of the initiative, underscoring the pivotal role of community-driven revival, economic growth, and ongoing environmental stewardship in the context of Sungai Bukit Jernih. This study serves as a beacon of inspiration for holistic environmental conservation efforts propelled by community engagement. Central to this achievement lie the principles of community awareness, knowledge, and effectiveness in addressing environmental challenges.

Firstly, community awareness serves as the foundation upon which conservation efforts are built. By fostering a deeper understanding of environmental intricacies, community members develop a heightened sense of responsibility towards safeguarding natural resources. This increased awareness instills a sense of ownership and accountability, motivating individuals to actively participate in environmental stewardship activities.

Furthermore, community knowledge empowers individuals to make informed decisions regarding environmental issues. When equipped with relevant information and resources, community members can effectively prioritize conservation challenges and implement targeted interventions for maximum impact. This informed decision-making process enhances the efficiency and effectiveness of conservation initiatives.

Lastly, community effectiveness hinges on collective action and collaboration among stakeholders. By mobilizing resources, harnessing expertise, and fostering collaboration, communities can address environmental issues in a comprehensive and sustainable manner. This collective effort ensures that conservation objectives are realized, leading to tangible and long-lasting positive changes in the environment.

In discussing the complexities of environmental conservation, it is crucial to acknowledge the significant role of human behavior in driving detrimental impacts on rivers, including Sungai

Bukit Jernih. Despite efforts to address environmental degradation through increased financing and resources for enforcement, it is evident that a multifaceted approach is necessary to tackle the underlying causes effectively.

Recommendations

Future research endeavors should prioritize longitudinal studies to track changes in community awareness, knowledge, and effectiveness of conservation initiatives over time. Additionally, conducting comparative analyses between engaged and non-engaged communities can shed light on the efficacy of community-driven approaches. Comprehensive socioeconomic analyses are necessary to understand the socio-economic factors influencing community participation in conservation efforts. Addressing the root drivers of unsustainable behavior requires a deeper understanding of societal attitudes, cultural norms, and economic incentives that contribute to environmental degradation. Future inquiries should focus on unraveling these complexities and developing innovative strategies to promote sustainable practices and behaviors within communities. Moreover, investigations into stakeholder engagement dynamics, behavioral drivers, and policy effectiveness are imperative for informing evidence-

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JTHEM
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based conservation strategies. Exploring the potential of technological innovations and assessing community resilience-building strategies will further enhance our understanding of community-driven conservation methodologies.

Conclusion

The findings from this study underscore the critical importance of community awareness, knowledge, and effectiveness in driving successful environmental conservation efforts, particularly in the context of rivers such as Sungai Bukit Jernih. By fostering a deeper understanding of environmental issues, instilling a sense of ownership and accountability among community members, and promoting collective action and collaboration, communities can play a central role in preserving and rejuvenating fragile ecosystems. Moving forward, it is imperative for researchers, policymakers, and practitioners to continue prioritizing community-driven approaches in environmental conservation. Longitudinal studies, comparative analyses, and comprehensive socio-economic assessments will be essential for advancing our understanding of the factors influencing community participation and the effectiveness of conservation initiatives. Additionally, exploring innovative technologies, engaging stakeholders in policy dialogues, and strengthening community resilience-building efforts will be key in addressing the complex challenges posed by environmental degradation. Embracing a holistic and collaborative approach can lead to sustainable outcomes and positive environmental change. Through continued research, education, and community engagement, rivers like Sungai Bukit Jernih can be protected and preserved for the benefit of present and future generations.

Acknowledgement

Appreciation to Dana Komuniti Setempat (DKS) UiTM Cawangan Perlis for their generous grant, which played a pivotal role in the successful completion of this working paper. Their financial support greatly facilitated the research process and contributed to the quality of this work.

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