



EXPLORING STAKEHOLDER COLLABORATION & COMMUNICATION FOR SUSTAINABLE PENANG HILL BIOSPHERE RESERVE: A QUALITATIVE APPROACH

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ABSTRACT

Biosphere reserves (BRs) are essential places for sustainable development through human and environmental equilibrium. The area must be well-managed, yet communication and collaboration among various stakeholders is the primary issue that each biosphere management confronts when attaining its goal and maintaining its international significance as a UNESCO BRs site. Penang Hill Biosphere Reserve (PHBR) has been acknowledged by the UNESCO as the third biosphere site in Malaysia in 2021. There are three main tourism destinations in PHBR: Penang Hill, Penang Botanic Garden and Penang National Park. These destinations are under their own governance, and the management office of PHBR is under development. This paper highlights the findings from a focus group discussion with the destination managers, local communities, and non-profit organisation involved in managing the three destinations in PHBR sites. The findings indicate that effective stakeholder communication and collaboration are important for achieving conservation and socio-economic development goals. Inclusivity in decision making, transparent communication and shared values were indicated as critical factors for motivating engagement and ensuring balanced governance. The present study carries a strong message on to the governance of PHBR to have a strong collaboration communication strategy for sustaining PHBR as a worldwide popular biosphere sites.

Keywords: stakeholder communication, stakeholder collaboration, Penang Hill Biosphere Reserve, sustainable tourism, biosphere reserves

INTRODUCTION

The Biosphere Reserve (BR) concept, first developed in the 1970s, idealised the integrated approach using three zonation: core, buffer, and transition zones to harmonise conservation and development. *"Biosphere Reserves are a mechanism within the UNESCO Man and the Biosphere Program (MAB) that seek to promote an approach to land management that harmonises interactions between people and*

nature" (Van Cuong et al. 2017, p.1). This framework aims to balance conservation efforts with sustainable development activities (Van Cuong et al., 2017).

Penang Hill and its surroundings received the designation "Penang Hill Biosphere Reserve" (PHBR) under the UNESCO Man and Biosphere (MAB) Programme for its unique natural and cultural heritage during the 33rd

International Coordinating Council at Abuja, Nigeria on 15 September 2021. It comprises a network of ca. 12,500 ha of contiguous natural areas that follow the slopes from Penang Hill down to Penang Botanical Gardens in the East and Penang island's coastal and marine areas in Penang National Park in the West. The mission of the Penang Hill Biosphere Reserve (PHBR) is to: 1. Create awareness, appreciation, and respect for the unique landscape, biodiversity, natural systems, and cultural history. 2. Introduce and maintain development and land use guidelines for sustainable development; 3. Proactively identify and facilitate the benefits to the community and 4. Contribute towards the environment and cultural knowledge through research and education.

The PHBR, composed of three main tourist attractions, is independently managed and governed by different agencies: Penang Hill Corporation (PHC), Penang Botanical Garden (PHG), and Penang National Park (PNP). With the new recognition of PHBR, all the key stakeholders must support the program's initiative and work under a new governing structure for future PHBR sustainability. Margles et al. (2009) sees biodiversity conservation as a complex issue linking local and global environmental issues. Conservation requires multidisciplinary effort. Activities need to be planned and communicated with their values and interests from researchers to society. Margles et al. (2009) further used the term conservation within borders to explain the importance of building communication across disciplines for effective conservation. Effective communication is essential for conservation, which is important for policy implementation, changing public behaviour, securing resources, and cooperating with volunteers (Jacobson, 2009). Bizerril et al. (2013) identified that conservation, communication can change people's mentality and affect better communication in various sectors of the community.

Some studies have identified gaps in achieving harmonised interaction between people and the environment due to a poor understanding of BR (UNESCO 2010; Reed & Egnyu 2013). Among the influential factors for the success or failure of the BR sites are stakeholder participation, collaboration, awareness and communication (Van Cuong et al. 2017).

According to Bickford et al. (2012), a lack of environmental literacy could explain the poor engagement of the public in sustainable activities. Knowledge of the environment needs more than awareness, it involves critical thinking; integrating principles and certain skills is vital to turn knowledge into actions (Coyle, 2005). Participation in outdoor activities is essential to help learners appreciate and understand ecological concepts and nature (Bickford et al., 2012).

Many studies have highlighted the failure of biosphere reserves because of competing interests and lack of collaboration among the stakeholders (Mgonja et al., 2015; Friedman-Rudovsky, 2015; Stone & Stone, 2011). Furthermore, Van Cuong et al. (2017) also saw collaboration among the stakeholders as one of main factors impacting biosphere reserve management. These studies also pointed out the key attributes that can guide stakeholder collaboration in biosphere reserves, such as interdependency, transparency, trust, participation, organisation support, awareness, and communication. Lack of biosphere reserve understanding by stakeholders, communities, and industry was another issue found in the biosphere reserve that hindered sustainability (Van Cuong et al., 2017). Without integrated cross-sectoral and multi-level policy approaches, action required to address biodiversity issues will be hindered (Kay & Regier 2000; Fairbrass & Jordan 2002). Thus, promoting interdisciplinarity and cross-sectoral collaboration and communication are essential to moving forward from silo thinking in management and policy. Literature on the integration of different stakeholders working towards biodiversity conservation is limited. Efficient stakeholder collaboration and communication will contribute to a harmonious ecosystem of achieving successful biodiversity conservation.

PHBR has received a new acknowledgement of a biosphere reserve and now should integrate the management of the three destinations under its governance. PHBR's governance is still in its initial stage of development. Thus, this study explores existing collaboration and communication activities at the destination. The first objective is to explore stakeholder collaboration through various implemented activities for each destination, and the second objective is to

identify future collaboration and communication strategies for managing PHBR. Addressing these aspects is crucial for harmonising conservation efforts with sustainable tourism and ensuring PHBR continues thrive as a model for sustainable development in Asia.

LITERATURE REVIEW

Stakeholders' collaboration and communication

Stakeholders are defined as "*Individuals and organisations who are actively involved in the project, or whose interests may be positively or negatively affected as a result of project execution or successful project completion*" PMI (2010). Timur and Getz (2009) and Kadi et al. (2015) note that stakeholders such as the local community, government, tourists, industry, educational institutions, and NGOs greatly influence sustainable development. Understanding the roles and significance of stakeholders could help resolve a wide range of issues in a sustainability context, and stakeholders' collaboration significantly impacts the area's development (Kadi et al., 2015).

Stakeholder collaboration is regarded as "*a process of ensuring that there is the interaction of various stakeholders with common or related goals during planning, learning, decision making and empowerment mainly for the sake of enabling smooth management, collectively decision and innovation when tackling challenges, opportunities and plans for current and future well-being of a particular society*" (Pasape et al., 2013, p.2). Stakeholder collaboration is necessary when investigating various stakeholders with varying needs and interests (Majail & Webber, 2006; Novey, 2015). Collaboration also refers to a process in which actors convene together to discuss issues of shared interest to arrive at a common ground (Jamal & Stronza, 2009). In essence, stakeholder collaboration aims to facilitate a space where stakeholders can jointly plan, make informed decisions and address challenges by working together.

Stakeholder collaboration at the site is vital because it enables stakeholders to develop new skills for the site, minimise conflicts, improve responsibility-sharing and leads to informed participation (Pasape et al., 2013). Issues like stakeholder conflict, human-wildlife conflict, and inefficient management

might all be remedied with a concerted effort to collaborate in the conservation and sustainable tourism sectors (Ancrenaz et al., 2007; Ratner et al., 2017). Moreover, it is also considered as one of the major factors along with communication that determines the success of a biosphere reserve (Van Cuong et al., 2017).

Stakeholder collaboration and communication are now widely recognised as essential components to achieving sustainability. The stakeholder communication proposed in this study addresses communication integration at different levels, including horizontal integration (i.e. collaboration across agencies/communities), vertical integration (i.e. collaboration within each agency/community), tactical integration (i.e. integration of messages and communication tools), and data integration (i.e. compiling, sharing, and managing data among various stakeholders). Stakeholders usually interact vertically, horizontally and or adopt a hybrid approach (Van der Zee & Vanneste, 2015).

According to Wondirad et al. (2020), stakeholder communication is often lacking, whereby their interaction is more formal and sporadic or seasonal, and has issues related to transparency and trust. For example, in the case of the Southern Nations and Nationalities People's Regional State, one of the UNESCO sites in East Africa, stakeholder collaboration has been inefficient, where the majority of the benefit goes to the private sector. There is a lack of involvement from the local community and poor governance which leads to the deterioration of natural resources (Wondirad et al., 2020).

Challenges in Stakeholder Collaboration and Communication

Stakeholder collaboration in biosphere reserves faces several challenges that can hinder the effective integration of conservation and sustainable development objectives. A key challenge is the diversity of stakeholder interests (Salman et al., 2021a); local communities, government bodies, NGOs, and private sector entities often have differing goals and priorities. This can lead to conflicting interests where conservation needs may clash with economic motivations, such as tourism development or resource exploitation. Power imbalances among stakeholders can

also be a significant challenge, in which influential actors dominate decision making, leaving smaller or marginalised groups without a voice. Financial constraints are another challenge, as funding is often limited for collaborative initiatives, and stakeholders might lack the resources required for effective participation (Salman et al., 2024; Jaafar et al., 2023).

Effective communication among stakeholders in biosphere reserves is often hampered by several barriers, which can significantly impact the overall success of conservation initiatives. One of the primary barriers is the lack of a common communication platform, which prevents consistent information sharing between different groups (Timur & Getz, 2009).

Furthermore, communication is often formal, sporadic, or seasonal, meaning that important information may not reach all stakeholders in a timely manner, resulting in delayed responses to emerging issues (Wondirad, et al., 2020; Baumgartner et al., 2023). Another major barrier is the limited use of digital tools for real-time communication and data sharing; stakeholders in rural areas, for instance, may have restricted access to technology, affecting their ability to stay informed and engaged (Hollman et al., 2021). Additionally, transparency issues can undermine trust when stakeholders are not open about their intentions, activities, or data, the result can be a lack of confidence in the process, ultimately hindering effective biosphere management.

To improve stakeholder collaboration and communication, it is important to implement strategic measures, such as enhancing transparency, building trust among stakeholders, promoting regular and informal meetings, and establishing better communication channels (Salman et al., 2021b). These measures could guide to foster sustainable development in biosphere reserves.

Theory that informed this study

This study uses Stakeholder Theory to examine stakeholder collaboration and communication in biosphere reserves like Penang Hill Biosphere Reserve. Stakeholder Theory, established by Freeman (1984), emphasises that an organisation or project's

success depends on managing relationships with all stakeholders that can affect or be affected by its consequences. The PHBR stakeholders include government agencies, local communities, NGOs, tourism providers, and tourists.

Stakeholder Theory helps explain biosphere reserve management, as numerous stakeholders with different interests must work together to achieve conservation and sustainability goals. Freeman's Stakeholder Theory states that companies must balance stakeholder interests and economic outcomes. PHBR addresses the requirements and concerns of conservation-focused NGOs and local authorities, inhabitants who depend on the region's resources for their livelihoods, and tourism operators whose businesses depend on sustainable tourism (Freeman, 1984). PHBR stakeholders include local community members and their associations, Penang Hill Corporation, Penang Botanical Garden, Penang National Park management, and tourism-related enterprises. Effective management requires an understanding of these varied interests, as sustainable conservation aims may differ from economic or tourism goals (Byrd, 2007; Salman et al., 2023)

Stakeholder Theory also emphasises the importance of inclusion in decision-making. The PHBR must involve stakeholders, especially marginalised groups, such as local communities, in planning and management. Tourism studies have shown that real and inclusive stakeholder interaction is necessary for effective and sustained conservation projects (Timur & Getz, 2009). Inclusivity encourages collaboration and stakeholder support and legitimises decision-making and conservation norms.

Stakeholder Theory emphasises good communication. To collaborate, PHBR stakeholders require clear and transparent communication channels. Stakeholder Theory promotes trust and accountability, which are essential for collaboration, by informing and providing information to all stakeholders. Stakeholder dialogue, community discussions, and transparent information sharing enhance collaboration because miscommunication or a lack of communication often leads to conflict. Ensuring that stakeholders see real advantages

from their involvement fosters continuous support and active participation in conservation projects, thereby sustaining the biosphere reserve (Waligo et al., 2013; Salman et al., 2023).

Case study sites

Historically, Penang Hill was first built in 1788 by the British Government (Perbadanan Bukit Bendera Pulau Pinang, 2018). Penang Hill, situated at an altitude of 735 m (2,450 feet) above sea level, provides comfortable and cool weather (Penang Hill Corporation, n.d.). Cable cars are the main attraction for recreation at three stations (lower, medium, and upper stations). Currently its residents consist of 147 communities of mixed races, including 36 private bungalow owners and locals. The service sector's involvement is mainly in tourism-related activities, such as accommodation, restaurants, gifts or souvenirs, transportation, and logistics.

Approximately 57 shops sell different kinds of products at the top and lower stations of the PHBR. The local communities consist of farmers of the older generation, who prefer to remain in the place and make a living through small-scale agriculture and fruit planting activities. There are 20 farmers, mainly concentrated at the Middle Station and Summit of Penang Hill. Other populations include people who visit Penang Hill, such as hikers, tourists, and businesses.

PNP was announced as a National Park in 2001. This state is the most important natural treasure in terms of its high biological diversity. PNP is a natural place with high biological diversity (flora and fauna) and sandy and rocky beaches, and Meromictic Lake contributes to tourism, research, and education. The concept of development focuses on tourism that has good sustainability and conservation. The current development of PNP focuses on Sungai Tukun dan Pantai kerachut, which provides basic infrastructure such as a walking walkway, chalet, camping area, jetty, lookout tower, hall and toilet.

The development combines tourism and sustainability. Ecotourism and conservation remain the most important considerations in PNP development. The local community consist of fisherman community who basically

resides around Teluk Bahang. In the context of Penang Island, a total of 2318 fishermen, with almost half of them within the age range of 40–69.

PBG existed in 1884 and is the oldest botanical garden in Malaysia. PBG has two main resources: the waterfalls which supply Georgetown and its surroundings and unique flora species. This area provides recreational areas for the community and tourists and plays an essential role in microclimate stabilisation, carbon sequestration, flood mitigation, erosion control, and water purification. Preserving this natural area is vital for ensuring the safety, health, and well-being of the residents (RKKTBPP, 2019). There are no specific local communities involved with PBG. However, PBG has its group of communities, which includes daily visitors (joggers), tourists, business operators and NGOs.

MATERIAL AND METHODS

Qualitative research methodologies are particularly suited to explain human behaviour's contextual and complex nature. This can uncover deep-seated motivations and mechanisms that drive individuals to act and hold attitudes in ways that often defy quantification. The particular value of such competence pertains to those areas where social convention, cultural influence, and personal experiences are the significant determinants. Therefore, this study employs a qualitative approach to gain understanding and experience directly with the respondents about their collaboration in the management of PHBR.

The focus group discussions (FGD), popularly known as group interviewing, is one of the most common primary tools used for research in current context. This tool, by nature, is qualitative and engagement in discussion enables the researcher or interviewer to pose inquiries to numerous participants systematically and simultaneously (Lanshima & Abdulkarim, 2021). This study reports the results of FGD sessions with stakeholders consisting of destination owners and local communities and Non-Governmental Organisations (NGOs). This FGD session started in January 2024 (See Table 1).

Table 1 : Respondents details

	Respondents
FGD SESSION 1: Destination Managers	RDM 1
	RDM 2
	RDM 3
FGD SESSION 2: Local community and NGOs *RN refers to NGOs *RLC refers to local communities	RN1
	RN2
	RN3
	RN4
	RN5
	RN6
	RLC1
	RLC3
RLC2	

This study used thematic analysis with a systematic approach to organise and examine qualitative data to reveal important themes from the FGD sessions that were conducted. We interpreted complex datasets from transcripts of focus group discussions by identifying recurring patterns from the discussion results. This analysis aligns with the thematic analysis framework guide from Braun and Clark (2006), familiarising with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes and producing the findings. Next, the formation themes and sub-themes for this study were explicitly formulated in the context of challenging aspects of managing PHBR.

RESULTS

Stakeholder Collaboration and Communication in PHBR

PHBR consists of three independent tourism destinations with different attractions. Each site has its own management. Destination planning, management, and conservation are conducted in accordance with specific acts and regulations. Two FGD sessions were conducted to identify: 1. the existing activities conducted at the three destinations and 2. the suggested collaboration and communication to enhance the PHBR conservation.

It has been reported that all three sites have their programs run with the cooperation of other agencies, NGOs, and local communities. For these three destinations, they have their own activities with their collaborators, which are mostly related to environmental awareness and education. The responses indicated that

each destination structured its activities, focusing on available assets and resources.

RDM1 mentioned that *“working closely with NGOs is important in conducting the activities”*. The strength of Penang Hill is the trail. According to one of the volunteer community groups (RLC3), Penang Hill has many trails and is popular among hikers. He stated, *“Our objective is to link the outdoor community with sustainability. Thus, we create a programme in collaboration with agencies, departments and media to create a healthy world-standard trail system in Penang. For example, we will help to ensure the cleaning up of the trails, which do not litter; we work with Forestry department, PBG, PHC and The Habitat”*. Another NGO (RN6) arranged a free and paid heritage walk and habitat tours. Besides that, they also arrange a program structured for the tourists, especially the younger generations, about farming, wild herbs and common herbs, sustainable farming including seeding and planting and he mentioned *“the education on PHBR is important for the younger generation because they are going to shape the future of PHBR”*. RN2 represents the NGOs concerning water education. They are involved in programs related to water education, river monitoring and related activities for education. She says, *“the awareness on water education as important for PHBR because of the farming activities on Penang Hill which less emphasized on sustainable farming”*.

For the PBG, RDM3 mentions that their activities cover many stakeholders. *“The Botanic Garden also runs a program for agencies, institutions, schools, the public and interested parties. Our program is particularly focused on environmental education, which aims to raise everyone's awareness of environmental literacy. We also collaborate with tour guides from our side for visits to our gardens. There are applications from schools for learning tours”*. PBG sharing trails with Penang Hill and the involvement of the volunteering group to manage the trail also happens in PBG.

For the PNP, according to the officer (RDM2), there are formal coordination stakeholder meetings for destination management. Formal meetings with government agencies are conducted once or twice a year. For example, garbage pollution needs attention from the local authority. RDM2 mentioned *“We always have dialogues and frequent meetings with the local*

community. We suggest the community should create an association for boat operators. We can help them to get licence and provides training such as safety. The boat operators are important contributors to supporting the activities at the national park. We also work closely with other parties in joint or visiting programs with agencies or NGOs”.

Good collaboration and communication are agreed upon by the community representative (RLC 1), who mentioned that they have a good relationship with the National Parks and that they have collaborated on many programs and meet regularly for any issues that arise. The above narrative explains the existing collaboration and communication between the destination management officers and local communities and NGOs on activities related to PHBR. These activities can be enhanced to support the sustainability of PHBR.

Future Collaboration and Communication Strategies for Sustainable PHBR

Based on the above responses, it was concluded that after almost 16 months of PHBR recognition, people still lack understanding of the concept of PHBR. The local community association of PH (RLC2) quoted, “Nobody knows about PHBR, and without a huge notice board, they won't know what it is”. One of the NGOs (RN4) also agreed on this and she added from her experience the new generation is more alert on PHBR compared to the older generation. PHBR is still a new recognition, and in Penang, people normally refer to Georgetown as a World Heritage City.

Based on the statements below, we explored strategies to enhance awareness of PHBR. According to the Management Plan of PHBR, the PHBR management office partly exists is responsible for managing PHBR. However, the responses below highlight suggestions for enhancing the achievement of PHBR objectives.

Most of the respondents agreed that serious attention should be paid to the role of the PHBR management office. The management of the PHBR is crucial for establishing a platform for clear communication between agencies. According to RN6, “A platform to engage and collaborate between departments for PHBR is very important”.

He advises the use of email to communicate and share information. He further argued “Sending via email to share information is more interactive and interesting, maybe in a simple but compact form. It means that there is no need for a lot of words and so on. This means using an email sharing platform because at least we can save it.”

Besides the signboards, one of the respondents highlighted the importance of having a platform for PHBR communication. RDM2 stressed the importance of communication, which can help each agency collaborate towards achieving the main goal. “Conversation involves many stakeholders and activities like sharing research data, and research activities need approval from specific people. RDM1 refers to creating a PHBR One Stop Centre as a good approach to gather all activities, events, programs, campaigns and others to promote and brand PHBR as a whole. This was agreed upon by RDM2, who stated “having a scientific biodiversity seminar involves community, university and agencies could be arranged for PHBR”. RDM1 mentioned that the PHBR management office has conducted activities under the umbrella of PHBR. She stated, “In 2024, we have started with an annual run that includes these three destinations. This is to attract tourist and promote PHBR.”

RN6 emphasised effective collaboration among stakeholders: “We need to work hard as a team to make a successful PHBR. The university, local communities, various agencies, and NGOs should do our best to protect PHBR.” RLC3 supported this statement by saying, “Our hikers management needs a good communication platform to deliver a message to those who are directly involved in conserving the trail.”

Branding is another concern from the respondents. According to RDM1, having one stop centre is important for PHBR branding. RLC3 added, “Every activity or programme should use PHBR branding as an official brand to attract their attention and promote PHBR”. According to RDM2, “branding should be our target because, as for now, each destination works in a silo and does not promote PHBR branding.”

The above statements indicate the need for the governance of the PHBR to explore its marketing and branding. The strategies can also be referred to in the table below.

Table 2: Proposed strategies based on the respondent's feedback

Respondents	Proposed strategies
RDM1	PHBR one-stop centre to gather all activities, events, programs, campaigns and so on annually to promote and brand PHBR as a whole
RDM2	Having more dialogue with the local community to increase the understanding of PHBR
RN6 & RDM2	Platform to engage and collaborate between departments for PHBR. Platform for Sharing data and information
RN6	Selected and specific entrance for PHBR A signboard in dual language with the regulations for sustainability
RDM2	PHBR Branding Special budget to implement PHBR activities
RLC2	Sign boards

Proposed Framework

The proposed framework as shown in Figure 1 presents PHBR stakeholders, processes, and outcomes. This framework shows how communication and collaboration can help in achieving sustainability. The structure emphasises the role of government agencies, local communities, NGOs and the private sector on the long term sustainability of PHBR, drawing from Stakeholder Theory. The framework identifies government agencies, local communities, NGOs, and the commercial sector as key stakeholders. These groups are crucial for PHBR's long-term sustainability. NGOs and local communities provide cultural and local expertise, whereas governments provide regulatory support. The commercial sector including tourism-related businesses helps integrate economic interests with conservation. Building a collaborative governance system starts with these stakeholders.

The framework highlights the importance of stakeholder communication and collaboration. Effective and clear communication is required to help stakeholders collaborate to resolve problems, support conservation and

community goals in PHBR. Communication, whether formal or informal, impacts stakeholder collaboration. Collaboration ensures that stakeholder interests are represented in the biosphere reserve, resulting in mutually beneficial conservation and socio-economic development in PHBR.

The processes of stakeholder communication and collaboration result in enhanced stakeholder engagement, sustainable conservation practices, and the generation of community benefits, which are key factors in implementing sustainability. A recent study by Ali and Haapasalo (2023) also indicated that effective communication is vital for resolving challenges related to cooperation, control and coordination of stakeholders. Therefore, effective communication could increase collaboration and as a result increase involvement, conservation success and local community socio-economic gains in the context of PHBR. This framework guides in building and maintaining collaboration among primary stakeholders to ensure PHBRs long term sustainability.

DISCUSSION

The findings of this study reveal the complexities and opportunities inherent in managing the Penang Hill Biosphere Reserve (PHBR) through effective stakeholder collaboration and communication. This study underscores the critical role that various stakeholder groups, including government agencies, local communities, NGOs, and the private sector, play in the sustainable management of biosphere reserves. The results indicated that even though the three tourism destinations included in PHBR have their own programs, there is a considerable scope for improving integrated communication and cross-cultural collaboration.

An important finding that emerged was the collaboration already occurring through partnerships with NGOs, local communities, and other agencies. These collaborations mainly focused on education and environmental awareness, as indicated in activities involving trail maintenance, heritage tourism, and water education. Another important finding that resulted from this study was the need for a centralised management platform. Stakeholders, including government representatives, NGOs and local, communicated highlighted the

importance of creating a PHBR one stop center to gather all activities, and programs under one umbrella. Such a type of platform could help consolidate efforts and promote PHBR as a unified entity, resulting in enhancing communication between agencies and ensuring more effective collaboration and thus guiding to achieve sustainability in the area. This is in line with a study conducted by Wondirad et al. (2020), who highlighted that stakeholder collaboration is key to achieve sustainability in the destination.

fostering understanding. Effective communication is essential for building trust and accountability among stakeholders, which is crucial for successful collaboration. The lack of communication infrastructure, particularly among local communities, impedes the timely exchange of information and often results in misunderstandings or misalignments of priorities. These findings are consistent with prior studies, such as Sharip et al. (2018), which indicate that communication is one of the major challenges facing reserves and

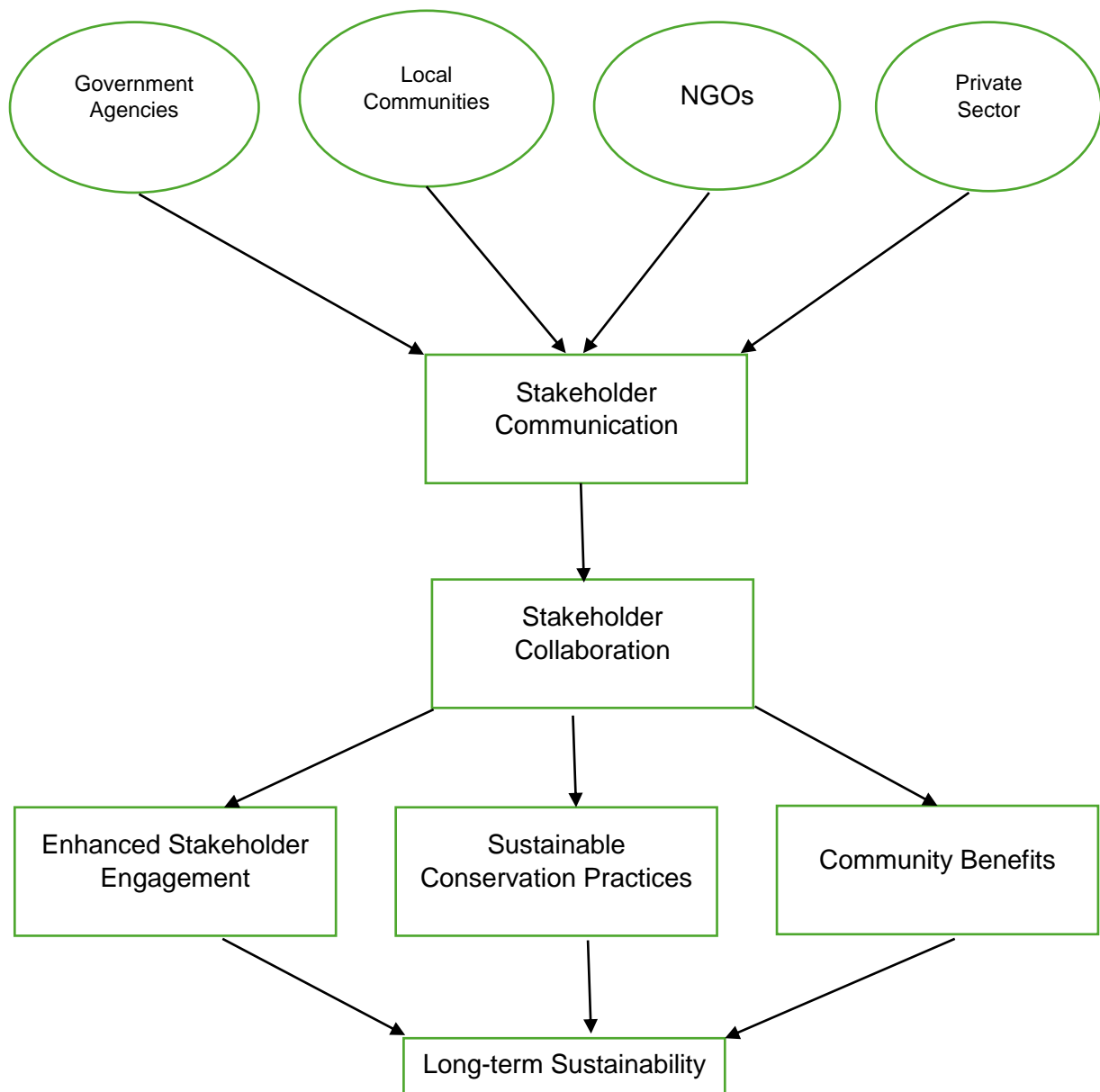


Figure 1: Proposed Framework for PHBR sustainability

This research also points out that communication remains a major barrier in PHBR management, as stakeholders have limited channels for sharing information and

emphasises the need for improved communication and coordination among stakeholders.

The results also indicate that there is limited awareness and understanding of PHBR among stakeholders especially the local community. Respondents indicated that many members are not aware of PHBRs recognition and its importance for the area. They also suggested enhancing communication by using digital communication platforms and signboards to address this gap and engage stakeholders effectively. Therefore, effective communication is a crucial factor for successful collaboration as it helps to build trust and aligns stakeholders' efforts to ensure that all parties are informed and motivated. This is also in line with the studies of Salman et al. (2021a) where the authors indicated that communication is the key to making projects successful.

The successful management of biosphere reserves like PHBR requires more than the mere participation of stakeholders; it requires genuine collaboration that builds on shared goals and mutual accountability. Stakeholders who were actively engaged in collaboration perceived greater benefits and were more willing to participate in future initiatives. This highlights the importance of establishing collaborative governance structures that support regular interactions, collective decision-making, and resource-sharing among stakeholders (Ansell & Gash, 2008). A structured, central platform for collaboration could facilitate smoother governance and enhance stakeholder engagement, ultimately contributing to the sustainable management of PHBR (Bramwell & Lane, 2011; Waligo et al., 2013).

Moreover, by promoting responsible tourism practices that respect local culture and ecosystems, stakeholders can align their interests more closely. This approach allows for the generation of economic benefits while safeguarding the natural and cultural heritage of the PHBR, ultimately contributing to both conservation and community development goals which also corroborates the results of a study by Timur and Getz (2009). The interplay between tourism and conservation, as observed in PHBR, demonstrates that achieving sustainability requires aligning stakeholder motivations with broader conservation objectives through inclusive and economically viable initiatives. Lastly, there should be a dissolution of borders between

protected areas and communities which prevents academic disciplines from freely communicating and working with each other.

CONCLUSION

Active stakeholder collaboration and communication are the basis for effective management of the Penang Hill Biosphere Reserve (PHBR). This study uses Stakeholder Theory to illustrate that balancing the diverse interests of various stakeholders is necessary for the attainment of sustainable conservation and socio-economic ends. Government agencies, local communities, NGOs, and the private sector all have different interests; therefore, it is vital to balance the varied interests for the long-term conservation and socio-economic success of the PHBR.

The findings also revealed that, even though collaboration is present, it remains fragmented across different destinations within the PHBR. Establishing a centralised communication platform such as PHBR, a one-stop Centre, emerged as a significant need to unify activities and improve stakeholder engagement. Consistent communication and inclusive governance were identified as the core elements for building trust and ensuring stakeholder engagement in the PHBR. Therefore, communication must be clear and consistent. Limited communication channels prevent collaboration, while transparent and frequent communication fosters trust and coordination among stakeholders. By establishing a formal platform for interaction, governance and stakeholder relationships can be improved, and collaboration can become more streamlined.

Diverse stakeholder opinions must be included when making decisions. PHBR can empower underrepresented groups, and especially local communities, to create an equitable governance framework consistent with environmental preservation and the well-being of local communities. This is to ensure that all stakeholders are able to speak and that conservation efforts enjoy broader support.

Moreover, this study highlights the importance of shared value creation for effective stakeholder interaction. Participation and conservation efforts that produce benefits to all, such as revenue from sustainable tourism, are aligned with the conservation

goals. Linking conservation and development goals can help PHBR turn competing interests into complementary ones, advancing ecological and community outcomes.

THEORETICAL AND PRACTICAL IMPLICATIONS

Theoretical Implications

This study contributes to the extant literature regarding the application of Stakeholder Theory in the context of biosphere reserve management with an additional emphasis on inclusivity, communication, and shared value creation. The findings demonstrate the importance of effective stakeholder engagement to governance of biosphere reserves in alignment with Freeman's (1984) stakeholder theory. This research shows that achieving sustainable management of a natural resource demands not only identifying primary stakeholders and the resulting use, but also understanding the stakeholders' interactions and their effect on conservation outcomes.

The study also points out that participation is not enough, and that stakeholder collaboration has to go beyond and includes real, inclusive decision-making processes. This insight helps bolster the theoretical understanding of the dynamics of stakeholder relations, where environmental conservation and socio-economic development intersect. The study implications support the argument for integrative governance models that have power dynamics coded within them, and all stakeholders are heard. Such participation expands the discourse on equity and governance in sustainability and tourism literature.

Practical Implications

Practically, this study offers various recommendations for managing the PHBR and related protected sites. First, a structured communication platform improves transparency and stakeholder trust. All stakeholders can access information, provide feedback, and plan together on this platform. A system like this could improve communication and synchronize operations across groups.

Second, inclusive governance to redress power disparities appears to be essential for collaboration. Community workshops,

capacity-building, and stakeholder meetings can empower underrepresented groups, especially local communities, to participate in decision-making. The key to long-term conservation support is making all stakeholders feel valued.

This study also underlines the importance of shared value creation in motivating stakeholder participation. Community-based tourism programs that benefit local stakeholders can also align interests and improve conservation-development linkages.

This study highlights that stakeholders require a collaborative governance framework for regular engagement and shared decision-making. To make decisions jointly and fairly, PHBR managers might consider developing a governance structure with stakeholder representation. This method would help sustain PHBR and inspire other biosphere reserves with similar challenges.

LIMITATIONS & FUTURE RESEARCH DIRECTIONS

The study contributes to the understanding of biosphere reserve sustainability and stakeholder collaboration, though the study has also some limitations. Second, while the study was limited to the PHBR, the findings cannot be generalised to other biosphere reserves that exist in different socio-political or ecological contexts. However, the specific dynamics of stakeholder collaboration and communication observed in PHBR may be quite distinct from what we see in other constellations of stakeholders and environmental conditions. These findings should be extended to other biosphere reserves to help verify the applicability of the insights, and to see whether such challenges and opportunities are present.

Second, the study is limited using focus group discussions with the stakeholders, which may themselves be biased responses. The answers of participants may have been adjusted to align with perceived expectations or participants may have underrepresented aspects from the group dynamics. Future research might consider mix-methods where interviews or questionnaires are used to minimize biases and to provide a more in-depth details of the nature of stakeholder's views.

Lastly, this study has not quantified the impact of stakeholder collaboration on specific conservation or socio-economic outcomes. Future research should empirically test the conceptual framework developed in this study across different biosphere reserves to validate its applicability and to further refine the stakeholder communication and collaboration mechanism for achieving sustainability.

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