

# **INDICATORS OF GOVERNANCE OF MARINE ECOTOURISM RESOURCES: PERCEPTION OF COMMUNITIES IN PULAU PERHENTIAN, TERENGGANU**

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## **ABSTRACT**

To be effective, the establishment of the Marine Protected Areas requires support from various stakeholders, which are directly or indirectly affected by the establishment. The support of relevant agencies to manage the Marine Protected Areas may depend on how the communities perceive the benefits of the establishment. The objective of this paper is to present the results of an analysis on the perception of local communities on the governance of the Marine Protected Areas by the relevant agencies. Data for the study were collected from members of the local communities on Pulau Perhentian using face-to-face interviews. The results show that most members of these communities were aware of the establishment of the Marine Protected Areas, though some were doubtful of the actual benefits of the establishment. Communities on Pulau Perhentian, which were directly dependent on the marine resources for their ecotourism-related businesses, were quite apprehensive of the ability of relevant agencies to act on reducing the encroachment of fishers in protected zones. Generally, the local communities agreed that the relevant agency were doing a good job of enforcing rules and regulations to protect the resources in the marine ecosystem. The cooperation among the stakeholders in adapting to the norms of governance was perceived as helpful in affecting the management of Marine Protected Areas.

**Keywords:** Natural Resources; Protected Area; Conservation; Perceived Benefits; Enforcement.

## **1. INTRODUCTION**

The Tunku Abdul Rahman Park in Sabah was gazetted as a marine park in 1974, then in 1994 it was established as the first Marine Protected Area (MPA) in Malaysia. The park covers an area of 50 sq kilometres comprising five islands. At present, Malaysia has established 53 coral reef Marine Protected Areas, comprising 42 coral reef MPAs in Peninsular Malaysia established by the Department of Marine Park Malaysia (DMPM), eight in Sabah formed by the Sabah Wildlife Department and three in Sarawak created by the Forest Department of Sarawak (Department of Marine Parks Malaysia, 2011). Each Marine Park forms a protected area, in the sea, with one or two

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nautical miles of “no-take” zone from the shore at lowest tide. The objectives of establishing Marine Protected Areas in Malaysia include resource conservation and fish stock enhancement. Thus, only non-extractive activities are allowed within the Parks, and fishing is prohibited (Wilkinson, 2004).

It has been pointed out that the objectives of establishing the Marine Protected Areas in Malaysia may not be achieved due to a number of threats that have degraded the coral resources where fishes seek food and shelter. These threats arise from increased tourism activities, siltation and pollution from land-based activities such as construction of tourism infrastructure, improper waste disposal, littering and run-offs from agricultural activities as well as illegal fishing (Reef Check Malaysia, 2011). Similarly, in a report on Reefs in the Coral Triangle Initiative by Wilkinson (2008) indicates that, in countries within Southeast Asia (Indonesia, Philippines, Eastern Malaysia, and Timor Leste), the urgency to achieve economic development have resulted in permanent damage to the coral resources brought about by heavy soil sedimentation, over fishing to fulfil the increasing demand for fish protein, and industrial sewage pollution. In the case of Pulau Payar, a popular snorkelling and diving spot, Embun (2010) indicated that more than 60% of coral reefs were under medium to high level of threats due to bleaching. Recreational activities can have a significant impact on the environment. For example, careless anchoring of boats in coral gardens, stepping on and touching corals during diving and snorkelling, and fishing have significantly damaged coral reefs, and the growth in the numbers of people causing overcrowding in the reef gardens is a further cause for concern (Prabhakaran, Nair and Ramachandran, 2016).

The effectiveness of MPAs management may also be affected because several government agencies have overlapping jurisdictions in the management of marine resources. More specifically, land matters are under the jurisdiction of state governments while the Department of Marine Parks Malaysia (DPMM) has jurisdiction over MPAs’ water areas from the lowest tide line up to two nautical miles seaward. On top of that, the Department of Fisheries Malaysia (DoFM) has jurisdiction pertaining to the conservation of fisheries resources. These overlapping jurisdictions may pose a major detriment to coral resources conservation and fish stock enhancement for MPAs by DoFM. The conservation of the mosaic of habitats in the seascape and landscape is very important as stressed by Arnason (2000), since aquatic organisms are known to use more than one habitat at different times of their lifecycles. Thus, biodiversity conservation and marine resource enhancement in MPAs would be more effective and sustainable if there is a better understanding, and coordination among various government agencies, as well as integration and extension of management of the seascape habitats that includes a landscape matrix of ecosystems.

### ***1.1. Governance of Marine Protected Area***

The main objective of the establishment of the MPAs is to protect the marine resources which are important sources for the livelihoods of the communities who are dependent on the marine resources; however, there are argument among interested parties such as the fisheries agencies, researchers, local communities and even among the policy makers against the effectiveness of the MPAs. As pointed out by Kooiman (2008), many factors may affect the functions of the MPAs in protecting the marine resources; different countries may have different fisheries systems to manage the fisheries ecosystems; the communities who are dependent on the resources have complex activities which influence the methods of utilization of the resources because of the differences in values placed on the resources, the differences in the cultural values, political affiliations, level of temporal and spatial scales of the activities have tremendous influences on the functions of the MPAs.

Several government agencies have been created to undertake the responsibilities of ensuring that the objectives of the establishment of the MPAs are achieved; the main objective being protecting the fisheries ecosystem which are of national, and perhaps, of international interests. The functions of the relevant agencies must be supported by other stakeholders who may benefit directly or indirectly from the MPAs. Local people should be encouraged to join with other stakeholders and get involved in the conservation effort, and locals should also seek to influence change in their community (Prabhakaran et al., 2016). The roles of other players and actors in enhancing the management of the MPAs are undertaken via governance of the MPAs. From the perspectives of IUCN (2006) when an MPA is established, it is in fact a form of governance tool of the marine resources.

However, the concept of governance of MPAs is usually misunderstood by the various stakeholders because of the complexities and ambiguities of the inter-relationships between socio-economic-political factors which form the organizations and institutions that enforce the functions of governance. Thus, Kooiman and Chuenpagdee (2005) define governance as “*the whole of interactions taken to solve societal problems and to create societal opportunities; including the formulation and application of principles guiding those interactions and care for institutions that enable and control them*”. Accordingly, in governing the MPAs, the approach should not only focus on the technical or economic and socio-political issues but also to emphasize the relationships of the players or actors who have interests in the *realm* of MPA. As Noël and Weigel (2007) have suggested in order to fulfil the requirements of governance of the multi-purpose resources in the MPAs it is necessary to adhere to the standards of the rules and regulations formulated within the MPAs.

The main objective of this paper is to present the results of an analysis of the perceptions by local communities and stakeholders on Pulau Perhentian, Terengganu, on the indicators of the governance of the Marine Protected area.

## 2. METHOD

### 2.1. Study Area

#### 2.1.1. Communities in Pulau Perhentian

Pulau Perhentian (PP) is located about 21 km off mainland Terengganu, in Peninsula Malaysia, in the South China Sea. The island is accessible from a small fishing town of Kuala Besut, Terengganu, located 103km from Kuala Terengganu, Terengganu. The island travel time is roughly 45 minutes using speedboat from Kuala Besut. The Perhentian Archipelago consists of two main islands, Pulau Perhentian Besar (large) and Pulau Perhentian Kecil (small), with land areas of approximately 867 and 524 hectares respectively. There are also several smaller islands located close to Pulau Perhentian Kecil. These islands have become popular for their high quality coral reefs, variety of commercial fish species and beautiful sandy beaches. The main village, Kampung Pasir Hantu, is located in Pulau Perhentian Kecil which has a population of approximately 1,200 residents, the majority of whom are Malays (District Office of Besut, 2010).

Although, tourism started in the 1960s, it has expanded significantly over the last decade. Tourism has become the island's main economic activity. Statistics on tourist arrivals show an increased trend, from 51,000 in 2004 to 90,000 in 2011. Majority of the island inhabitants are involved in tourism-related activities, between March and September. However, during the monsoon season, from

**Table 1: Socio Demographics of Pulau Perhentian communities**

Item	Percentage (%)	Item	Percentage (%)
<b>Household size</b>		<b>Age</b>	
1-3	39.8	Up to 30	22.6
4-6	32.3	31-40	30.8
> 7	27.8	41-50	22.6
		>51	24.0
<b>Education level</b>		<b>Occupation</b>	
Non formal	32.3	Fishing	3.8
Primary	47.4	Tourism related businesses	71.4
Secondary	18.1	Petty trading	18.8
Tertiary	2.3	Others	10
<b>Main source of income</b>		<b>Income from Tourism related business</b>	
Fishing	1.5	<RM500	1.2
Tourism related businesses	82.0	RM500-RM999	18.1
Petty trading	10.5	RM1000-RM2000	31.4
Others	6.0	>RM2000	49.4
<b>Affiliation with Agencies</b>			
Agricultural Research	12.2		
Security/ Health	22.0		
Fishermen/Boatmen Society	29.3		
Reef Check/Nature Conservation	22		
Fishermen Cooperative	14.6		

October to February, almost all resorts, restaurants and shops on the islands are closed for tourists and the main activity during this period is limited to boat services to and from the islands. There are only twelve, licensed full-time fishers in Pulau Perhentian, although majority of the household heads *who are artisanal fishers* are involved in fishing during the monsoon season. Fishing within the 1-2 nautical miles of the island, the fishers use small and relatively low powered boats with an average engine of 40 horsepower. Three types of fishing gear, namely hook and line, traps and gill/drift nets are commonly used by the artisanal fishers. However, each gear type has a number of different designs and sizes to catch specific types of fish species.

The local communities in PP are dependent, directly or indirectly, on the natural resources within the MPA where the conservation of marine ecosystem is undertaken. It is pertinent that, to obtain support for the governance of the MPA, the local communities must believe or perceive a synergy between conservation and usage of the resources that positively affect their livelihoods. If the communities are persuaded to recognize that the establishment of the MPAs to conserve the marine ecosystem is not at the expense of or abusing the cultural system of the communities, the roles of governance of the MPAs will be fully supported. The communities must be convinced that the first beneficiaries of the establishment of the MPA project must be the local communities. The concept of governance of the MPAs thus must project the beneficial interaction between conservation of the marine resources and socio-economic development of the communities.

## **2.2. Data collection**

Focus group discussions with key informants were carried out, to gather general information on the histories of the research sites, changes in the resource conditions over time, general perceptions regarding fisheries and environmental resources conservation, as well as other major issues related to the management and governance of MPAs. The stakeholders involved in the focus group discussions included village leaders, MPA managers, officers from the state and federal government departments and agencies such as the Department of Fisheries Malaysia, Fisheries Development Authority Malaysia, Marine Park Department of Malaysia, Terengganu state economic and development agencies, fishermen association representatives, tourism industry operators, researchers, local leaders, and representatives from non-governmental organizations.

Primary data, particularly on the perception of MPAs' management effectiveness of governance aspects were also collected from face-to-face interviews with stakeholders using a structured questionnaire. The respondents included locals who were familiar with and were knowledgeable about the situations of the research sites. They were grouped into two main strata which included the resource users such as fishers, local residential communities and tourism-related business operators such as traders, chalet operators, tourist guides, boat transport operators and tourism workers. Stratified random sampling method was used to select 140 sample respondents separately for Pulau Perhentian, out of which 133 were useable respondents.

## **2.3. Factor Analysis**

The factor analysis technique was used in this study to reduce large number of variables (39) into a few interpretable underlying latent variables or factors (Hair et al., 1998). Factor analysis assumes the existence of a few common factors driving the variation in the data, while principal component analysis does not. These methods are used after conducting surveys to "uncover" the common factors or obtain fewer components to be used in subsequent analysis. The key concept in factor analysis was that all the observed variables had similar patterns of responses due to their correlation with the factors (Habing, 2003). The principal components analysis was often preferred as a method of data reduction, while factors analysis was often used in the analysis to detect structure or to classify variables. Hence, the principal components analysis was used to construct the indicators in this study.

# **3. RESULT**

## **3.1. Indicators of Governance of MPAs**

The results of the Exploratory Factor Analysis (EFA) are presented in Table 2. The EFA used varimax rotation matrix, which produced 6 factors that formed the Indicators of the MPA management. The reliability of the governance variables was accepted as indicated by the KMO value of 0.68 and the Barlett's test being significant with a Chi square = 855.41 at 5% level of significance. The 6 factors for the Indicators of governance included 17 variables, which accounted for 57.67% of the total variance in the data set. The criteria used for the selection of the factor was Eigen value >1.0; only variables that had factor loadings of 0.5 and above were included in each selected factor (Stevens, 2002).

**Table 2:** Perception of Communities on Indicators of Governance of MPAs

<b>Construct</b>	<b>F1</b>	<b>F2</b>	<b>F3</b>	<b>F4</b>	<b>F5</b>	<b>F6</b>	<b>Score</b>
Local people's view should be considered in making MPA decision	.83						0.383
Local people are willing to participate in implementing MPA rules	.78						0.346
Local people have participated in making MPA decision	.75						0.271
Government has adequate funds for monitoring of MPA		.80					0.592
MPA boundary is clearly demarcated		.76					0.378
Conflicts reduced due to clear demarcation of MPA area		.71					0.354
Government agencies are effective in MPA management			.78				0.408
Enforcement of MPA rules are adequate			.73				0.406
Use conflicts are reduced due to better enforcement			.58				0.322
Local people are aware of the rules and regulations to protect MPA				.63			0.413
Local people are aware of local MPA management plans				.59			0.407
Tourism operators cannot operate their business without permit/ license				.55			0.387
Existing MPA regulation hampers ecotourism activities					.76		0.414
Tourism rules are acceptable to local community					.72		0.392
Local people are aware that excess tourism damage environment of MPA					.59		0.323
Local people who broke the rules have been punished						.57	0.327
Generally people do not break rules						.54	0.268
<b>Eigen value</b>	<b>2.93</b>	<b>2.09</b>	<b>1.68</b>	<b>1.56</b>	<b>1.20</b>	<b>1.06</b>	
<b>% Variance explained</b>	<b>15.62</b>	<b>11.41</b>	<b>9.42</b>	<b>8.63</b>	<b>6.72</b>	<b>5.87</b>	
<b>Cumulative % Variance explained</b>	<b>15.62</b>	<b>27.03</b>	<b>36.45</b>	<b>45.08</b>	<b>51.80</b>	<b>57.67</b>	

Factor 1: Involvement in Decision Making Process. This Factor 1 was named as “Involvement in Decision Making Process” of the local communities. The factor consisted of 3 variables explained 15.62% of the variance in the data set. The communities were concerned with the inclusion of their views in the decision making process for the MPA. They indicated that through their JKKK, they were willing to participate in the implementation of the MPA rules. As the tourism-related businesses became the dominant economic activity for this community, within the village area, the elected representatives were well represented in the management planning committees. Some of the villagers have voiced out their concerns as there were operators in other parts of the island who were not locals; thus the villagers feared that these non-locals may not have been included in the decision making committees.

Factor 2: MPA’s Boundary. This factor accounted for 11.41% of the total variance. It has been found that 65% of the local people agreed that the boundaries of MPA were clearly demarcated since it was shown in the MP policy map; on the other hand 63% also feel that boundaries of MPA were not clearly demarcated in the open sea which may be the main cause of use conflicts between the fishers and the ecotourism operators (Tai et al., 2013). The common criterion in Factor 2 was the information available to the local communities; although the fishermen and tourism operators felt that they could get the information without much difficulties from the agency, some of the information like the boundaries of MPA were not easily identifiable in the open sea, simply because it was not practical to place the boundary indicators. The local communities feel that with the knowledge of the general boundaries of the MPA, they would not normally encroach into the restricted zone for their tourism activities. The Department of Marine Park was there to help resolve any misunderstandings that may have risen due to misinformation or impracticality of the issues.

Factor 3: Enforcement of Rules and Regulations. Factor 3 relates to the enforcement of rules and regulations in the MPA and accounts for 9.42% of the variance. It is thus named as “Enforcement of Rules and Regulations”. The communities were supportive of the roles of the agency in enforcing the rules in the protected area; this was supported by a slight majority of the community members

who felt that the conflicts that arose were not due to poor enforcement of the rules but may be caused by other factors. They (60% of the members) believed that the existing rules and regulation were sufficient to control the damage caused by pollution originating from the tourism facilities (Tai et al., 2013)

Factor 4: Awareness of Rules and Regulations. This factor is made up three variables; it explains 8.63% of the variance in the data set. The variables are associated with the communities' awareness on regulations of the various agencies. Although generally the communities adhered to the rules set by the government, a small proportion (28%) felt that there were still members who bent the laws; they felt slightly apprehensive on the strict requirements for permits to even operate petty businesses like beverage stalls; nonetheless, a majority of them (82%) agreed that operators must obtain the necessary permits or licenses to operate tourism-related businesses, since many tourists to the island were international tourists. Permits or licenses for business operations may be obtained from local councils, like the District Office (business license), Marine Department (passenger boat permits) and Fisheries Department (recreational fishing permits). The requirement to obtain permits and licenses to operate the businesses would enable controls and monitoring by the relevant agencies. These are also sources of income for the local government.

Factor 5: Tourism Regulations. It accounts for about 6.72% of the total variance and comprises of three variables. The factor is named as "Tourism Regulations" since the variables can be interpreted as protecting resources and ensuring the safety of visitors to the islands. Variable one is concerned with the impacts of the existing regulations on the ecotourism activities; the communities are divided between the negative effects (52% perceived that the regulations were hampering their activities) and the positive effects (42% feel that the regulations did not hamper their ecotourism activities). Those who felt that the regulations had negative effects were viewing in terms of reducing accessibilities to dive spots and other marine-based activities. Nonetheless more than 76% of the members of the communities accepted the regulations (limiting the development of chalets and restaurants) in the island as a means to protect the marine resources. About 54% of the members of the communities were also aware that if the tourism activities were not controlled it would result in damages to the environment of MPA. Relatively, the tourism activities are abundant in PP, thus a slightly bigger percentage of the communities feel that the tourism activities must be monitored to avoid damage to the resources in the MPA (Tai et al., 2013).

Factor 6: Compliance of MPA Rules. This factor explains 5.87% of the variance. Factor 5 contains two variables which suggest that the communities do follow the rules and regulations formulated by the relevant agencies. The communities did not deny that there were still some people who got away with breaking of the rules and regulations; as shown in the analysis, a slightly higher proportion of the communities on the island (64%) were upset by this situation. On the other hand, a higher proportion of the communities (75%) felt that the relevant government agencies were managing the MPA effectively. They felt in most cases, the lawbreakers did not get away scot free.

#### 4. CONCLUSIONS

It is a necessary condition that the communities affected by the establishment of the MPAs must give supports to the relevant agencies in order to ensure that the management of the MPAs become more effective. The supports on the governance of the MPAs are reflected in the forms of the communities positive perceptions on the ways the relevant agencies execute their functions and the readiness of

the communities to obey the rules and regulations formulated by the government to protect the resources. It is even more crucial that in the decision to establish the MPAs, communities who are living in close proximities of the boundaries of the MPAs be involved in planning and management so that the communities will have the sense of ownerships of the resources and thus strive to ensure the long term success of the conservation efforts (Nair, Ramachandran, Shuib, Syamsul and Nair, 2012). Future research should delve into the details and levels of involvement of communities in the formulation of the management plan and management practices.

The effectiveness of MPA management involves the degree in which the stated MPA objectives are being achieved by management actions. The management performance may in turn be directly or indirectly influenced by various biophysical, socioeconomic and governance factors (Pomeroy, Lani, John, Gonzalo, 2005). In order to assist the management of MPAs, an evaluation of these factors must be documented to provide a report on the progress to policy makers and stakeholders. The report may help to facilitate the identification of specific challenges so that strategic improvements in MPA management can be applied. In addition, public trust and support can be strengthened when local stakeholders and community members are involved in the review and assessment, in turn raising the visibility and credibility of the MPA management.

The perceptions of the local communities on the governance of the MPA are useful in effecting the management of the MPAs. This study has shown that:

- Clear demarcation of the MPA boundary, strict enforcement and compliance with regulations, and the participation of local stakeholders are important governance factors that influence the management effectiveness of the MPAs.
- Stakeholders prefer to know clearly the boundaries of the MPAs so that they will not easily transgress into the protected areas, will not contravene rules and regulations but will encourage compliance to help in reducing resource use conflicts and will ensure that the regulations are enforced effectively.
- In addition, creating separate zones within MPAs for specific activities would likely create opportunities for special interest groups or stakeholders to participate in the relevant specific activities. This alternative will encourage more local stakeholders to participate in MPAs' management decision making, particularly with respect to decision making on the zones relevant to their main livelihood activities.
- Strictly enforced rules and regulations as well as better fisheries resource protection are likely to encourage higher compliance with the regulations and more positive views of local stakeholders with regards to the effectiveness of MPA management. These will increase their willingness to participate in the decision making process of MPA management.

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## REFERENCES

- Arnason, R. (2000). Marine Reserves: Is there an Economic Justification? In R. Sumaila (Eds.), *Economics of Marine Protected Areas* (pp. 19-31). Vancouver, B.C., Canada: Fisheries Centre, University of British Columbia.
- Department of Marine Park Malaysia. (2011). *Marine Parks in Malaysia*. Malaysia: Ministry of Natural Resources and Environment.
- District Office of Besut. (2010). *Development of the Tourism Sector in Besut District (Pembangunan Sektor Pelancongan Daerah Besut)*. Besut, Terengganu: Office of the District Officer.
- Embun, M. (2010). Top Dive Spots Closed due to Coral Bleaching. *Reef Check Malaysia Newsletter*, 2.
- Habing, B. (2003). *Exploratory Factor Analysis*, University of South Carolina. Retrieved from <http://people.stat.sc.edu/habing/courses/530EFA.pdf>.
- Hair, J. F. Jr., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate Data Analysis* (5<sup>th</sup> edition). New York: Prentice Hall.
- IUCN. (2006). *Evaluating Effectiveness: A framework for assessing management effectiveness of protected areas* (2<sup>nd</sup> Edition). Switzerland: IUCN.
- Kooiman J., & Chuenpagdee, R. (2005). Governance and Governability. In J. Kooiman, S. Jentoft, R. Pullin & M. Bavinck (Eds), *Fish for Life, Interactive Governance for Fisheries* (pp. 11-25). Amsterdam: Amsterdam University Press.
- Kooiman, J. (2008). Governability: A conceptual exploration. *Journal of Comparative Policy Analysis*, 10(2), 171-190.
- Nair, M. B., Ramachandran, S., Shuib, A., Syamsul, H. M. A., & Nair, V. (2012). Multi-Criteria decision making approach for responsible tourism management. *Malaysian Forester*, 72(2), 135-146.
- Noël, J. F., & Weigel J.Y. (2007). Marine Protected Areas: From conservation to sustainable development. *International Journal of Sustainable Development*, 10(3), 233-250.
- Pomeroy, R., Lani M. W., John E. P., & Gonzalo A. C. (2005). How is your MPA doing? A Methodology for Evaluating the Management Effectiveness of Marine Protected Areas. *Ocean & Coastal Management*, 48, 485–502.
- Prabhakaran, S., Nair, V. & Ramachandran, S. (2016) Community participation in mitigating marine waste to reduce climatic change in tourism destinations. *Worldwide Hospitality and Tourism Themes*, 8(5), 569 – 57.
- Reef Check Malaysia. (2011). Reef Check surveys. *Reef Check Malaysia Newsletter*, 2011 – 01.
- Stevens, J. (2002). *Applied Multivariate Statistics for the Social Sciences* (4<sup>th</sup> Edition). Mahwah, NJ: Lawrence Erlbaum Associates.
- Tai, S. Y., Kusairi, M. N., Ahmad, S., Gazi, M. N. I., Aswani, F. M. N., & Ahmad, A. (2013). *The Value and Effectiveness of Marine Protected Areas as a Management Tool of the Management of the Seas of Malaysia*. Research Report Submitted to the Department of Fisheries Malaysia, and IKDPM, UPM.
- Wilkinson, C. (2004). *Status of Coral Reefs of the World: 2004*. Townsville, Queensland, Australia: Australian Institute of Marine Science.
- Wilkinson, C. (2008). *Status of Coral Reefs of the World: 2008*. Townsville, Australia: Global Coral Reef Monitoring Network, Reef and Rainforest Research Centre.