Income Risk Vulnerability and Perception towards Conservation: A Community Level Analysis for PulauSibu -TinggiMarinePark, Mersing

(Risiko Pendapatan dan Persepsi ke arah Pemuliharaan: Analisis Terhadap Komuniti Taman Laut Pulau Sibu-Tinggi, Mersing)

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ABSTRACT

This paper seeks to examine the trade-off between conservation and the incidence of poverty among the marine park community in the Sibu-Tinggi Marine Park, Mersing, Malaysia. The aim of this study is to look at the magnitude of income variation (vulnerability) as environmental constraints are imposed and determine the factors that may mitigate such risk exposure in the community. This study enables policy makers to formulate better marine diversity conservation policies through the designation of marine parks.The fundamental question is how variation in income (across households and across alternative incomes) represents the revenue instability that may affect the sustainability of the community's daily livelihood. In light of mandatory marine park regulations, the community will be deprived of basic access to marine resources within 2 nautical miles of the nearest shoreline. In addition, the tourism sector may provide an alternative income option which may be lucrative enough to supplement their existing livelihoods. Nevertheless, the inability to gain access to capital and marketing channels will impede these opportunities as physical and financial infrastructure remain lacking and under provided for. Given such constraints, will the community be able to adapt to marine park regulations and if they do, what are the costs they have to pay?

Keywords: Growth, distribution, environmental balance, ecosystem, marine parks areas.

ABSTRAK

Kertas ini ditulis bertujuan meniliti konflik antara usaha permuliharaan dan masalah kemiskinan yang dihadapai oleh komuniti Taman Laut Sibu Tinggi, Malaysia. Kajian ini cuba menilai kesan pelaksanaan dasar pemuliharaan taman laut ke atas tahap pendapatan komuniti. Sehubungan itu, perbincangan akan juga mengenalpasti beberapa faktor yang boleh mengurangkan risiko turun naik pendapatan yang melampau di kalangan penduduk tempatan. Kajian ini cuba menyarankan rangka kerja dasar taman laut yang boleh digunakan untuk memulihara biodiversiti kawasan taman laut. Persoalan pokok yang ingin diketengahkan ialah bagaimana sumber pendapatan isi rumah terdedah kepada turun naik yang melampau dan kedudukan ini akan menjejaskan kehidupan seharian komuniti berkenaan. Dasar Taman Laut menyebabkan komuniti tidak lagi mempunyai akses kepada segalas umber yang berada dalam 2 batu Nautika dari kawasan persisiran. Sektor pelancongan boleh dibangunkan sebagai alternatif yang terbaik untukmeningkatkan tahap sosio-ekonomi penduduk tempatan. Walaubagaimanapun, ketiadaan akses kepada modal dan kepada faktor pasaran merupakan hambatan utama di samping ketiadaan infrastruktur fisikal dan kewangan. Berdasarkan kepada kekangan berkenaan, apakah komuniti dapat mematuhi peraturan taman laut dan apakah pula kos yang terpaksa ditanggung oleh komunti berkenaan?

Katakunci: Pertumbuhan, agihan, kesimbangan alam sekitar, ekosistem, kawasan taman laut

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INTRODUCTION

The economic value of natural ecosystems is increasingly recognized by scientists and policymakers. What is increasingly clear, however, is that natural ecosystems are under enormous pressure around the world from the growing demands placed on them by human economies. Growth in human populations and prosperity increases demand for ecosystem inputs and increased pressure on the capacity of natural ecosystems. It has often been argued that a major reason for our failure to conserve natural ecosystems is that we do not realize how valuable they are. Conserving ecosystems may also involve foregoing certain uses of these ecosystems and the benefits that would have been derived from those uses. We are asking more and more from natural ecosystems even as we reduce their capacity to meet our needs. The economic value of natural marine parks has had considerable impact on recent analysis and discussions on public policies concerning the cost and benefit of conserving marine parks under federal agencies such as the Department of Marine Park, Malaysia.

There has been extensive debate about the effectiveness of Marine Park Areas (MPA) as conservation strategies that contribute to the sustainability of marine resources. The debate focuses largely on the MPA'sability to achieve management objectives given the challenges faced in areas where the many factors contributing to marine biodiversity degradation are beyond the control of MPA managers. For example, many MPAsare threatened by pollution beyond their control especially from atmospheric, terrestrial and oceanic sources. Some may have been successful in controlling terrestrial pollution,but atmospheric and oceanic pollution is trans-boundary or large scale and mitigation measures can be costly or almost impossible. Given such complexities, of 1,306 MPAs surveyed worldwide, only about 31% of these believe that they have been able to achieve the management objectives stipulated in their respective management plans (Jameson et al. 2002).

It is thus crucial to examine the objectives of the formation of a MarinePark, which might include:

- to afford special protection to aquatic flora and fauna, and to protect, preserve and manage the natural breeding grounds and habitats of aquatic life with particular regard to species of rare or endangered flora and fauna
- to allow for the natural regeneration of aquatic wildlife where such life has been depleted
- to promote scientific study and research
- to preserve and enhance the pristine state and productivity of the environment
- to regulate recreational and other activities in order to avoid irreversible damage to the environment

Current research on MPAs has focussedon two areas. On one hand, a rich literature has developed describing the potential ecological *benefits* of an MPA notably in terms of ecosystem health, biodiversity and greater long-term fish harvests (Roberts et al. 2001). The focus on ecological factors reflects the fact that MPAs have largely attracted the attention of natural scientists, while the emphasis on the benefits of MPAs reflects a sense that the implementation of MPAs is generally a positive move from an ecological perspective. The other major direction in the literature deals with the *process* by which an MPA is developed and implemented, and the policy issues involved. This literature on *process* is substantial

largely because it deals with the need for conflict resolution in MPA design, which reflects the reality that is put into practice; there is often opposition to the implementation of an MPA (Roberts et al. 2001). The existence of these two trends in MPA literature, one highlighting the potential *benefits* of MPA, and the other the need to deal with *opposition* to the MPA, raises a natural question: If MPAs produced only benefits, why would there be opposition to their introduction? The answer, of course, is that the implementation of an MPA, like human actions of any sort, produces both benefits *and* costs. Furthermore, these benefits and costs do not appear uniformly: some stakeholders may benefit more than others, while some may incur higher costs than others. What is more, both benefits and costs may appear at different stages over time. The importance of addressing such matters is now clearly recognized. Indeed, while the successful development and implementation of an MPA certainly involves technical and knowledge-based matters (e.g., optimizing MPA design from an ecological perspective), perhaps the dominant challenge lies on the human side, in dealing with the various connections between the MPA, ocean users and coastal communities, and in optimizing the overall benefits obtained by society (McClanahan 1999).

Malaysia took a step in conserving marine diversity through the designation of marine parks under the Fisheries Act 1985 (Act 317) amended in 1993. Currently, the total area of the 40 marine parks is reported to be 569,447.7 hectares and is currently managed by the Department of Marine Parks Malaysia (DMPA). The DMPA, set up 1997, is the federal agency responsible for the management of MPAs, while state agencies and local development authorities complement their role in an attempt to ensure the conservation and sustainable use of marine biodiversity (Ahmad 2002). Nevertheless, primary threats still include declining fish stocks and the exploitation of breeding grounds, loss of habitat for marine life and destruction of coral reefs, habitat degradation and the degradation of water quality. for the causes of these threats might be weak enforcement by the responsible agencies, but some external factors are beyond the jurisdiction of marine park management. The tourism industry which emerged as a million dollar industry is central to the success of marine park management as industry investors would wish for mass tourism on the back of the limited carrying capacity of MPAs (Cabanban & Nais 2003).

The establishment of MPAs in Malaysia to enhance marine diversity conservation has somewhat affected the economic situation of the local communities (Yaman 1993). They are, for example, now less dependent on fisheries and more dependent on tourism. While the income from the tourism sector is welcome, there is still residual tension among the local communities concerning the limitations imposed on them by marine park regulations, primarily the prohibition of fishing within the two nautical mile limit of the MPA, an area which is traditionally used by self-subsistence fishermen. The communities inhabiting the coastal area or MPA find themselves facing a cruel paradox. On the one hand, the coastal ecosystems on which many of them depend are affected by increasing levels of degradation caused by a range of human activities (such as unsustainable fishing practices, pollution and mining) and environmental trends (such as climate change and natural disasters). These processes affect the livelihoods of coastal dwellers dependent on these ecosystems, particularly the poor who often have limited alternatives at their disposal, leading to declining living standards or forced migration. In some cases, local resource users are themselves at least partially responsible for some of this degradation, but often the causes are beyond their control.

On the other hand, efforts to manage, protect and conserve these ecosystems more effectively often involve preventing or limiting the access of some or all local resource users

to the resources they depend on for their livelihoods. Protecting these ecosystems clearly generates benefits for society as a whole and for future generations by ensuring that they are sustainable, and that the services and benefits that they provide will continue to be available in the long term. However, from the point of view of local resource users, particularly the poor, the impact of such protective measures in the short term are potentially even more serious than the gradual decline of resource access that results from ongoing processes of ecosystem degradation. The introduction of new forms of management of protected areas – such as Marine and Coastal Protected Areas (MCPAs) – can constitute a sudden shock where people find themselves denied access to resources that provide them with a key part of their livelihoods. For the poor, such shocks can be particularly severe as their capacity to adapt to sudden change is limited, and they will often find themselves facing either greater levels of poverty, or attempting to circumvent new restrictions on resource use in order to continue to exploit coastal eco-systems as before. Even if the poor recognise the long term benefits of better management, the day-to-day necessities of finding a means of livelihood from the limited choices available to them often mean that they are forced to ignore long-term benefits in favour of short-term necessity. In extreme cases, this can lead to the "criminalisation" of the livelihoods of the poor, adding greater risk to their livelihood strategies, which are often already precarious, and ultimately deepening their poverty. Like all changes, new conservation efforts can represent either a threat or an opportunity for local resource users.

Communities living in MPAs in Malaysia are often poor; they have fewer assets and limited or non-transferable capabilities, and have difficulties dealing with institutions and accessing services they need (Cabanban & Nais, 2003). For these people – members of fishing communities, the elderly and infirm, the uneducated andindigenous people –coastal resources are often an important safety net that provides a means of living when other sources of livelihood fail and the introduction of management measures can be a disaster. Many are forced to ignore new measures and bypass regulations in order to survive. In situations where people are unable to adapt to changes in resource access, they are likely to find that their livelihoodsare reduced as a result of ecosystem protection and conservation. It has long been recognised that measures to protect coastal and marine ecosystems can only work if the people who depend on those ecosystems are compensated for losses to their livelihoods as a result of new management measures. Thus, communities living within the marine parks areas will have to begin to engage in services related sectors such as tourism, retailing and small business related to tourism sector.

MATERIALS AND METHODS

Survey Instrument

This study was conducted between July 2009 and February 2010. 320 interviews were conducted in and around 3 MPA sites (Redang, Tioman and Sibu-Tinggi).This study was based on 10% of the total sample.. To determine a desirable sample size for the study, we assumed that the acceptable margin of error was limited to around +/- 5% with a confidence level of 95%. The 95% level is usually selected when one wants to be reasonably confident of the outcome. The confidence level shows the likelihood that the selected sample is large enough so that statistical results concerning welfare characteristics fall within the specified margin of error.

Reliability and Validity

A pilot study was done to test the questionnaire and the feasibility of the study. Potential problems were identified and resolved before commencing the study. The information gained was used to improve the instrument where applicable. The pilot study was conducted on a small group of people. The findings of the pilot study assisted the investigators in the removal of questions that were considered to be vague or unclear to the participants.

Data Collection

The data used here is based on surveys conducted during community meetings that were conducted during workshops for the community. Several workshops were conducted as part of the consultative management approach adopted by the Department of Marine Park Malaysia (DMPM) in collaboration with the United Nation's Development Program (UNDP). Surveyswere conducted during the socialization phase of the study where consultants engaged the community in dialogues and discussionsto introduce the concept of conservation through marine park strategies. Sampling was done through the convenience method where non-response bias was minimised by having enumerators conduct direct conversations with the sample. The analysis was based on questionnairesgiven to the community participating in the Marine workshops conducted from July 2009 to February, 2010. To prevent non-response bias direct interviews were also conducted among the community while the guide and lead method was used to ensure correct and complete information from participating respondents.

Demographic Characteristics and Site Description of the Study Area

Table 1 shows the physical description and carrying capacity of the area which includes the main island of Redang, Tioman and Sibu-Tinggi and covers a total area of 18,019ha. A total of 221 coral reefs have been identified in these three MPAs including 67 species not previously reported from Malaysia. This figure represents about 80% of the number of species identifies in an equivalent area in the "Coral Triangle", which is known to have the greatest coral diversity on earth. One species of coral which is new to science (from the genus Labophyllia) was collected while four species were found which were previously thought to be endemic to other countries.

Statistical analysis

The magnitude of vulnerability in income constitutes one of the risk factors among the marine park community. This vulnerability is further enhanced by seasonal changes in income as tourist arrivals follow certain seasonal peaks and lows. The model attempts to measure the exposure in terms of income variability among respondents who have multiple incomes generating activities as a means to sustain their livelihood.

Table 1: MPA - RSTS: Physical Description and Carrying Capacity

MPA	Size	Location	Population		Land Availability	Carrying Capacity
P.Redang	2,483.58 ha	5°43-5°49(N/Lat) 102°59-103°02(E/long)	1996 2015(F) Mean rate	1,200 2,970 4.78%	125.4	4200*
P. Tioman	13,509.42	2°54-2°42(N/lat) 104°05- 104°14(E/Long)	1996 2015(F) Mean rate	2,134 5,017 4.0%	145.67	20,400*
P.Tinggi	**1524.14ha**	**2° 17'-2°19" (N/ lat) 104° 05-104° 09" (E/long)**	**1996 2015(F) Mean rate**	**441 385 5.6%**	**158.87**	**7,704***
P. Sibu	**503.29ha**	**2°10'-2°14(N/lat) 104° 03'- 104°06(E/Long)**	**1991 2015(F) Mean rate**	**280 459 5.6%**	**142.3**	**3360***

Source: Ministry of Local Government, Malaysia (GOV, 2010)

Model Specification

We apply simple statistical analysis to treat risk exposure and vulnerability among income earners. The equation was based on the following specification:

$$Risk/impact = \alpha_1 + \beta_2 Age + \beta_3 edu + \beta_4 dum(1 = tourism\ related\ \sec tor, 0\ otherwise)$$
$$+ \beta_5 asset + \beta_6 productivity + \varepsilon(error)$$

Assets and Opportunities

Wealth indicators have been included in the questionnaire to derive more information about the level of wealth of the respective households. Besides income, specific information was retrieved on the characteristics of housing and luxury items present in the household. The subjectivity and uncertainty involved in combining income, housing and luxury items into one composite welfare indicator led to the separate analysis of the each welfare variable.

RESULTS AND DISCUSSION

The question of economic vulnerability is an important issue as the group is likely to fall below the poverty threshold level and a direct policy instrument needs to be put in place to address the problem. In the model, age and the level of existing assets increase economic risk in the community. The age factor can be explained in terms of income reduction while the existing level of assets (too low) may expose an individual to income variation and economic vulnerability. The prime factors affecting the economic vulnerability of the community are shown in Table 2. However, factors such as education, employment in main sectors such as tourism as well as the doubling of asset size may mitigate the degree of vulnerability in income. With regards to tourism, many operators have vertical and horizontal integration within the industry and this could be why tourism might be a good "hedge" against income variation. Alternative livelihood programs may also wish to focus on skills training (education), involvement in tourism and service sectors as well creating

access to capital and financial means to build up the household's existing assets. Alternatively, because of continued heavy dependence on marine resources, a viable zoning area may support community accessibility to natural capital as many are in favour of community based economic zones as an alternative to no-take zones within the MPA . In line with that option, about 58% of the fishermen sampledwere quite willing to selectalternative income generating (AIG) as a means to sustain their livelihoods.

Employment in Tourism Related Fields

About 20 respondents (resort operators, transport services, catering) reported their involvement in tourism-related sectors in which the average participation in the industry was about 4 years; some had joined the industry forjust a year, and there were about 10 who had been in the industry for a maximum period of 15 years (Table 2). The average income of the respondentswho depended on tourism-related activities was between RM1,000-RM1,500 per month while about 57.1% earned an average income of RM501 – RM 1,001.

Table 2: Parameters for risk and income vulnerability (Sibu-Tinggi, Mersing)

Variables	Mean	Max	Min	SD	Coefficient	p-value
Intercept					-0.56238	0.88
Age	9.5	60	30	9.5	0.133774+	0.003
Sector(Tourism=1, 0-Otherwise)	0	1	0	0.49	-2.88477+	0.005
Education	11	16	7	3.05	-0.04226	0.65
Asset	8,543	75000	1000	20290	0.00051	0.47
Productivity++	9543	31360	1000	8568	0.0005	0.10

+ Significant at alpha = 0.05 level
++ Negative coefficient (but not significant) for the whole sample (3 sites)

However, a sizeable 14.3% earns an average income of RM1,500 – RM2,000 per month and about 4.8% earn more the RM2,000 per month. Economic income is clearly very diverse in range and this could be associated with the scale and size of business operation. The dominant business structure was based on family ownership of which about 85% of local business entities were based on spouse/sibling/children partnerships; the dominant entity of business operations. In terms of total assets, about 65% of the sample owned total assets below RM10,000; a strong indicator that many local businesses are represented by small scale business entities (Table 3).

Table 3. Level of income, asset and respective percentage

Level of Income	Percent	Asset	Percent
Less than RM500/month	60	Less than RM 10,000	65
RM 500- 1,000	20	RM 10,001- RM25,000	20
RM 1,001- 1,500	15	RM 25,001- RM50,000	10
RM 1,501- 2,000	5	More RM 10,000	3
RM 2,001- 2,500	5	More RM 50,000	2

Surprisingly, many operators considered low paid up capital as an obstacle in starting a business, where about 60% of the operators claimed that despite low paid up capital, starting the operation could be difficult as the accessibility to capital is limited and restricted. In line with such outcomes, about 10% of the operators have complete ownership over business premises while about 90% operate based on rent and lease conditions. The small entity may also affect income levels as almost 60% of business operators fall within the income range of RM501 –RM2000 per month. Thus, the ability to complement income through alternative economic activities or business diversification strategies may thatimprovesand sustain future income prospectsamong the community. In this regard, almost 60% of the respondents agreed to the need for short courses and business modules that can help them to stay competitive and become market players in the industry. Almost 85% of those in business are in favor of cooperative models of business operation and this may be due to the close-knit family ownership that represents the dominant business entity among the islanders. Despite the strong need for external resources (quite apart from reinvestment capital from the current business), the ability to access external sources of funds for future business expansion remain problematic and difficult. Many operators admit that the amount of capital needed may not be high as it corresponds to the relatively small size of their business entities.

Almost 70% of the respondents believe that despite the small capital needs, many cannotafford to self-financea start-up. Interestingly, government support has been low as about 73% of the respondentsdid not request government help, the prime reasons for doing so include: (a) lack of opportunity to develop a relationship with the potential creditor, (b) delay or longer approval period, (c) lack of knowledge of the process required (d) the need for risk free collateral and the inability tocomply with the terms and conditions of a business loan and (e) a lack of understanding by the creditor of the cost involved.

Alternative Livelihood (AIG)
The presence of alternative or secondary incomesources among the local community portrays their willingness to adapt to environmental constraints introduced through conservation strategies adopted by marine park areas. Almost 57% of the total respondents have engaged in alternative income generating activities. The alternative livelihoodsmay also includesmall retail, handicraft, catering services which do not involvedany direct utilization of natural resources.Similar to businesses involved in tourism-related activities, a sizable number of businessesare family-owned. In terms of asset, about 46% of the sample reported owning total assets of below RM10, 000.

In terms of income from AIGs, about 64% of the respondents reported a total income of less than RM500/month whilea sizable number of respondent (4%) falls within the income bracket of between RM15-RM2, 000 per month. Only 2.8% of the respondents have sourced financial support from government agencies or financial support from government agencies compared to 97% who have never solicited financing from these bodies. Because of the unsustainability of existing income patterns, many are quite willing seek alternative jobs especially in sectors such as retail, F & B, boat rental or aquaculture-related activities. However, requests for assistance with fishing gear/equipment rank high in terms of demand and this may be a strong indication that fishing-related activities are popular sources of alternative livelihoods. Assistance in the form of constructing artificial reefs as part of measures to increase catch among the fishermen has been forthcoming. A significant number of respondents (33%) favor the idea of a special community-based

"harvest zone" made up of artificial reefs that can be a lucrative catch area for the local community.

Table 4: Type of alternative employment and size of assets in AIGs

Alternate Employment	No	Size of Asset	No
Chalets (tourism)	5	Less than RM 10,000	15
Chalets and boat renting (tourism)	10	RM 10,000 – RM 25, 000	4
Restaurant/food outlet only	8	RM 25,000 – RM 50, 000	4
Retailing only	3	RM20,000 – RM 30,000	4
Food outlet and Tours	2	Less than RM 10,000	3
Food outlet and boat renting only	2	RM 10,001- RM25,000	1
Boat and equipment renting (tourism) only	2	RM 25,001- RM50,000	1

CONCLUSION

In this study we bring together poverty and environmental issues in marine park areas focusing on environmental sustainability. We use the sustainable alternative livelihood approach as the framework of analysis The intention of this study is to look at the magnitude of susceptibility and identify the factors that may mitigate such risk exposure among the community. We try to investigate some parametersof risk and income vulnerability such as:employment in tourism related income, level of assets, and alternative livelihoods among the marine park community. Our approach in this study enables policy makers and policy implementers to be better informed about poverty and environmental issues through available evidence in the MPAs

Clearly, the emergence of the tourism industry in the MPA does not generate the comprehensive multiplier effect that is expected out of this industry. This conclusion was derived from the income indicator as well as the AIGs discovered in this study. Despite the emergence of a fairly mature tourism industry in the MPAs, the dichotomous nature of the industry may be the prime reason for the low multiplier effect of the industry. If MPAs are meant to balance between protecting the natural environment and economic growth, a fundamental shift is needed to achieve a more systematic and people-centered approach that promotes the community's priorities and capabilities. Realistically, integrated approaches to conservation and development cannot promise win-win solutions. Pure conservation–management strategies seldom deliver perfect conservation outcomes. Thus it is time to look for the best possible outcomes, bearing in mind the principles of equity.

ACKNOWLEDGEMENTS

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