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Growth, Equity and Vulnerability in Marine Park Areas: In Search of Economic-Environmental Balance

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Abstract: This study brings together poverty and environmental issues in the marine park areas focusing on growth, equity and sustainability. This article attempts to use sustainable alternative livelihood approach as the framework of analysis and a marine park area has considered with conservation value. Our efforts put in place to preserve the quality of marine life linking poverty reduction based on environmental concerns in support of sustainable and equitable development in ways that benefit marine life, coastal communities and economies. We analyze to recognize alternative ways that benefit marine park areas, to improve the states of coastal communities and to progress towards the local economy. The aim of this study is to look at magnitude of income variation and vulnerability as environmental constraints and the factors that may alleviate such risk among the poor community. This study finds several extents of susceptibility in the marine park areas and what are the factors that lessen such risk among the poor community. To advocate the study approaches several vital parameters consider such as income related liability, employment in tourism related income, level of asset, income of poor people and their respective percentage and alternative livelihood among the marine park community. This study enables policy makers to formulate better policy in conserving marine diversity through the labeling of marine parks.

Key words: Growth · Distribution · Environmental balance · Ecosystem · Marine parks areas

INTRODUCTION

The economic value of natural ecosystems is increasingly recognized by scientists and policy makers. 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 increased 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 provide 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. Recently the economic value of natural wetlands has had a considerable impact on analyses and discussions of public policies concerning natural wetlands such as marine parks under the fisheries' management. The recognition of the nature by which economic values are determined should be made illegitimate principles of systems following on ecology and economic theory and application should be sound.

There has been extensive debate about on the effectiveness of Marine Park Areas (MPA) as conservation strategies that will contribute toward sustainability of marine resources. The debate focuses strongly on the success of MPA as in terms of achieving the management objectives given the challenge to manage such area where factors contributing toward marine biodiversity degradation have been broad and beyond the control of MPA managers. For example, many of MPA

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have been threatened by pollution outside their control especially through atmospheric, terrestrial and oceanic source. Some may have been successful in term of controlling terrestrial pollution while the atmospheric and oceanic are more of the trans-boundary or international or large scale where mitigation measures can be costly or almost impossible. Given such complexities, of the 1,306 MPA surveyed worldwide, only about 31% of these believe that they have been able to achieve the management objective as stipulated in their own respective management plan [1]. Thus, it remains crucial to look at the purpose of the formation of Marine Park which includes: (a) to afford special protection to aquatic resources and to protect, preserve and manage the natural breeding grounds and habitats of aquatic life, (b) to allow for the natural regeneration of aquatic wildlife where such life has been depleted, (c) to promote scientific study and research, (d) to preserve and enhance the pristine state and productivity of the environment and (e) to regulate recreational and other activities in order to avoid irreversible damage to the environment.

Research to date on MPA has tended to focus in two directions. First, a rich literature has developed describing the potential ecological *benefits* of MPA notably in terms of ecosystem health, biodiversity and greater long-term fish harvests [2]. The focus of that literature on ecological factors reflects the fact that MPA have largely attracted the attention of natural scientists, while the emphasis on the benefits of MPA reflects a sense that the implementation of MPA 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 the *process* is substantially large because it deals with the need for conflict resolution in MPA design, which reflects the reality in practice, there is often opposition to the implementation of MPA (Roberts *et al*., 2001). The existence of these two trends in the MPA literature, one highlighting the potential *benefits* of MPA and the other the need to deal with *opposition* to MPA, raises a natural question: If MPA produced only benefits, why would there be opposition to their introduction? The answer, of course, is that the implementation of 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 successful development and implementation of 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 MPA, ocean users and coastal communities and in optimizing the overall benefits obtained by society [3].

In response to above debated and matters, this paper attempts to use sustainable alternative livelihood approach (SALA) as the framework of analysis for balancing between protected areas and stakeholders needs. The SALA[1] approach (Figure 1) offers a way of addressing the whole range of policy issues relevant to the specific community, such as access to finance, markets, poverty, vulnerability and personal security as well as health and education. This study analyses to look at magnitude of income variation (vulnerability) as environmental constraints and factors that may mitigate risk expose among the community, because poverty issues are moreover emerged when we consider conservation policies in the MPA. As a result the conservation policies, the traditional roles can create a form of paradoxical strategy. This situation is often disguised by the aggregate increase in wealth of the MPA with tourism and recreation industry creating more wealth. It is often the poor who are excluded poverty issues from programmes that intend to focus conservation, as we know that the poor people often depend upon marine resources for subsistence needs. Thus, it is crucial to measure their magnitude of vulnerability following extreme income variation and what are the aspects that resist them within the poverty regime together with instability. Therefore, our novelty of this study is to look at magnitude of income variation and vulnerability in the marine park poor community as environmental constraints and the factors that may alleviate such risk. Our approach and argument in this study enable policy makers better inform the core reason of the vulnerability and volatility through available findings, information and guidelines. This is very much in line with the task of being critical on conditions that facilitate well informed policy making procedures.

[2] Similar framework and approach have been used in other countries such Maldives, Sri Lanka, Caribbean to form the basis for best management practices for the countries marine park

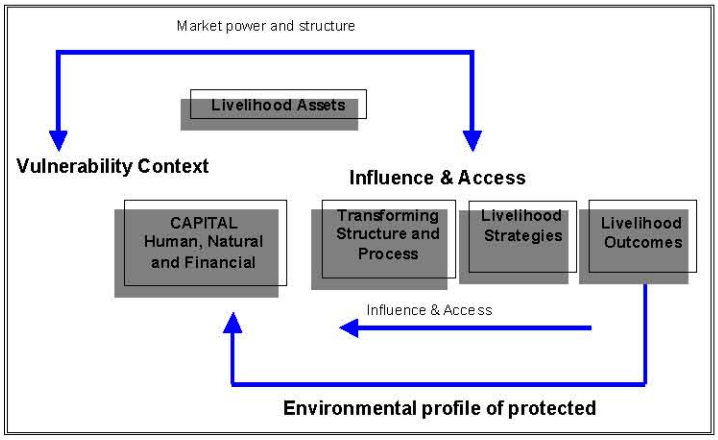

Fig. 1: Sustainable Alternative Livelihoods Approach (SALA) Framework

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 hectare 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 (MPA), while state agencies and local development authorities complement their role in an attempt to ensure the conservation and sustainable use of marine biodiversity [4]. Nevertheless, primary threats as such declining fish stocks and exploitation of breeding grounds, loss of habitat for marine life and destruction of coral reefs and habitat degradation and degradation of water quality. Causes for the threats might be due to weak enforcement by the responsible agencies while some external factors are beyond the jurisdiction of marine park management. The tourism industry which emerged to be a million dollar industry will be central in the success of marine park management as industry investors would wish for mass tourism on the back of the limited carrying capacity of MPA [5].

The establishment of MPA in Malaysia to enhance marine diversity conservation has somewhat affected the economic situation of the local communities [6]. They are, for example, less dependent now on fisheries and more 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 the 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 are affecting the livelihoods of coastal dwellers dependent on these ecosystems, particularly for 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) -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 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 the MPA in Malaysia are often poor; precisely they have fewer assets and limited or non-transferable capacities, faces difficulties in dealing with institutions and accessing the services they need [5]. For these people such as members of fishing communities, the elderly and infirm and the uneducated tribal groups for whom coastal resources are often an important safety net that provide a means of living when other sources of livelihood fail, the introduction of management measures can represent a disaster. To cope with it, many 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 their livelihood outcomes reduced as a result of coastal and marine resource managers and policy makers working on conservation and ecosystem protection. 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 able to be compensated for losses to their livelihoods as a result of new management measures. Over years Malaysian economy has undergone drastic transformation from that of a commodity based to service based economy. At the national level, such changes demand new economic planning and management strategies that can build resilient mechanism for the country.

MATERIALS AND METHODS

Survey Instrument: This study conducted since July 2009 to February 2010. There are 200 interviews were conducted in and around MPA. To determine a desirable sample size for the study, we assume that acceptable margin of error was limited to around ±5% with a confidence level at 95%. The level of 95% 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 the 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. Therefore, potential problems 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 based on the survey conducted during community meeting that was conducted during the workshop session among the community. Several workshops have been conducted as part of consultative management approach adopted by Department of Marine Park Malaysia (DMPM) with collaboration with United Nation Development Program (UNDP). Survey was conducted during the socialization phase of the study by the consultant attempt to engage community through dialogue and discussion in introducing conservation through marine park strategies. Sampling was done through convenient method where non-response bias was minimised by having enumerators conducting a direct conversations.

Table 1: MPA-RSTS: Physical Description and Carrying Capacity for local inhabitants

MPA	Size (ha)	Location	Population	Land Availability	Carrying Capacity
P. Redang	2,483.58	5°43-5°49 (N/Lat) 102°59-103°02 (E/long)	1996 1,200 2015(F) 2,970	125.40	4,200
			Mean rate 4.78%		
P. Tioman	13,509.42	2°54-2°42 (N/lat) 104°05-104°14 (E/Long)	1996 2,134 2015(F) 5,017	145.67	20,400
			Mean rate 4.00%		
P.Tinggi	1524.14	2° 17'-2°19" (N/ lat) 104° 05-104° 09" (E/long)	1996 441 2015(F) 385	158.87	7,704
			Mean rate 5.60%		
P. Sibu	503.29	2°10'-2°14 (N/lat) 104° 03'-104°06 (E/Long)	1991 280 2015(F) 459	142.30	3,360
			Mean rate 5.60%		

Source: [7]

Demographic Characteristic 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 the total an area of 18,019ha. A total of 221 coral reefs have been identified in these three MPA 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 [7]. 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 arrival follows certain seasonal peaks and lows. Our model attempts to measure the exposure in term of income variability among respondent who have multiple income generating activities as a mean to sustain their livelihood.

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. Together with those characteristics we understand the importance of other alternative resources that may involve generating extra income, alternate livelihood prospect, employment and better tourism opportunities in the marine park poor communities and that may improve the level of welfare (i.e. indicators in the model specification such as $\beta_3 edu + \beta_4 dum + \beta_5 asset + \beta_6 asset^2 + productivity$ led to analysing the improvement of overall social welfare variables in the marine park community).

Model Specification: Towards the achievement of the stated objective, the employed methodology of this paper is based on statistical analysis followed by McClanahan, 1999 and Stephen *et al*., 2002, where the structure of economy is analyzed in terms of interrelationships between risk exposure and vulnerability. We apply our analysis to treat vulnerability among income earners in the marine park areas. The equation was based on the following specification:

$$Y = \beta_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \varepsilon$$

Where:

$$Y = Risk, X_2 = Age, X_3 = Education, X_4 = \begin{matrix}1 \text{ if } tourist \\ 0 \text{ if } otherwise\end{matrix},$$

$$X_5 = Asset, X_6 = Asset^2,$$

$X_7 = Asset \times productivity$, abd $\varepsilon = error\ terms$

In our analysis we also assume some dimentions in our dependent variables as *Risk* indicates risk and vulnerability involved among respondent's income, *Edu* indicates the respondent educational level of respondent, X_4 indicates the dummy variable (1 if foreign tourist and 0 if domestic tourist), *Asset* indicates the housing and luxury items possesses by the respondent and *Productivity* indicates the respondent involved with multiple income generating activities.

RESULTS AND DISCUSSION

The question of economic vulnerability becomes crucial as the group is likely to fall below the poverty threshold level and some direct policy instrument needs to be put in place to address such a problem. In our model, age and level of existing asset increase the economic risk among the community. Interestingly, the age factor explained in terms of income reduction while the existing level of asset (too low) expose to income variation and economic vulnerability. The basic facts are figured out is shown in Table 2. However, factors such as education, employment affect tourism and doubling of size of asset mitigate the degree of vulnerability in income. Many of the operators have vertical and horizontal integration within the industry and this may be the reason why tourism being "hedge" against income variation. Alternative livelihood program also wishes to focus on skill training (education), involvement in main sectors as well creating access to capital and financial means to build up existing assets of household. Alternatively, because of the continues heavy dependence on marine resources, a viable zoning area may support community accessibility to natural capital as many were in favour of community base economic zone within MPA. In line with option, about 58% of the sample among fishermen was quite willing to go for alternative income generating (AIG) as a mean to sustain their livelihood.

Table 2: Parameter for risk and income vulnerability

Variables	Mean	Max	Min	SD	CV	Coefficient	p-value
Age	55	88	34	27	49.09	704.8	0.40
Education	8.2	14	1	6.5	79.27	-1202.8	0.10*
Asset	3996	10000	450	4775	119.49	83.22	0.007*
Asset square	30603550	100,000,000	202500	49898750	163.05	-0.0057	0.019*
Productivity	2.78	9.34	0.45	4.445	159.89	-5875	0.53
Dummy veriable	-	-	-	-	-	92.2	0.001*

*Significant at alpha=0.10, SD= standard deviation, CV= cumulative variance

Table 3: Level of asset, income and respective percentage

Level of Income	Percent	Asset	Percent
Less than RM500/month	4.8	Less than RM 10,000	57.8
RM 500- 1,000	57.1	RM 10,001- RM25,000	21.1
RM 1,001- 1,500	19.0	RM 25,001- RM50,000	15.8
RM 1,501- 2,000	14.3	More RM 10,000	5.3
RM 2,001- 2,500	4.8	More RM 50,000	0.0

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

Alternate Employment	Percent	Size of Asset	Percentage
Chalets (tourism)	9	Less than RM 10,000	84.00
Chalets and boat renting (tourism)	2	RM 10,000 - RM 25, 000	13.40
Restaurant/food outlet	13	RM 25,000 - RM 50, 000	2.60
Food outlet, retailing, boat renting, equipment rent	2		
Retailing	15	Total asset owned	
Food outlet	15	Less than RM 10,000	57.80
Food outlet and boat renting	2	RM 10,001- RM25,000	21.10
Boat and equipment renting (tourism)	39	RM 25,001- RM50,000	15.80
Aquaculture	11	More RM 10,000	5.30

Employment in Tourism Related Income: About 20 respondents (resort operator, transport services, catering) report their involvement in tourism related sector in which average participation in the industry is about 4 years while some have joined in the industry for 1 year ago while there are about 10 have been in the industry for a maximum period of 15 years. The average income of respondents who depend on tourism related activities in tourism industry in which average income with the range of RM1,000-RM1,500 per month while about 57.1 earn an average income of RM501 - RM 1,001 per month. 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. Clearly, the economic income is very diverse in the range and this could be associated with the scale and size of business operation. The dominant nature of business structure was based on family ownership in which about 85% of business entity was based on spouse, sibling and children partnership. A fair amount of sample owns the total asset of below RM10,000 and many of the business entities are represented by small scale business (Table 3).

Surprisingly, many operators considered low paid up as an encouraging factor in starting the existing business, however, 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 outcome, about 10% of operators have a complete ownership over the business premise while about 90% operate based on rent and lease condition. The small entity may also affect the income level as almost 60% of business operators fall within the income range of RM501 -RM2000 per month. Thus, the ability to complement income has significantly affected the income prospect and alternative economic activities or business diversification may be a solution to sustain future income. In this regard, almost 60% of correspondence agreed to the need for short courses and business hand on module that can help in staying competitive and be the market player in the industry. Almost 85% of those in business are in favor of cooperative like module of business operation and this may be due to family knitted ownership that represents the dominant business entity among the islanders.

Despite the strong need for external source (quite apart from reinvestment capital from current business), the ability to source external source of a fund for future business expansion remain problematic and difficult. Many operators admit that the amount of capital needed may not be high as it consummates with the relatively small size of business entity.

Almost 70% of the community members believe that despite the small business capital needs, many can not effort to go for self financing for the startup investment. Quite interestingly, government support has been low as about 73% of the correspondence never requested for the government help and prime reasons for doing so include: (a) lack of opportunity to develop a relationship with the potential credit, (b) delay and longer time approval period, (c) lack of knowledge of the process required (d) need of risk free collateral and can't afford the term and condition of business loan and (e) lack of understanding by the creditor of the cost involved.

Alternative Livelihood: The alternative livelihood among the marine park community portrays their willingness to adapt to environmental constraints introduced through conservation strategies adopted by marine park areas. Almost 57% of the total community people choose to have second job alternative income generating activities (Table 4). Clearly, there are efforts to diversify the income sources and these could be an indirect measure for alternative income generating activities among the community. The diversification of livelihood can include the introduction of alternative where a particular livelihood involves unsustainable utilization of natural resources. This provides an opportunity to create an enabling environment where wealth is spread amongst various income generating activities and develop through multiple income without over utilization of a particular resource. As what have been portrayed under tourism related activities, a sizable amount of business activities was family owned. About 84% of sample reported to have a total asset of below RM10, 000 as compared to other ranges.

In terms of income from AIGs (non-tourism), about 64% reported total income of less than RM500/month generate from tourism related sector, while a sizable number (4%) are able to generate income of between RM1,500-RM2,000/month. External support from government agencies or finance bodies remains low at 2.8% as compared to 97% that they have never solicited any support from these agencies. Because of the unsustainable income pattern, may are quite willing to go for the alternative job especially in sectors such as retailing, food and beverages, boat renting or other aquaculture related activities. However, support is much related to fishing gears (equipment) rank high in terms of demand for support and this may be strong indication fishing related activities rank high in terms of their livelihood. Strong supports have been forward in term of constructing artificial reef as part of measures to increase catch among the fishermen. A significant number of respondents (33%) would favor the idea of a special community based "harvest zone" made up of artificial reef that can be a favorable catchment area for the fishermen.

CONCLUSION

In this study, we bring together the poverty and environmental issues in the marine park areas focusing on environmental sustainability. We use here sustainable alternative livelihood approach as the framework for analysis. Our efforts put in place to preserve the quality of marine life linking poverty, sustainable and equitable development in ways that benefit marine life and coastal communities. The intention of this study is to look at magnitude of susceptibility and what are the factors that may mitigate such risk exposes among the community. We try to investigate some parameter for risk and income vulnerability, employment in tourism related income, level of asset, income and respective percentage and alternative livelihood among the marine park community. Our approach in this study enables policy makers and policy implementers better informed through available evidence in MPA together the poverty and environmental issues. This is a very much critical task on conditions that facilitate well informed policy making procedures.

Clearly, the emergence of tourism industry in MPA does not generate the comprehensive multiplier effect that is expected out of this industry. This is based on the income indicator as well as the AIG that is currently figured out. Despite the emergence of a fairly matured tourism industry among MPA, the dichotomous nature of the industry may be the prime reason for low multiplier effect of the industry. If MPA's are meant to balance between protecting the natural environment and economic growth, a fundamental shift is needed to achieve more systematic and people-centered approaches that promote 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 either. Thus it is time to look for the best possible outcomes, bearing in mind the principles of equity.

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