

Rehabilitation of Malaysia Coastline: An Economic Perspective

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ABSTRACT Malaysia has a wide range of ecosystems includes marines and terrestrial habitats. Coastal ecosystems and their services have economic as well as social value. They directly contribute to a number of economic sectors, including tourism and fisheries. After the tsunami disaster in 2004, a large scale of replanting activities was conducted along the country coastlines. This effort was made by government to increase the natural buffer zones. Unexpectedly, few replanting sites have become tourist spots and are able to generate income, since the initiation of the coastline rehabilitation project. Pantai Senok, Kelantan or known as “Nami Island Malaysia” is one of the most impressive achievement of the project. Pantai Senok rehabilitation began in 2009; where approximately 3 hectares of land has been planted with Casuarina species. In 2018, an economic study was conducted to empirically estimate the economic benefits of rehabilitation of Pantai Senok by using environmental economic tools of stated preferences method. A total of 311 visitors were successfully interviewed and the results show significant economic benefits of the Pantai Senok rehabilitation. It indicates that more concerted effort is needed by governments and other stakeholders to conserve and rehabilitate the coastal ecosystem in Malaysia.

KEYWORDS: Economic benefits, economic valuation, rehabilitation and coastal ecosystem

I Received 2 May 2019 II Revised 8 August 2019 II Accepted 13 August 2019 II Online 28 August 2019 II © Transactions on Science and Technology I Full Paper

INTRODUCTION

Malaysia with 4800km of coastline has a wide range of ecosystems includes marines and terrestrial habitats. Coastal ecosystems and their services have economic as well as social value. They directly contribute to a number of economic sectors, including tourism and fisheries. Economic Planning Unit Malaysia (1985) in National Coastal Erosion Study stated that about 29% or 1,380 km of country's coastline prone to coastal erosion. Coastal erosion in many parts of the country threatens the livelihood and property of the coastal communities. The rehabilitation efforts began after Tsunami in 2004, a large scale of replanting activities with research and development (R&D) was conducted along the country coastlines. This effort was made by government to increase the natural buffer zones and mitigate coastal erosion (Ministry of Natural Resources, 2015). From 2005 until 2017, the total planted area throughout the country was 2,804 hectares with 6.6 million planted trees (Mohd Parid *et.al*, 2019).

Pantai Senok, Kelantan or known as “Nami Island Malaysia” is one of the impressive achievement of the coastline rehabilitation program. Pantai Senok rehabilitation efforts by Kelantan Forestry Department began in 2009; where approximately 3 hectares of land has been planted with Casuarina species. Over the years, the trees become mature thus beautifies the beach area. Unexpectedly, this rehabilitation site has become tourist spots and is able to generate income especially to local communities. This kind of public goods, provides indirect values that are not traded in the market place, but are vital to the livelihood of many people. Therefore, the economic valuation must be done to value these goods and services (Salles, 2011) and must be carefully managed for maximal benefits. Using the Pantai Senok ecosystem as an illustration, the study quantifies the economic benefits of rehabilitation of Malaysia coastline by using environmental economic tools of stated preferences method. Economic valuation had been widely used for the following reasons:

- Support Policies: Christie *et.al*, (2006) stated that environmental valuation technique can provide useful evidence to support such policies by quantifying the economic value associated with the protection of biological resources;
- Externalities: Refers to the benefits than are not paid and also not internalized in decision making process. Harrison and Hester (2010) ecosystem services are always been under-valued and ignored especially in decision making process;
- Value added: This economic valuation will represent different perspective of rehabilitation and reflects the important in monetary values of this coastline ecosystem; and
- Outcome/Impact: This valuation will measure the outcome or the benefits of the conservation project by government.

METHODOLOGY

Valuation technique

Technique applied in this study was Stated-preferences methods. This technique depends on statements by respondents about their willingness to pay (WTP) or willingness to accept (WTA) the monetary compensation for their loss (Hanley & Spash, 1993). The value can be obtained through a questionnaire which consists of the amount of unit goods at a given price. The questionnaire must be well-designed to ensure the response and accuracy of respondents during the interview. There are two methods in stated preferences method namely Contingent Valuation Method (CVM) and Choice Modelling (CM). For the purpose of this study, CM was applied. CM is a series of multiple choices; each management option proposes differs according to the choice sets, each choice set comprised three management options (Hanley *et.al*, 2006). This method requires respondents to state their preferences on the sets of attributes and level related to the goods and services. According to Hanley *et.al* (2006) and Bateman & Carson (2002) a marginal utility estimates can be converted into willingness-to-pay estimates for changes in attribute levels and welfare estimates obtained for combinations of attribute changes by making one of these attributes a price or cost term. The attributes and levels chosen should be related to the policy-making proses and must have meaning to respondents (Bennett & Blamey, 2001).

In this study, there are two CM analyses were conducted on the economic benefits of ecosystem services and recreational services. Where, for each analysis, four (4) attributes were chosen. There are few studies on CM approach applied for the valuation of non-marketed goods in Malaysia in various field of study, such as study on solid waste disposal (Pek & Jamal, 2011), wetland Management (Jamal *et. al*, 2004), and Marine Park (Mohd Rusli *et. al*, 2008), ecotourism attributes (Wan Norhidayah, 2013).

Econometric model

This study applied simple Multinomial Logit model and data were analyses using econometric software NLOGIT 5 (LIMDEP) and descriptive analysis by using statistical software IBM SPSS 25. The model shows the importance of choice attributes in explaining the respondents preferences among three different management options. The econometric model is written as

$$U = \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n \quad (\text{Eq. 1})$$

where:

U = utility

β = coefficients corresponding to each attributes

X = the choice set

RESULT AND DISCUSSION

Demographic background

The analysis of demographic background was carried out by using descriptive and frequency analysis (**Table 1**). The analysis showed that out of 421 respondents 68.2% was female, and 31.8% was male. As high as 93% of the respondents had attended formal education and the balance of 0.3% of respondents never attended formal education. Most of the respondents' received education until university, followed by secondary school and primary school with percentage of 64.6%, 31.8% and 2.9% respectively. This finding in line with Wight (1996) stated that nature tourist tend to be more highly educated than general tourist. The analysis found 49.4% of the respondents married and most of them aged between 18 until 40 years old. There is no significant difference between single and married people. Pantai Senok offers leisure activity that suit for both group. However, local authorities/government agencies need to further explore and promote other recreation activities that offer more adventure and excitement in future. Analysis also showed the highest age frequency (42.3%) in age group of 21-30 years, with mean of 28.8 years old. The result also in line with other study by Ayob *et. al.* (2000) stated that ecotourism is a youthful activity.

Table 1. Demographic background of respondents

Demographic background		Frequency	Percentage
Gender	Female	287	68.2
	Male	134	31.8
Marital Status	Single	213	50.6
	Married	208	49.4
Age (Mean=28.8 years old)	<21 years old	116	27.6
	21-30 years old	178	42.3
	31-40 years old	64	15.2
	41-50 years old	37	8.8
	>50 years old	26	6.2
Education	No formal education	3	.7
	Primary school	12	2.9
	Secondary School	134	31.8
	University	272	64.6

Visit characteristics

The result found that respondents interviewed were from all over Malaysia including Sabah and Sarawak. However, majority (70.8%) of the respondents' origin was from Kelantan itself. The results prove that rehabilitation of Pantai Senok creates new nature attraction at Kelantan, in which 73% specifically choose to visit Pantai Senok. Almost half of the visitors (41.6%) was a first timer visitors, and followed by more than fourth timers (29.2%). For visitors who came more than four times are the regular visitors and often visit Pantai Senok almost every weekend. Most of them came for leisure and landscape view. Respondents also were asked whether they are aware of Pantai Senok was a rehabilitation area and previously was a bare sandy land. The results find that only 67% of them knew that trees at the beach were planted, while 37% of them did not know it. Therefore, local authorities or government agencies need to conduct more awareness programs so that public will be more aware of government effort in conserving, protecting and rehabilitating the country coastline and they should be a part of it too.

Economic valuation

Results in **Table 2** show the CE model summary for economic benefits of Pantai Senok ecosystem services. The variables used for this analysis were ecological service as wind breaker (ECOL), carbon stock as microclimate stabilization (CARBON), tree health from pest and disease or vandalism (HEALTH) and aesthetic value (AES). The overall result showed, all attributes and parameter are highly favored and have positive coefficient at 1% significant level. This result provide as an evidence on how important the rehabilitation efforts, even public willing to contribute in rehabilitating the coastline at study area. The parameter coefficient for PRICE has a negative sign which is in line with the theory. The coefficient for PRICE is negative which confirms the hypothesis that increasing the level of conservation charge makes a negative contribution to utility.

In the same table showed the marginal value of the attributes for each level, where all variables had positive values. Which means, all respondents are willing to pay for each attributes. The highest value respondents willing to pay is for attribute HEALTH2 (RM13.53), followed by AES2 (RM8.87), ECOL2 (RM8.08) and CARB2 (RM7.28). This finding shows public willing to pay more to ensure the tree health, compared to function Pantai Senok for carbon stoking or ecological service. This finding proved that awareness program is needed to increase public awareness on rehabilitation and conservation and also to promote and educate public more on other ecosystem services especially role of trees as wind breaker and regulator for microclimates. By taking into account 70,000 estimated visitors in 2018, the economic benefits of rehabilitating Pantai Senok for ecosystem services is estimated to be RM2.65 million/year.

Table 2. CE model summary for economic benefits of ecosystem services

Model summary		
Variable	Coefficient	Std. Error
ECOL2	0.89981***	0.08117
CARB2	0.81155***	0.16243
HEALTH2	1.50746***	0.07019
AES2	0.98831***	0.08562
PRICE	-.11138***	0.01352
Summary statistics		
Number of observation	1866	
Log likelihood	-1485.51227	
Marginal values of attributes (RM)		
ECOL2	8.07860***	
CARB2	7.28624***	
HEALTH2	13.5342***	
AES2	8.87323***	

Note: ***, **, * = Significance at 1%, 5%, 10% level.

Results in **Table 3** show the CE model summary for economic benefits of Pantai Senok as recreational services. This valuation is important as supporting document, if there is any proposal to develop and gazette Pantai Senok as Protected area (PA) or recreational tourism site. The variables used for this analysis were basic facilities such as restroom and parking area (FAC), recreational facilities such as jogging track, gazebo and benches (RECR), environmental education such as interpretive signage (EDU) and park maintenance to ensure proper management of the area (MAIN). The overall result showed, all attributes and parameter are highly favored with the positive

coefficient at 1% significant level. This result may assist local authorities to develop a master plan in managing and developing Pantai Senok based on public preferences. The parameter coefficient for PRICE has a negative sign which is in line with the theory. Same as ecosystem services, the coefficient for PRICE is negative which confirms the hypothesis that increasing the level of conservation charge makes a negative contribution to utility.

In the same table showed the marginal value of the attributes for each level, where all the parameter had positive values. Based on the result, respondents put highest priority for basic and recreational facilities with amount of RM9.48 and RM9.21 compared to interpretive information/environmental education and maintenance of the beach itself. Therefore, roadshow and campaign need to be done to increase the awareness about cleanliness and enhance environmental education among visitors. By taking into account 70,000 estimated visitors in 2018, the economic benefits of rehabilitating Pantai Senok for recreational services is estimated to be RM2.08million/year.

Table 3. CE model summary for economic benefits of recreational services

Model summary		
Variable	Coefficient	Std. Error
FAC2	1.31923***	.08667
RECR2	1.28167***	0.14592
EDU2	0.70109***	0.06607
MAIN2	0.82794***	0.08005
PRICE	-0.13916***	0.01236
Summary statistics		
Number of observation	1866	
Log likelihood	-1612.00459	
Marginal values of attributes (RM)		
FAC2	9.47976***	
RECR2	9.20987***	
EDU2	5.03792***	
MAIN2	5.94945***	

Note: ***, **, * = Significance at 1%, 5%, 10% level.

CONCLUSION

The high amount of economic benefits shows that the rehabilitation of country coastline will bring positive effects. The economic perspective of rehabilitation of Malaysia Coastline, such as Pantai Senok will provides useful evidence to support and helps the formulation of policies that protect Malaysia coastline by quantifying the economic value associated with the ecosystem services. It is also important as a guideline to assist the management or decision-makers in terms of welfare measures and rehabilitation/conservation benefits. The policy-makers should really consider the impact of any policy made on this ecosystem. Finally, more concerted effort is needed by both the federal and state governments to conserve and rehabilitate the coastline in Malaysia.

ACKNOWLEDGEMENTS

This project was funded by "Program Penanaman Pokok Bakau dan Spesies bersesuaian di Pesisir Pantai Negara" under Ministry of Water, Land and Natural Resources (KATS). Special thanks go to

Forest Research Institute Malaysia (FRIM), Forestry Department of Peninsular Malaysia (FDPM) and Kelantan Forest Department.

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