ESTIMATION OF TOTAL ECONOMIC VALUE OF THE DELTAIC MANGROVE FOREST RESOURCES IN THE DISTRICT OF KUCHING

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Bachelor of Economics with Honours
(Industrial Economics)
2011
ESTIMATION OF TOTAL ECONOMIC VALUE OF THE DELTAIC MANGROVE FOREST RESOURCES IN THE DISTRICT OF KUCHING

SHARON YAP JIN FUI

This project is submitted in partial fulfillment of the requirements for the degree of Bachelor of Economics with Honours (Industrial Economics)

Faculty of Economics and Business
UNIVERSITI MALAYSIA SARAWAK
2011
Statement of Originality

The work described in this Final Year Project, entitled “Estimation of Total Economic Value of the Deltaic Mangrove Forest Resources in the District of Kuching” is to the best of the author’s knowledge that of the author except where due reference is made.

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(Date Submitted)     (Student’s signature)
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22281
ABSTRACT

Estimation of Total Economic Value of the Deltaic Mangrove Forest Resources in the District of Kuching

By

Sharon Yap Jin Fui

The aim of this study is to determine the total economic value (TEV) of the 52,318 ha of deltaic mangrove forest resources in the District of Kuching. The method used to collect the data is the face to face interviews of villagers living in the surrounding areas of the mangrove forests. The mangrove areas chosen in the study include those in the Mukim of Santubong, Matang, Lundu and Sematan. To estimate the total economic value, the means of use value (tangible benefits consisting of timber woods and non-timber mangrove products) and means of willingness to pay (intangible benefits consisting of the conservation and option values) communities in surrounding areas of the forests are calculated. A multiple linear regression analysis is carried out to determine the factors influencing the TEV of the mangrove forests. The results show that the total economic value of mangrove forest resources in the District of Kuching is RM1.1bil. per year. Through conservation practices, the mangrove forest resources in the delta could produce benefits in perpetuity, giving an estimated present value of the benefits of about RM27.7 bil. In addition, the regression results show that secondary education level, occupation of villagers as
fishermen and household income of the villagers have significant influence on the TEV of the deltaic mangrove forest resources in the District of Kuching.

ABSTRAK

Anggaran Jumlah Nilai Ekonomi untuk Sumber Hutan Bakau Delta di Daerah Kuching

Oleh

Sharon Yap Jin Fui

RM1.1 bil. setiap tahun. Sekiranya sumber hutan bakau dipulihara dan diurus dengan baik, hutan bakau di delta ini boleh menghasilkan keuntungan untuk selama-lamanya; nilai kini faedah dianggarkan berjumlah lebih kurang RM27.7 bil. Selain daripada itu, keputusan regresi juga menunjukkan bahawa tahap pendidikan sekolah menengah, pekerjaan penduduk sebagai nelayan dan pendapatan isi rumah mempunyai kesan yang signifikan terhadap jumlah nilai ekonomi sumber hutan bakau delta di Daerah Kuching.
ACKNOWLEDGEMENT

This study would not have been successful if not for the guidance and advices of various people. Their contribution and cooperation make this study easier to complete and more meaningful.

First and foremost, I would like to give my highest respect and appreciation to my supervisor, Professor Dr. Ahmad Shuib. His patient guidance and generous advises contribute a lot to this study. Without his sacrifices in terms of time and knowledge, this study could not be completed on time.

My grateful thanks would also be forwarded to my lecturer, Puan Salbiah Edman and her spouse Encik Awang Suhailey bin Ledi, for without their guidance, our research group would not have easy access to those villagers in the selected study areas. We appreciate their sacrifices very much.

Apart from that, I would like to thank the staffs in Faculty of Economics and Business for their good work in providing us the important information with regards to our final year project. Besides that, I am very thankful to our research assistant, Kak Norjumawati Sabran. She is currently a masters student in Unimas. She provides the research groups with valuable information and helps in managing the progress of the research.
Not forgetting Encik Hamden bin Mohammad, Encik Abang Ahmad bin
Abang Morni, dan Encik Haazizkin bin Jumat, who are the executives in the
licensing department, Sarawak Forestry Department. They provide us with useful
information regarding the mangrove forests in the District of Kuching.

Furthermore, I would like to give my sincere gratitude to the heads of
villages and those villagers who have given full cooperation to us. They have spent
their time in answering our questionnaire and unselfishly share their information
regarding the mangrove forest environment.

Besides that, I would like to thank my research group members and my
course mates, Lee Sook Yee, Anna Bon Sin Yii, Tie Pick Si, Tan Soo Ling, Nadia
Sofhia Rapaiiee, Nurul Azwa Bt. Ahmad, and Nur Amni Bt. Shahmat. Their
motivation and cooperation make the process of the study goes smoothly.

Last but not the least, my family and my beloved friends, thank for their
encouragement and caring. With their support, I am able to face any failure and stand
up tall to achieve my dreams.
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CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Mangrove is a special woody plant forests in the tropical areas that can survive and live on the water edge. Mangrove can be found where the rainforests meet the oceans (Claris Home Page, 2003). Usually mangrove forests are found on coastlines and river deltas, and they grow between land and sea (brackish wetlands) where other plants may not be able to survive (Claris Home Page, 2003). Mangrove forests supply critical economic, social and ecological services for the survival of biophysical and social-economic subsystem on earth (Batagoda, 2003). However, since mangrove ecosystem provides a range of non-market as well as market products, full value of the products is not easy to identify. Therefore, the non-market value may be it neglected in development of a country (Spaninks & Beukering, 1997).

Besides that, mangrove forests protect the coastline and prevent erosion by collecting sediment from the rivers and streams, slow down the flow of water. This shows that mangroves play an important role in preserving and progressing the biological environment such as purifying air, and preventing wastewater pollution and natural disasters in bays or estuary areas (Li, et al., 2010). Apart from that, mangrove forests can act as natural barriers defending the life and property of coastal communities from several natural disasters such as storms and cyclones (Badola & Hussian, 2005).
From all over the world, mangroves are distributed in 112 countries and territories. There are around 18 million hectares of mangrove total global coverage in the world where it occupied 0.45% of the world’s forest and woodland areas (Kathiresan, 2008). Mangroves that found in the Indus River Delta in Karachi, Pakistan supply goods and services to the villagers nearby and help them to gain profits and earn economically. However, some of the resources harvest by the villagers may not be sold in the markets, thus part of the economic value is forgone (Khalil, 1999). This is because some of the villagers might harvest those resources for own consumption.

Mangrove forests in Malaysia cover about 637,164 ha and represents 2.5% of global mangrove resources. Some studies show that mangroves of Peninsular Malaysia contribute RM650 million to the national economy annually. Besides that, Malaysia wetlands contribute more than RM 5 billion to the economy every year directly or indirectly. One of the famous mangroves in Malaysia is the Matang Mangrove Forest Reserve, and it has even been nominated as the best managed mangrove forest in the world (Sime Darby Berhad, 2009). For example, mangrove forest of Larut Matang has a high productive ecosystem which can provide many benefits to local residents. The benefits usually come from the collection of the marine products such as fishes and shrimps, cockles, timber harvesting and non-timber products. Another important benefit that can be generated from the mangroves is outdoor recreation. Since recreation does not have a market price, estimation is less direct (Shuib, 2008).
In Sarawak, mangrove forests comprise 173,792 ha or 1.4% of the total land area. However, it is economically the third most important forest type in the state (Chai, 2009). About 15,983 ha have been gazetted as TPA (Totally Protected Area) and 28,000 ha remains as Forest Reserves and Protected Forests. By referring to figure 1.1 above, major mangrove habitats are located in Kuching Division consisting of 52,318 ha, Sarikei Division in Rajang Delta (87,544 ha) and Limbang Division (8,359 ha) (Chai, 2009).

This research will focus in the mangrove forest in District of Kuching. District of Kuching is an administrative district within first division of state Sarawak in Malaysia, it is subdivided into three sub districts, including Kuching Proper, Padawan and Siburan. The total area of these districts is 1,868.83 km². (Pejabat Daerah Kuching, 2010). The geography location of Kuching is longitude is 01°33’ N and latitude is 110°25’ and situated at 15km NNW of Kuching City. The climate in
Kuching is tropical and humid, moderately hot and receives substantial rainfall with an annual average of 3,600 to 4,000 mm or approximately 160 inches. The temperature of the city ranges from 20 °C to 36 °C but the average temperature is around 23 °C in the early hours of the morning and rises to around 32 °C in the mid afternoon (World Climate, 2008).

This paper will estimate the total economic values of the mangrove forests in various District of Kuching. The study will focus in those areas where mangrove forests situated. Several selected areas for this study which included Mukim of Santubong, Matang, Lundu and Sematan. Within these areas, there are many villages where the villagers are dependent on the mangrove forests resources as the main income. The villages are selected for the study are Kampung Salak, Kampung Bako, Pekan Sematan, Kampung Tanah Hitam, Kampung Sedemak, Kampung Tresan Jaya, Pekan Lundu, Kampung Semunim, Kampung Dagang, Kampung Seketi Melayu, Kampung Sileng Melayu, Kampung Buntal, Kampung Telaga Air, Kampung Goeblit, and Kampung Muara Tebas. Total economic values from those areas will be estimated by using different types of methodological tools that take into consideration the use value and non use value of the mangrove forests. The estimated total economic values will play a vital role in further understanding the processes and steering actions of this study, and also contribute to future studies. In this study, socio-demographic factors that influences total economic value will be identified
1.2 Theoretical Framework

This study uses the Total Economic Valuation (TEV) Framework to analyse the total economic value of the mangrove forest in Kuching Districts. TEV as the principal analytical tool provides a range of analysis which estimates the value of the goods and services derived from mangrove forests.

The theoretical framework for this study is the Utility Theory as its main concern is to determine the satisfaction of consumers toward natural resources. To get the Total Economic Value (TEV) of the natural resources, both Use value (UV) and Non-Use Value (NUV) will be taken into account.

As seen in figure 1.2, several factors such as government policy and regulation affect production function. The production function may be influenced by others factors such as the climate of the forest area, location or the geography of the area, and the quality of the soil in the mangrove areas. Besides that, available information of the natural resources can affect the types of regulation and policy the government establishes on the natural resources. These regulations may protect and conserve the natural resources for future use.

In a market, production function will influence the use value (UV) of those natural resources. UV can be divided into two categories which are consumptive use and non-consumptive use. Besides production function, it also highly depends on
Figure 1.2: Theoretical framework.

Factors Influence Production Function:
- Climate
- Geography
- Quality of soil

Consumptive Use

Non Consumptive Use

Use Value (UV)

Production Function

Government Policy and Regulation

Environmental Value

Utility/Satisfaction

Social-cultural Demography

Non-use Value (NUV)

Available of Information

Willingness to Pay

Total Economic Value (TEV)

- Income
- Family Size
- Education
- Occupation
- Age
- Perception

the utility of consumer and social-cultural demography of the consumers. These factors alter the use value (UV) of mangrove use products such as fish, prawn and charcoal. For those products which do not have market price their value, they can be measured using shadow price of similar products that have market price to substitute the real market price.

For non-use value (NUV), again, Utility is the basic theory to identify the satisfaction of consumer toward those non-use values. To determine the satisfaction level of consumer, Willingness to Pay (WTP) from consumer will need to be verified. WTP of consumers can be affected by several external factors such as available information of natural resources. Besides willingness to pay, social-cultural demography will influence non-use value (NUV) of the mangrove resources such as biodiversity.

Apart from that, Utility may influence the overall environmental value of the mangrove forests and its nearby villages. The environmental value of mangrove forests such as the scenery enjoyment, free form pollution, and protection of living things can give satisfaction to consumers nearby or visitors.

Ultimately, social-demographic of the respondents may affect the Total Economic Value (TEV) of the Mangrove forests in Kuching District. The social-demographic such as income, family size, education level, age, occupation and perception of the respondents will be tested for their effects on TEV.
Table 1.1: Ecological wetland functions, economic goods and services, types of value, and applicable valuation methods.

<table>
<thead>
<tr>
<th>Ecological function used valuation methods</th>
<th>Economic goods and services</th>
<th>Value type</th>
<th>Commonly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flood and flow control</td>
<td>Flood protection</td>
<td>Indirect use</td>
<td>Replacement Cost Market Price</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Opportunity Costs</td>
</tr>
<tr>
<td>Storm buffering</td>
<td>Storm protection</td>
<td>Indirect use</td>
<td>Replacement Costs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Production Function</td>
</tr>
<tr>
<td>Sediment retention</td>
<td>Storm protection</td>
<td>Indirect use</td>
<td>Replacement Costs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Production Function</td>
</tr>
<tr>
<td>Groundwater recharge/discharge</td>
<td>Water supply</td>
<td>Indirect use</td>
<td>Production Function NFI</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Replacement Costs</td>
</tr>
<tr>
<td>Water quality</td>
<td>Maintenance/ nutrient retention</td>
<td>Indirect use</td>
<td>CVM</td>
</tr>
<tr>
<td>Waste disposal</td>
<td>-</td>
<td>Direct use</td>
<td>Replacement Costs</td>
</tr>
<tr>
<td>Habitat and nursery for plant and animal species</td>
<td>Commercial fishing and hunting</td>
<td>Direct Use</td>
<td>Market Prices NIF TCM CVM</td>
</tr>
<tr>
<td></td>
<td>Recreational fishing and hunting</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Harvesting of natural materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Energy resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biological diversity</td>
<td>Appreciation of species existence</td>
<td>Non-use</td>
<td>CVM</td>
</tr>
<tr>
<td>Micro-climate stabilization function</td>
<td>Climate stabilization</td>
<td>Indirect</td>
<td>Production Function</td>
</tr>
<tr>
<td>Carbon sequestration cost</td>
<td>Reduced global warming</td>
<td>Indirect</td>
<td>Replacement Costs</td>
</tr>
<tr>
<td>Natural environment</td>
<td>Amenity Recreational activities</td>
<td>Non-use</td>
<td>CVM</td>
</tr>
<tr>
<td></td>
<td>Appreciation of uniqueness to culture/heritage</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: (Brander, Florax, & Vermaat, The Empirics of Wetland Valuation: A Comprehensive Summary and a Meta-Analysis of the Literature., 2006)
Problems Statement

Usually mangrove forests provided both ecological and economic benefits. However, mangrove forests do not escape destruction and exploitation fate. According to United Nation Environment Programme report on World’s Mangrove Forest, although conservation efforts slow down the rates of clearance, however, mangroves are still being cleared at three to four times the rate of other forests. (McDermott, 2010)

Several treatments may harm mangrove forests all over the world, such as clearing, over harvesting, river changes, over fishing, pollution and climate change. Nowadays, a country growth is highly dependent on growth in production and production requires an abundance of input of resources like land and wood. These inputs can be collected from clearing and harvesting of mangrove forests. Conflict may arise between conservation of mangrove forests and the growth of the country.

In Sarawak, mangrove forests occupy about 60% of the 740km long coastline, located mainly along the sheltered shores and estuaries within the major bays of Kuching, Sri Aman and Limbang Division (Sarawak Timber Industry Development Corporation (STIDC), 2008). Mangroves play important role in the development of the economy and also contribute to a balanced ecology. The first working plans on mangrove forests were implemented in Sarawak in 1950s in Rajang Delta namely Rajang Mangrove Forests Reserve, Loba Pulau Protected Forests, and Paloh Protected Forests. (Sarawak Timber Industry Development Corporation (STIDC), 2008)
However, the protected mangroves forests in Sarawak are relatively small compared to the total land area in Sarawak.

Table 1.2: Distribution of mangrove forest in Sarawak.

<table>
<thead>
<tr>
<th>Division</th>
<th>Section</th>
<th>Mangrove area ha</th>
<th>Forest resources and protected forests ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Kuching</td>
<td>52318</td>
<td>14019</td>
</tr>
<tr>
<td>II</td>
<td>Kuching</td>
<td>10360</td>
<td>-</td>
</tr>
<tr>
<td>III</td>
<td>Sibu</td>
<td>5180</td>
<td>-</td>
</tr>
<tr>
<td>IV</td>
<td>Bintulu/Miri</td>
<td>2849</td>
<td>1212</td>
</tr>
<tr>
<td>V</td>
<td>Miri</td>
<td>15540</td>
<td>-</td>
</tr>
<tr>
<td>VI</td>
<td>Sibu</td>
<td>87542</td>
<td>26982</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>173789</td>
<td>42213</td>
</tr>
</tbody>
</table>

Source: Annual report of the Forest Dept, Sarawak, 1976.

From the table 1.2, Districts of Kuching which is Division I of Kuching section, mangrove area consist 52318 ha however only 14019 ha of the forests is protected. Only approximately one fifth of the land area.

However, Kuching’s residents have slowly become more aware of the importance of conservation of mangroves after several programs have been established. One of these programs are “Trees for Life” (TFL) Community Project started on 7th July 2007 at Sama Jaya Nature Reserve, Kuching to create awareness on global warming threats. According to Datu Haji Len Talif b. Salleh said, “Trees for Life is a very relevant name for this project, perhaps we can remind ourselves of the vital important trees or forests play in our daily life.” (Sarawak Timber Industry Development Corporation (STIDC), 2008)

In 14 November 2007, another planting of mangrove trees programme was introduce by Datu Haji Len Talif b, Salleh at the coastal areas of Sarawak Mangrove Forests. This programme was organised by Sarawak forestry