



Faculty of Economics and Business

**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)
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the requirements for the degree of Bachelor of Economics with Honours
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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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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

Kajian ini bertujuan untuk menentu jumlah nilai ekonomi untuk sumber hutan bakau delta di Daerah Kuching yang seluas 52,318 ha. Kaedah temubual bersemuka digunakan untuk mengumpul data dari penduduk kampung yang tinggal di sekeliling hutan bakau. Kawasan hutan bakau yang dipilih dalam kajian ini termasuk yang terletak di Mukim-mukim Santubong, Matang, Lundu dan Sematan. Anggaran jumlah nilai ekonomi dibuat dengan mengira gabungan purata nilai guna (faedah ketara seperti hasil kayu bakau dan hasil bukan-kayu hutan bakau) dan purata nilai kesediaan untuk membayar (faedah tak ketara yang meliputi faedah pemuliharaan dan faedah opsyen) bagi penduduk di sekitar hutan bakau. Analisis regresi berganda dilakukan untuk menentukan faktor-faktor yang mempengaruhi jumlah nilai ekonomi hutan bakau di Delta Kuching. Keputusan kajian menunjukkan bahawa nilai ekonomi sumber hutan bakau di Delta Kuching ini berjumlah sekitar

RM1.1 bil. setiap tahun. Sekiranya sumber hutan bakau dipulihara dan diurus dengan baik, hutan bakau di delta ini boleh menghasilkan keuntungan untuk selamanya; 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.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

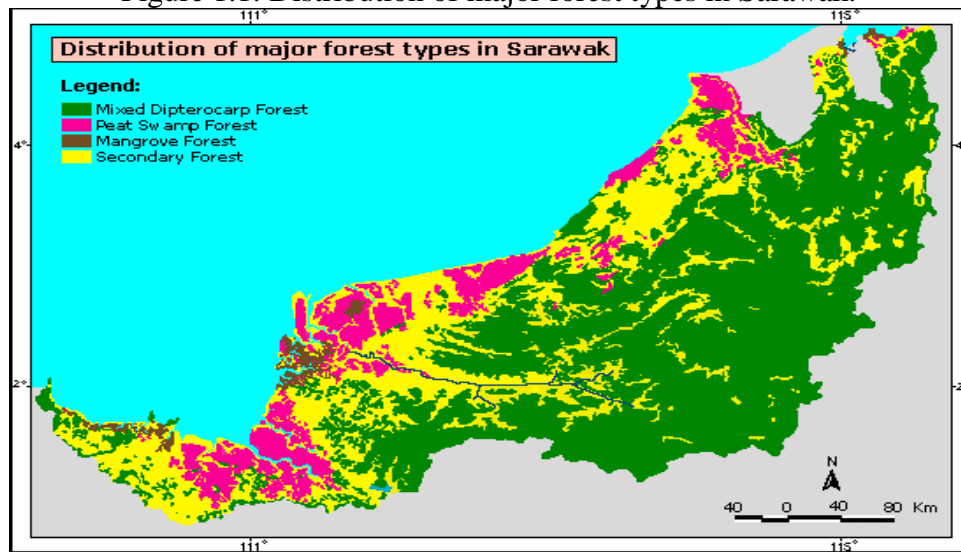
Mangrove is a special woody plant forests in the tropical areas that can survive and live on the water edge. Mangrove can be found where the rainforests meet the oceans (Claris Home Page, 2003). Usually mangrove forests are found on coastlines and river deltas, and they grow between land and sea (brackish 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).

Figure 1.1: Distribution of major forest types in Sarawak.



Source: Sarawak Forestry Corporation (SFC) (Fah, 2007)

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 28,000ha remains as Forest Reserves and Protected Forests. By referring to figure1.1 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, Kamupung 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 Goebliit, 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

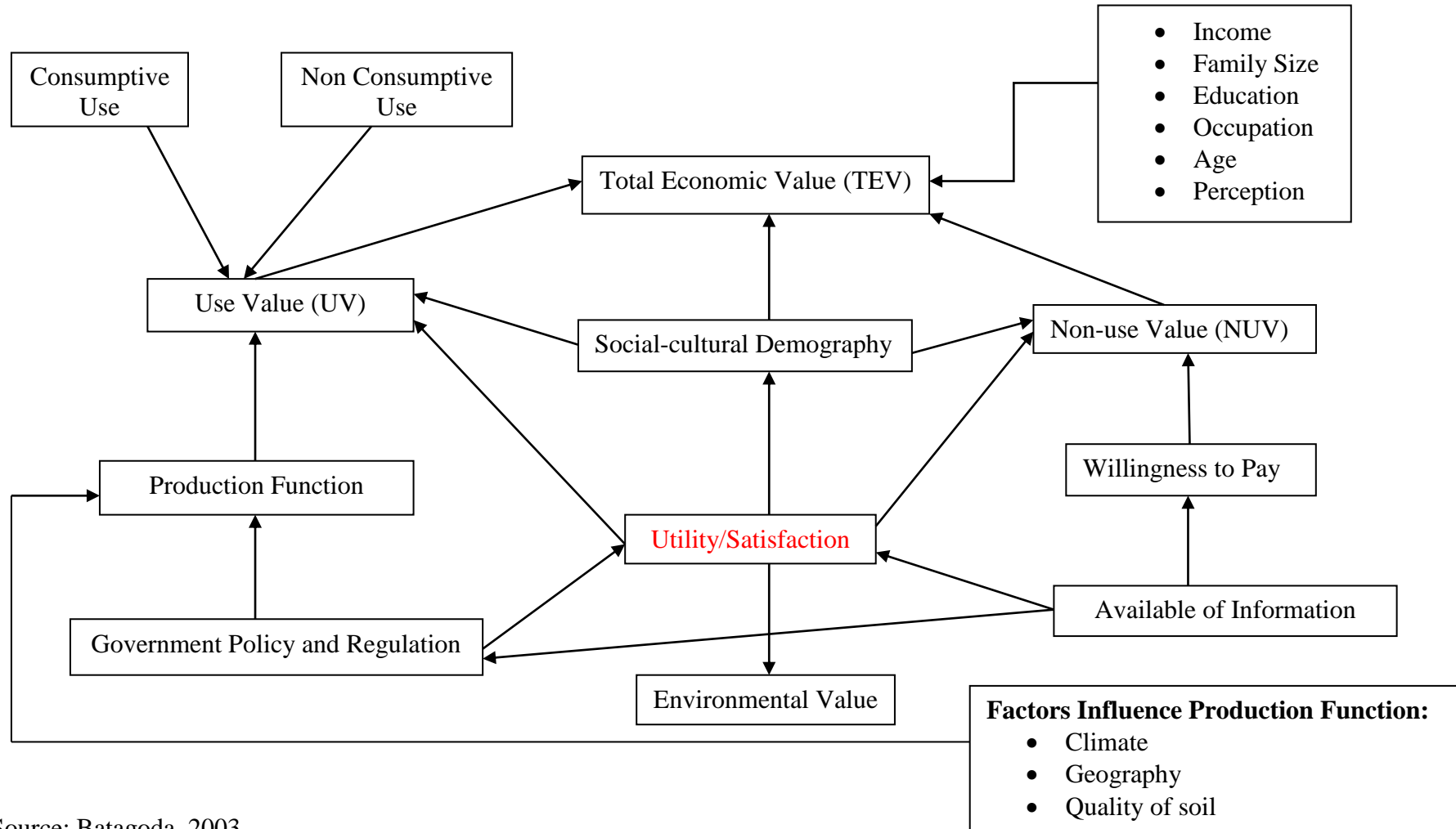
This study uses the Total Economic Valuation (TEV) Framework to analyse the total economic value of the mangrove forest in Kuching Districts. TEV as the principal analytical tool provides a range of analysis which estimates the value of the goods and services derived from mangrove forests.

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.



Source: Batagoda, 2003.

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 indentify 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.

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

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.

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

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 introduced by Datu Haji Len Talif b. Salleh at the coastal areas of Sarawak Mangrove Forests. This programme was organised by Sarawak forestry