UNIVERSITI PUTRA MALAYSIA

*VISITORS' ECONOMIC VALUATION OF THE ATTRIBUTES OF
MARINE RESOURCE CONSERVATION AND MANAGEMENT
IN THE PERHENTIAN MARINE PARK, MALAYSIA*

SEDDIGHEH ARABAMIRY

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By

SEDDIGHEH ARABAMIRY

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,
in Fulfilment of the Requirements for the Degree of Doctor of Philisophy**
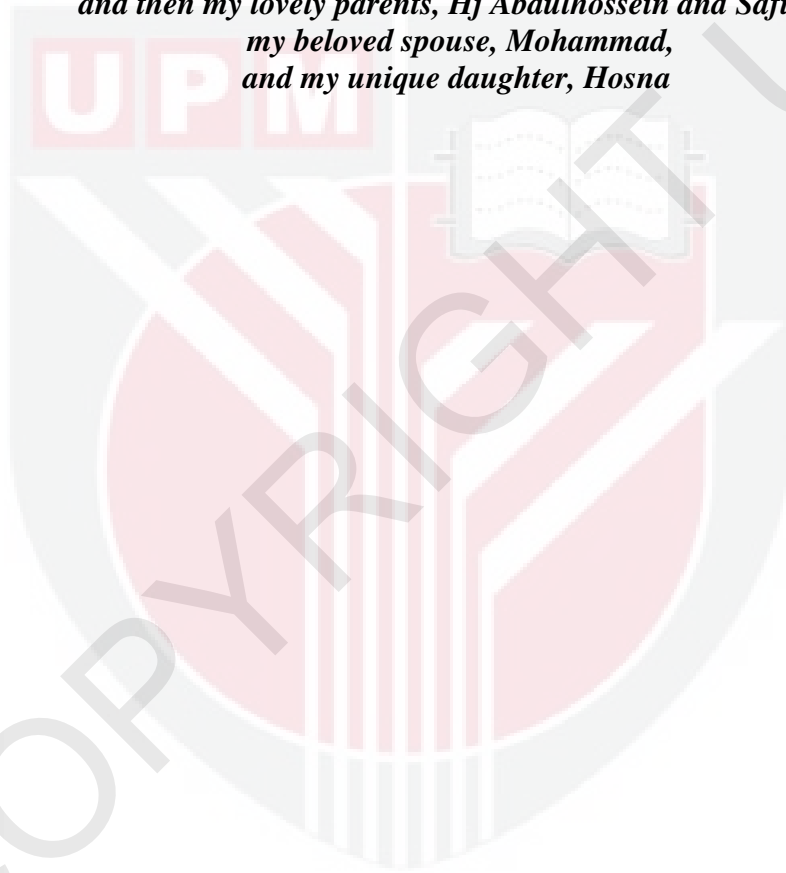
March 2014

DEDICATION

To creator of all existence "ALLAH S.W.T"

Whoever I am...
Whatever I am...
Is because of his blessing,

and then my lovely parents, Hj Abdulhossein and Safura,
my beloved spouse, Mohammad,
and my unique daughter, Hosna

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VISITORS' ECONOMIC VALUATION OF THE ATTRIBUTES OF MARINE RESOURCE CONSERVATION AND MANAGEMENT IN THE PERHENTIAN MARINE PARK, MALAYSIA

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March 2014

Chairman: **Professor Khalid Abd Rahim, PhD**
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East coast of Peninsular Malaysia is rich in marine biodiversity, and the only habitat for few and rare species of marine life. Perhentian Island Marine Park (PIMP) is located in Terengganu state. It is a popular marine park among Malaysia international tourists (64.28% in 2012). It seems that ecological attributes which are as variables in this study, are not in acceptable situation. For instance, coral cover in PIMP is in fair condition (32.8%).

Underestimated non-market values of marine ecosystem can cause excessive depletion and the less conservation of these environmental goods in the process of development decisions. Therefore, in such studies, one of the most useful instruments to express the value of unique marine ecosystems like PIMP for decision maker is estimating the economic benefits (e.g. conservation or/and recreation) of PIMP.

This study is aimed to estimate the economic values of ecological function and relevant management process that the visitors of PIMP held for them (e.g. PIMP visitors' willingness to pay and Marginal Rate of Substitution of attributes) by applying choice modelling method of stated preference techniques. Cochran's formula in which population size is assumed last year visitors of PIMP (2012), was employed to estimate sample size; therefore the total collected data consist of 380 Questionnaires which have been completed by visitors through a face-to-face interview in two main islands: Perhentian Besar and Perhentian Kecil.

Several models including Multinomial Logit (MNL) and Mixed Logit (ML) models for each part of the study have been estimated. The results infer that the visitors of PIMP are aware of the sensitivity of the main marine resources and the respondents' intention to improve its status. Based on estimated models, the greatest visitors' preference for different attribute levels in part one with RM38.9 was for water quality improvement from *status quo* to 5%. As well, the next marginal value in this part was for coral cover improvement from *status quo* to 5% with RM30.7. Similar marginal rate of substitutions (MRS) for part two was for management, relative to

water quality with RM109.5 for improvement from *status quo* to level 1 and next amount was related to fish species management for improvement from *status quo* to level 1 with RM68.6.

Economic valuation is a procedure to identify and quantify the major benefits which are available by marine Park as environmental goods. Thus, the results of this study as an economic valuation provide invaluable support for conservation efforts in the direction of maintenance biodiversity conservation. The benefits of Marine Park for society via Marginal Rate of Substitution could encourage policy makers. Meanwhile, the profile of respondents and their perceptions will be useful to assists all stakeholders in their future management and development plans in Marine Park sites in Malaysia and similar case in South East Asia.

Budget, aims of the study, and lack of reliable and available information due to being a more or less new phase regarding CM technique, may create some limitation in this study. Hence, in order filling gaps, inclusion users and non-users of PIMP as unit of sample in CM technique for future economic valuation studies through zoning plan is suggested.

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Abstrak tesis yang dikemukakan kepada senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Doktor Falsafah

PENILAIAN EKONOMI PENGUNJUNG TERHADAP ATRIBUT PEMULIHARAAN DAN PENGURUSAN SUMBER MARIN DI TAMAN LAUT PULAU PERHENTIAN, MALAYSIA

Oleh

SEDDIGHEH ARABAMIRY

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Pengerusi: **Professor Khalid Abd Rahim, PhD**
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Pantai timur Semenanjung Malaysia amat kaya dengan biodiversiti marin, dan merupakan satu-satunya habitat bagi beberapa spesis terumbu karang dan ikan yang jarang ditemui. Taman Laut Pulau Perhentian (PIMP) terletak di negeri Terengganu. Ia merupakan sebuah taman laut yang terkenal dalam kalangan pelancong antarabangsa Malaysia (64.28% pada 2012). Atribut ekologi yang merupakan pembolehubah dalam kajian ini dilihat sebagai tidak berada dalam keadaan yang munasabah. Sebagai contoh, litupan terumbu karang di PIMP ialah dalam keadaan sederhana (32.8%).

Memandang rendah kepada nilai bukan pasaran ekosistem marin boleh menyebabkan kemerosotan secara berlebihan dan kekurangan pemuliharaan bagi produk alam sekitar dalam proses membuat keputusan berkaitan pembangunan. Oleh itu, bagi kajian sedemikian, instrumen yang paling berkesan perlu digunakan oleh pembuat keputusan untuk menyatakan nilai ekosistem marin yang unik seperti PIMP bagi menganggarkan manfaat ekonomi (contoh: pemuliharaan atau/dan rekreasi) di PIMP.

Kajian ini bertujuan untuk menganggarkan nilai ekonomi bagi fungsi ekologi dan proses pengurusan yang relevan, yang dikaitkan dengan pengunjung PIMP (contohnya: kesediaan pengunjung PIMP untuk membuat bayaran dan Kadar Penggantian Marginal bagi atribut tertentu) dengan menggunakan kaedah model pilihan bagi teknik yang telah dipilih. Formula Cochran berdasarkan saiz populasi pengunjung PIMP pada tahun yang lepas (2012) telah digunakan untuk menganggarkan saiz sampel; maka, jumlah data yang telah dikumpulkan adalah 380 borang soal-selidik yang telah dilengkapkan oleh pengunjung secara temubual bersemuka di dua pulau utama iaitu Perhentian Besar dan Perhentian Kecil.

Beberapa model termasuk model Logit Multinomial (MNL) dan model logit bercampur (ML) bagi setiap bahagian dalam kajian ini telah dianggarkan. Keputusan kajian mendapati bahawa pengunjung PIMP peka terhadap sensitiviti sumber marin

utama dan para responden juga berhasrat untuk meningkatkan status sumber marin. Berdasarkan model yang dianggarkan, majoriti pengunjung memilih tahap atribut yang berbeza dalam bahagian pertama dengan nilai RM38.9 iaitu bagi peningkatan kualiti air berbanding status quo sebanyak 5%. Begitu juga dengan nilai marginal berikutnya dalam bahagian ini ialah untuk peningkatan litupan terumbu karang berbanding *status quo* kepada 5% dengan nilai RM 30.7. Kadar Penggantian Marginal (MRS) yang serupa bagi bahagian kedua adalah bagi pengurusan berkaitan kualiti air dengan RM 109.5 bagi peningkatan daripada *status quo* kepada tahap 1 dan seterusnya jumlah berkaitan dengan peningkatan pengurusan spesis ikan berbanding *status quo* kepada tahap 1 dengan nilai RM 68.6.

Penilaian ekonomi ialah suatu prosedur untuk mengenalpasti dan mengira faedah utama yang terdapat di Taman Marin sebagai produk persekitaran. Maka, dapatan kajian ini adalah penilaian ekonomi yang menyediakan sokongan tidak ternilai kepada usaha penyelenggaraan ke arah kelangsungan pemuliharaan biodiversiti. Faedah Taman Marin kepada masyarakat melalui Kadar Penggantian Marginal boleh memberi galakan kepada pembuat dasar. Sementara itu, profil responden dan pandangan mereka akan berguna untuk membantu pihak-pihak berkepentingan dalam pengurusan masa hadapan dan pelan pembangunan di Taman-taman Marin di Malaysia dan juga di Asia Tenggara.

Bajet, tujuan kajian, dan kekurangan maklumat yang boleh dipercayai kerana sedikit sebanyak merupakan fasa baru berkaitan teknik CM boleh menjadi beberapa limitasi bagi kajian ini. Oleh itu, untuk mengisi kekosongan ini, penyertaan pengguna dan bukan pengguna PIMP sebagai unit sampel dalam teknik CM untuk penilaian ekonomi yang akan datang melalui pelan zoning adalah dicadangkan.

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Sayid); who their blessing and encouragement were with me even from far destination; and never failing support me ii every matter great and small.

I certify that a Thesis Examination Committee has met on 12 March 2014 to conduct the final examination of Seddigheh-Arabamiry on her thesis entitled "Visitors' Economic Valuation of the Attributes of Marine Resource Conservation and Management in the Perhentian Marine Park, Malaysia" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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This thesis was submitted to the Senate of the Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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LIST OF ABBREVIATIONS

ASC	Alternative Specific Constant
ABSCM	Attribute-Based Stated Choice Model
CBA	Cost Benefit Analysis
CM	Choice Modelling
CVM	Contingent Valuation Method
DEFRA	Department for Environment, Food and Rural Affairs
DOE	Department of Environment
DMPM	Department of Marine Park Malaysia
EDM	Environmental Decision Making
GDP	Gross Domestic Product
IIA	Independence from Irrelevant Alternative
IID	Independently Identically Distribution
IDB	International Day for Biological Diversity
IMWQS	Interim Marine Water Quality Standard
IUCN	International Union for Conservation of Nature
KM	Kilometer
KPI	Key Performance Indicator
MIDU	Marine Inventory Data Updating
MNL	Multinomial Logit Model
ML	Mixed Multinomial Logit Model
MRS	Marginal Rat of Substitution
MU	Marginal Utility
MPA	Marine Protected Area

NRE	Natural Resources and Environment
PIMP	Perhentian Island Marine Park
PPMP	Pulau Perhentian Marine Park
RIMP	Redand Island Marine Park
RM	Ringgit Malaysia
RUM	Random Utility Model
RUT	Random Utility Theory
TEV	Total Economic Value
TCM	Travel Cost Method
TIMP	Tioman Island Marine Park
TEV	Total Economic Value
UNDP	United Nation Development Programme
WTA	Willingness to Accept
WTP	Willingness to Pay

CHAPTER 1

INTRODUCTION

Oceans, coasts, and marine ecosystems have their vital roles at global, national, and local levels which are apparent to any individual because they create economic, environmental, social, cultural, and security opportunities. These opportunities are growing and perhaps significantly able to compete in use. Thus, planning and management of these growing uses are important for any country that is geographically located close to the ocean. Furthermore, these opportunities can diversify a country's economy which can help reduce dependency of the economy on economic sectors (e.g. manufacturing of goods). In the new millennium, leisure activities take shape in the form of tourism and ecotourism. Implicit economic impact of leisure activities is apparent when people's efficiency increases after recreational activities. Thus, investigating this related issue is of utmost importance.

1.1 Background of the Study and Issues

Malaysia is surrounded with open water and South China Sea. Therefore, maritime boundaries created marine opportunity for this country such as tourism. Nowadays, tourism industry has grown in the world. As an economic sector, this industry can be promoted in order to improve the low level of per capita income, the low level of foreign currency incomes and unemployment. The scale of the world tourism industry, which contributed about 10.4% of the world's Gross Domestic Product (GDP) in 2004, will increase to 10.9% in 2014 (Habibi, Khalid and Chin, 2009). Moreover, the number of international tourists in the world will increase to 1602 million by 2020, while tourism receipts will reach some US$200 billion (Zortuk, 2009). The importance of international tourism to an economy could also be recognized by its contribution to the GDP. Tourism can be one of the potential industries in order to increase the level of economic growth in Malaysia. Incentives and promotion activities, for instance the declaration of Visit Malaysia Year in 1990, 1994, 2000 and recently in 2007, caused total arrivals for tourism increase from 10.2 million in 2000 to 25.0 million in 2012 (Table 1.1). Table 1.1 illustrated the increasing trend of tourism Malaysia for the years 2000-2012.

Table 1.1: The trend of tourism Malaysia

Years	Tourist Arrival (million)	Tourist Reciepts (RM billion)
2000	10.22	17.3
2001	12.78	24.2
2002	13.29	25.8
2003	10.58	21.3
2004	15.70	29.7
2005	16.43	32.0
2006	17.55	36.3
2007	20.97	46.1
2008	22.05	49.6
2009	23.65	53.4
2010	24.58	56.5
2011	24.71	58.3
2012	25.03	60.6

Sources: Tourism Malaysia, (2012a)

One form of tourism that emphasises on ecology and conservation of the environment is ecotourism. The primary attractions are flora, fauna and heritage. Thus, they are destination of visitors. Its importance is in terms of sustainable development. Marine Parks in Malaysia can be attractive especially for ecotourism and international visitors.

The greatest coral biodiversity on the earth has been recognized in the Coral Triangle (global priority for conservation) where Malaysia is one of the Coral Triangle countries. The number of coral species identified in the East Coast of Peninsular Malaysia is approximately 80% of equivalent number of species that has been identified in the coral triangle sites (Harborne *et al*., 2000). In addition, from the total species of fish found in the world approximately one-third of this number makes coral reefs as their home. Furthermore, about 25% of marine life is found in the world coral reefs as their habitat for nursing and breeding (Reef Check Malaysia, 2010). Over 360 species of coral has estimated in Peninsular Malaysia and 1094 species of marine fishes estimated in Malaysia as well (Reef Check Malaysia, 2009).

The Peninsular Malaysia, particular the Terengganu archipelagos, Terengganu marine parks that consist of islands are the first protected marine parks in Malaysia. Tioman and Tinggi marine parks have the highest marine biodiversity. These marine parks have hard coral species from the coral reefs, and there are other species which equal 80% of the species found in the triangle coral area (i.e. The Philippines, Indonesia and Papua New Guinea) (Harborne *et al*., 2000). Due to the richness of coral species in East Coast of Peninsular Malaysia, this area has global importance. Particularly, Perhentian is the only habitat for some few and rare fauna species of marine life (Takushi, 2000).

This is also true with regard to fish biodiversity and habitat biodiversity (Reef Check Malaysia, 2009). Coral cover as explained in the section 2.2 is an index or gross surrogate which indicates reef health. It is in fair condition in Pulau Redang, Tioman and Perhentian have respectively 40.2%, 36.6% and 32.8% (Department of Marine Park Malaysia (DMPM), 2011a). Because of bleaching coral in these two states in East Coast of Peninsular Malaysia (i.e. Terengganu and Pahang), some of the coral areas in marine parks have been closed for visitors in 2010.

The Ministry of Natural Resource and Environment (NRE) has Strategic Action Plan in moving towards 2020 goals. Consistent with this plan, DMPM for first time has documented Strategic Plan 2011-2015 which is based on the International Union for Conservation of Nature (IUCN) and the World Bank Management indexes. In this planning document, key performance indicators (KPIs) have also been introduced in order to compare the performances and purposes of the plan. For instance, increasing biophysical index for coral cover, focal species and water quality have been predicted in this plan (DMPM, 2011b). In addition, this plan is a step towards improving conservation and stability of Malaysia's marine environment as well as achieving its objective to become a leader in Southeast Asia in 2015 as a Marine Biodiversity Conservation and Management that emphasizes the improvement and development of physical capacity in Marine Park. Every five year DMPM will review and upgrade its management plan. The Stratrgic Plan will expire by 2015.

Currently, it is estimated that based on biophysical indicators (as presented by IUCN), the management of Marine Park Malaysia had been effective at 40% level in 2010 (DMPM, 2011b). One possible reason is that it is due to "overlapping role among agencies" and "vagueness of the legal boundary between federal and states". Achieving efficient marine park management to 50% by 2015, as one of the strategic objectives, has been predicted in the strategic plan 2011-2015. In addition, the establishment of marine life site has also been predicted. Following this, the Tioman Marine Park has been nominated for Global Biodiversity Hub (DMPM, 2011b).

With the above explanation and issues the question is what combination of marine resources should be produced over time and space? How human activities in marine areas (e.g. marine parks), such as fisheries, energy, transportation, conservation, protection and recreation, can be analyzed and allocated to achieve ecological, economic, and social objectives (which can be one of the aims of the economic valuation studies)? Normal goods in an economy are explicitly exchanged in regular markets by posting a price between the seller and the buyer. Environmental goods and services (e.g. Marine Park) may have no market, or may have limited market, surrogate market and incomplete market. They effectively contribute to human welfare (or reduce well-being); which are well known as non-market goods with economic values. To assign monetary values to these non-market goods and services, various economic valuation techniques have been employed.

As a result, Marine ecosystem that marine parks are a section of it has multiple functions. For instance: conservation, recreation, fisheries, transportation, biodiversity maintenance and so on. The central theme of this study is economic valuation of ecological function values such as maintenance of biodiversity through ecological attributes and biophysical indicators (as predicted in strategic plan 2011-2015 of DMPM); that visitors of Perhentian Island Marine Park (PIMP) held for these attributes. By applying non-market valuation technique i.e. choice modelling stated preference technique.

1.2 Problem Statement

Goods and services produced by marine areas are common property resources. If the demand for these resources is simultaneous, the capacity of these resources would be exhausted eventually; because, sometimes access to marine resources (e.g. wildlife habitat, threatened species and nutrient cycling) is open and free of charge. Here, market failure concept is held, and market cannot lead us to the best allocation of resources. Potential problems occur due to the non-existence (or defective) of price or market for environmental goods and services.

In each marine ecosystem corals are key element. Current situation of coral cover in east coast of Peninsular Malaysia is in fair condition (in Pulau Redang, Tioman and Perhentian respectively 40.2%, 36.6% and 32.8% (Department of Marine Park Malaysia (DMPM), 2011a)). In addition, human activities on the islands, such as sewage (Hui, 2008) and mechanical damages (e.g. submarine freshwater pipelines) have also affected the coral life. Moreover, the felling of trees causes the reduction in coral growth due to rain water which carries fine soil into the coastal zone, whereby sediment prevents light from reaching the benthos resulting in high concentration of sedimentation that can kill corals (Harborne *et al*., 2000).

Moreover, there are several threats for other ecological attributes which are selected as variables in this study. Four species of marine turtle observed in Malaysia are in the red list of IUCN; not only the overall numbers of Marine turtles over the years (Tan, 2004) but also because of low site stress abundance and size of fish species are decreasing (Hin and Sa, 2001; UNDP, (n.d); Reef Check Malaysia, 2009). Furthermore, water quality is threatened (Hin and Sa, 2001; UNDP, (n.d)) because of tourism and development, oil spills, agriculture and plantation that increased sediment. All these factors affect marine biodiversity in Malaysia; which PIMP faced with these realistic problems.

However, at present there is a conservation fee for some marine parks in Malaysia (Redang, Tioman, Payar, Perhentian and Sabah), but according to Rahim it is not more effective due to some limitation such as human and finance resources and logistic (Yacob, Radam, & Awang, 2008). It is clear that management of marine ecosystem is important and complex; therefore, for DMPM to achieve its given obligations and responsibilities, fund and sustainable finance are essential factors. So for the Marine Park there is not real market and real price.

On the one hand, there is an increasing trend in visitors of PIMP from 2000 to 2012 (2.73%) (Table 2.3); from 2003, based on Act 195, all visitors of PIMP should pay conservation fee (i.e. RM5 for adults and RM2 for others); until now this amount has not any changed. On the other, at present selected ecological attributes in this study are faced threats, which occurred gradually over the years. Thus, the question is how much is the real price of services which provided by ecological attributes in PIMP. Is it RM5? How much the people are willing to contribute to improve ecological aspect and relevant management process in PIMP (or in other words real price).

In order to choose policies, projects and programmes, the outcomes of these choices should be assigned money values. The money value can be realized through economic valuation via people's willingness to pay. Adamowicz (2004) historical analysis indicates that economic valuation could provide potential techniques for assigning money values. For instance, Bateman *et al*. (2002) pointed out that Cost Benefit Analysis (CBA), which is a type of applying environmental valuation, to measure the cost or benefits of a policy, project and programme measure of them should be sought; the type of valuation can likely be relevant to revealed preference which are besed on actual behaviour, stated preference which are based on hypothetical behaviour and hypothetical market and benefit transfer[1] techniques. Thus, public consultation methods, which are based on questionnaire surveys, are utilized in public environmental policies, projects and programmes.

Rational visitors make decisions which maximize their utilities; this is the base of discrete choice models (Choice Modelling (CM)) (Train, 2009) of stated preference techniques. Therefore, applying the random utility theory is an attempt that will be examined in this study.

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[1] Benefit transfer relies on estimates from stated preference and revealed preference studies (Bateman *et al*., 2002)

1.3 Objectives of the Study

In each survey-based economic valuation, the general objective can be the estimation of economic benefits of natural resources or environmental goods and services. For the purpose of achieving the intention of this study, the objectives are as follows:

i.   To estimate the value of management attributes in Perhentian Island Marine Park.
ii. To estimate the value of conservation attributes in Perhentian Island Marine Park.
iii. To examine socio-demographic factors affecting the willingness to pay in improving the conservation and management practices.

1.4 Research Questions

Based on the research objectives of this study, the research questions are as follows:

i.   How much are the respondents willing to pay for the ecological attributes in the PIMP?
ii. How much are the respondents willing to pay for the management practice attributes in PIMP?
iii. Is there any relationship between the values that people hold for conserving the coral reefs, water quality, threatened species and other attributes in this PIMP survey?

The following questions are associated with whether the people are interested in sustainable financing as predicted in the Strategic Plan 2011-2015 of DMPM.

iv. How do the respondents trade-off among the ecological attributes?
v.   What is the people's conservation priority among the ecological attributes?
vi. What is the role of public awareness factors in this study?
vii. If the management process information is included in CM, what is its impact on preferences?

1.5 Importance of the Study

The importance of the study can be considered from the economics and management point of view. Of the economics point of view, Costanza *et al*. (1997) have comprehensively listed ecosystem functions and services (e.g. Marine Parks). And then Moons (2003) extends the list by adding recreation, non-use, options and other values, which are parts of natural capitals. Nowadays, from conventional theory of economics, it has been known as one of the production factors. In addition, Pearce and Barbier (2000) illustrate the basic relationship between physical, human and natural capitals and economic ecosystem (Arabamiry, Yacob, Radam, Samdin and Shuib, 2009).

Economists believe that available resources should be taken into public decision making and used in the best manner; this means rational choice. Therefore, monetary valuation is needed to capture the total value of public goods (e.g. Marine Parks). Based on the nature of public goods, market failure prevents market mechanism to assess these values. Thus, economic valuation is a process of valuing those goods by

employing people's preferences, such as applied user's preferences of PIMP in this study. Therefore, by knowing preferences of user's PIMP, on one hand, policy makers can make effective decision that is near or consistent with user's community; on the other hand can take user's assistance for finance and led their sensitivity to obligations and commitments to accomplish better.

Decision making is based on choices in relation to policies, projects or programmes, while non-market valuation quantifies the value of non-market goods in economic terms. Individual's preferences determine the cost and benefit that they receive from a good. Conversely, a policy can be measured by cost benefit analysis (CBA). Furthermore, Bateman *et al.* (2002) indicate that stated preference, revealed preference and benefit transfer are categorizes of the economic valuation method. Individuals' money valuations of costs and benefits are directly and indirectly extracted through these techniques. For a hypothetical change in the provision of non-market good, when the intention of the study is economic valuation, the stated preference technique measures the respondent's willingness to pay (WTP) or the value of non-market goods.

Non-market environmental goods and services can be valued via various methods (Gibson and Burton, 2009). Contingent Valuation Method (CVM) and Choice Modelling (CM) are two main procedures of stated preference techniques (Adamowicz, 2004); in which the hypothetical environment change for values (use and non-use values as explained in detail in section 3.3) are assessed through a survey based on a scenario to elicit individual values (Bennett, 1999). Among the non-market valuation methods, CM is the more preferred approach because of some reported advantages; for instance reduction in some bias that may occur in CVM (Bennett & Gillespie, 2011).

A wide range of benefits (or ecosystem function values) - not more tangible but more important that directly cannot be consumed - are estimated by measuring of biological effect through WTP of user's PIMP in this study. Yeo (2004) indicate three categories of these benefits for marine parks: Biological Support (i.e. Fisheries, Turtle and Sea Birds), Physical Protection (i.e. Ecosystems, Landforms, Navigation and Coastal Extension) and Global Life Suport (Calcium Store and Carbon Store).

Adamowicz (2004) believes in two markets[2] for environmental valuation by considering their historical trends. During recent years, policy and other decision making market arenas have not applied the academic market to the extent that could be expected. If our expectation is opposite of it, environmental vauation should provide useful and relevant information which helps guide the policy. Thus, this can also be another explicit aim of this study. This study uses factors from strategic plan (i.e. KPI) as levels of attributes to create hypothetical market which is close to real market to provide useful information to policy makers.

Resources should not be allocated to a non-market choice (conservation/recreation) policy, programme and project if more values could be extracted by allocating the resource in different options and alternatives. In an efficient decision making among

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[2] Environmental valuation has been applied through: (1) academic markets, and (2) policy, regulatory and application arenas (Adamowicz, 2004).

options and alternatives, cost effectiveness is fundamental because of opportunity cost for an efficient decision making (Bateman *et al*., 2002).

Applying individual level data, or in other words, discrete choice models, is an attempt to analyse individuals' preferences. Because the purpose of economic valuation is non-market valuation, therefore, CM and CVM are the main choices. Moreover, estimation of WTP for individuals' attributes can be done through CM. When WTP in total is needed, CVM should not be chosen. In addition, when information on relative values for different attributes of environmental goods is needed, CM is a useful stated preference, which is a survey-based method. Some values of environmental goods and services are not related to the direct use of these goods and services. For instance physical, biological and global life benefits of marine parks, thus, CM (a special technique of stated preference) is able to capture these values quantitatively, which is one of the advantages of CM.

In choice modelling[3] each alternative is a combination of attributes and their levels. Choice sets are constructed with alternatives. Since each alternative in each choice set is unique, thus each alternative can be considerd as a scenario. Individual make choice preferred option or alternative in each choice set. By choosing a preferred alternative, infact individual trade-off among levels of attributes that presented in different alternatives in each choice set. Often, one of the attributes in the alternative represents money value. Therefore, the results of economic valuation as Garrod (2002) indicated for ecotourism, in this study can represent the user's WTP (or preferences), values of marine ecosystem function which can be used to assess policy toward ecological and biophysical in national and international arena.

Economic values of ecosystem function of PIMP provided by this study can be used to manage and evaluate steps to sustainable protection of marine biodiversity. Moreover results can help policy makers to balance between ecotourism and general tourism and marine ecosystem in PIMP. KPIs that are utilized in this study make it possible that those results can be transferred for other marine parks. To achieve the aims of DMPM as documented in the Strategic Plan 2011- 2015 these estimated values can be useful in order to compare between the cost and benefits of those plan. In addition, because of some international agreements by Malaysia in international marine arena the results can be utilized to achieve the aims of those plans.

It seems first economic valuations of non-market goods in Malaysia by applying travel cost method of revealed preference techniques have been conducted by Shuib (1991); while first CVM of stated preference techniques applied by Mustapha (1993) and utilizing CM of stated preference techniques by Othman (2002). In marine park environmental goods valuation the first attempt using CM have been done by Yacob *et al.* (2008). Therefore, as mentioned above regarding first strategic plan of DMPM and introducing KPI in it, it would seem that the first effort to take account of environmental valuation of ecosystem functions (ecological attributes and relevant management process) using CM is to be done in this study.

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[3] Conjoint analysis, discrete choice modelling and choice modelling are other mention called in relevant literature for choice experiment (Bateman *et al*., 2002; Yacob *et al.,* 2008). In this study, CM refers to choice experiments.

Of the management point of view, fundamentally, effective integration, combination of different incompatible, inconsistent and contrast values related to environmental goods and sevices or public goods (e.g. tourism and protection in Marine Park) are difficult tasks to undertake. Various management options related to public decision making need multi-criteria procedures of valuation technique like CM. Alternative management strategies impose different implications of attributes and their levels in CM. CM is an emerging technique which supports non-market valuation as a well-known alternative method. For the respondents it is basically dependent on their own preferences; they may choose a group of attributes or servics with a specific cost or prefer to select another group of attributes or services that have different costs. Relevant management process with ecological attributes and their levels in this study provide Pulau Perhentian users with multi-management options. Kenyon and Hanley (2000) indicate that policy makers are more interested to generate a combination of multi-criteria analyses, general public approaches and environmental valuations (e.g. CBA). Seemingly, CM is the best procedure because other methods such as CVM which are sensitive to scale and more than a couple of quantities are uncommon to be valued. Scale itself can be an attribute in the choice experimental procedure (Hanley, Mourato, & Wright, 2001).

To achieve the effective public participation, some theoretical evaluation criteria are essential. People's opinions can be extracted through questionnaires, focus groups[4] and consultation mechanism at higher level could be involvement. So that in the process of CM construction, interviewers focus groups for several times are carried out in this study. Mueller (2003) states that administrators and politicians act based on their own self-interest or the public interest (Carlsson, Kataria, & Lampi, 2011), which is known as the public choice theory.

Decision making in environmental economics because of public goods is more restricted than other fields of economics. In general, Zavadskas and Turskis (2011) believe that, when there is a problem or an improvement in a situation, choices and evaluations of a preferred solution are based on preferences. These preferences are assumed as foundation for making decision. Furthermore, it could be practised by decision making not only individually but organizationally as well. These decisions can be supported by effective decision-making methods.

Johnson-Larid and Byrne (1991) specify that the core of decision making is rationality, whereas the core of rationality is preference (Zavadskas and Turskis, 2011), which means that the expected performance of those who want to make a decision will be maximized. In the society, their action reflects the trade-off between the cost and benefits among different choices and actions; as they are motivated by their desires and target which are crystallized in their preferences.

Public taxes are responsible for funding government expenditure in a democratic society (e.g. conservation charges which are imposed upon all visitors to Malaysia's Marine Parks). In such community, the management of public asset can be directed through considerable influence of the public. Lengwiler (2008) states that

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[4] A small group commonly five to ten people from public members or individuals based on topic experts can be used for survey design by roles: developing for good in question, people understanding of a under consider good, attributes describe and determining appropriate WTP or other measures that attributes change them (Mazur & Bennett, 2008).

information regarding values, preferences and attitudes of the society to achieve an appropriate policy is required for decision makers. As mentioned earlier for each ecological attribute, relevant management processes have been selected as attributes in this study. If the policy makers in DPMP desire or being awareness of the preference level regarding attribute choice for users' perhentian are important, thus based on such information and through the result of the research, DMPM will be able to plan effectiveness protection policy in the next strategic plan.

Usually, a policy or a decision, when advised by the expert, is a technical feature. In a proposed policy, assuming that technical advice of the expert included public's preferences, from the cost perspective, the expert's advice can be a cost effective alternative for applying a society consultation programme (Rogers & Cleland, 2010). Notably, since there are different approaches in non-market valuation; valuation of people and expert preferences may utilize different procedures (Colombo *et al.*, 2009), and thus, estimated values cannot be directly compared.

1.6 Environmental Decision Making Approaches

Kontoleon, Macrory, & Swanson (2001) point out that, the roles of individual preferences and CBA in environmental decision making (EDM) are extensively debated by economists, lawyers and philosophers. EDM faces two issues, namely, policy decision and damage assessment. Preference validity regarding people and expert has different roles and various degrees. Partly, all forms of decision making rely on individual preferences. However, Kontoleon, Macrory, & Swanson (2002) add that, conceptual, moral and legal criteria of individual preferences guide environmental policy, which are the criteria for suitability as initially suggested in environmental resource arena. This notion of economic value has been utilized based on a meaningful concept like trade-off. In economic terminology, the meaning of value is different from other fields, which posits that an individual by his/her preference makes a choice over his/her request. Therefore he/she has to trade-off among alternatives or options. On the other hand, in spite of the fact that CBA has a moral foundation limitation, it is applied as an approach in guiding EDM which does not execute invalidation. In general, preferences are based on approaches that are accurately applied in policy and legal fields and assume the information as role provision, which is more colourful than determinative role (Kontoleon *et al.*, 2002).

In moral or legal basis, when EDM is related to policy decision, we are faced with moral arguments; however, in damage assessment, legal arguments will be applied. The role of information is different in each section (of suitableness) and depends on the intention of utilizing the CBA (valuation), in which EDM is used for policy decision or damage assessment (Kontoleon *et al.*, 2001).

In pricing techniques, price data provides information related to the cost of an environmental change. Therefore, methods that rely on pricing techniques are not capable to catch total social net value. Furthermore, the only techniques which are able to capture non-market valuations are the stated preference techniques.

Environmental Decision Making (EMD) utilizes various techniques, methods and approaches. This broad array can be categorised by role and importance which they hold on individual preference values. In other words, these economic values "should

not be confused with other types of values" (Kontoleon *et al*., 2001). Preferences are stated and revealed in which individual preferences are the forefront and alternative procedure that rely on policy makers, expert panels and stockholder group inputs that avoid direct use of individual preferences (Kontoleon *et al*., 2001).

1.7 Outcome and Process Levels

Based on standard and traditional assumptions, utility depends only on outcomes or consequences, while it may be affected through alternative causes (Bulte, Gerking, List & De Zeeuw, 2005). Bateman *et al*. (2002) indicate that these alternatives are explained in terms of attributes, whereby different levels and values may define these attributes. In stated preference (or clearly CM), the attribute levels can be achieved through various policy outcomes (McCartney, 2009). Having defined that, environmental valuation is based on utility which is the function of outcome. In addition, it is important as to how utility is constructed. The result of the empirical test by Bulte *et al*. (2005) indicated that preferences are conditional on contextual. Therefore, if it is expected in an environmental valuation stated preferences (such as CM), the results would be taken by policy makers as an optimal policy, whereby utility should be measured over levels (process).

In changing environmental quality impact on welfare (WTP) to achieve environmental outcomes, the policy technique should be utilized. For instance, Bosworth, Cameron and DeShazo (2010) found out that the impact of WTP on mortality as an outcome depends on the policy mechanism (because of prevention or treatment). Also, Johnston & Duke (2007) indicate that, welfare assessment in the traditional approach, in which the policy process is not utility neutral. Thus, employing CM can estimate the effect of policy process on utility and WTP by including the policy technique as an attribute level. Furthermore, attributes are processed when they are unobserved outcomes (e.g. absence of information), and utility is affected by probability. Therefore, estimated WTP has bias because of the omitted policy attributes (Johnston & Duke, 2007).

Having justified that, in a CM, environmental outcomes can be achieved by defining attributes, and utility is also estimated by outcomes. It is possible that, including the process (e.g. management) into the CM utility may affect it. Thus, by incorporating both outcome and the process in the CM estimation, the results which consist of more information will be more realistic that can be relied on by policy makers.

Examining the outcomes (value of ecological attributes) and relevant management process with these attributes in an equivalent condition in CM is one of the intentions of this study. Johnston & Duke (2007) believe that the WTP estimation by outcomes only may mislead decision making (policy implication) or eventual partial welfare (validity of welfare estimate).

1.8 Organization of the Thesis Structure

Present thesis consists of six chapters. Study background, problem statement, objectives and important of the study have been discussed in this chapter. The second chapter presents general information about the marine parks in the east caost of peninsular Malaysia and its' governance and management; special and basic

information and perspective of PIMP as well. Relevant literature of this research issues such as: theoretical and methodological background and empirical studies has been reviewed in chapter three. Theoretical framework and methodological details including model specification, statistical and econometric point of view, and process for CM study from questionnaire design to do survey, have been defined in chapter four. Analysing of collected data by CM approach, either respondents profile and estimating the models, interprete by econometric and statistical procedure in chapter five; and estimated economic benefits of ecosystem function for instance preserving biodiversity has been discussed in this chapter as well. Finally, chapter six consists of implication of estimated WTP in previous chapter and discussed to implication of these results to policy makers; suggestion for future studies and conclusion has been followed in this chapter as well.

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