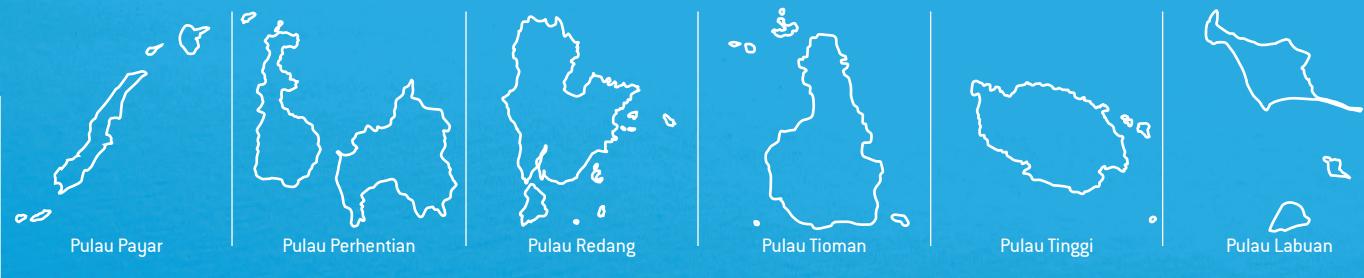


Total Economic Value of Marine Biodiversity

Malaysia Marine Parks



Key Figure

Marine biodiversity in Malaysia's marine parks harbours a wealth benefits to the country especially towards local communities. Series of studies were carried out to investigate the total economic value of our marine resources. To date, 6 archipelagos of our marine parks have been evaluated to obtain a value of **RM 8.7 billion**. These benefits cover a wide range of ecosystem services include: provide fisheries resources, fuel the Eco-tourism industry, coastal protection, climate regulatory function, as well as nutrient recycling. The value also includes bequest and aesthetic value as assessed by our stakeholders.

Total Economic Value
(TEV) Of Malaysia
Marine Park
2011-2015

RM8.7
Billion

Foreword



Assalamualaikum, salam 1Malaysia

The services of ecosystems and the natural capital are critical to the functioning of the earth's life support system. They contribute significantly to human wellbeing both directly and indirectly, and therefore represent a significant portion of the total economic value of the planet. However, these services are not fully captured in markets or adequately quantified, therefore, they are often given too little weight in policy decisions. This issue has been highlighted and decision makers around the world are giving emphasis on evaluating countries' natural capital.

Malaysia has realised that our marine ecosystem holds invaluable potentials which are of high importance in terms of economics, ensuring food security, pharmaceuticals components, maintaining ecological processes and protection from natural hazards. This is because our water lies within the Coral Triangle and we are one of the 12 most biological diverse country in the world. Main ecosystems within our waters are coral reefs, seagrass beds and mangrove forests. We have recorded 612 reef building coral species which is 77% of the total recorded species in the world. The total ecosystem service benefits of coral reefs in South East Asia have been estimated at USD 2.4 billion a year. In Malaysia, value of marine ecosystems ranges between RM 39.6 million to RM 3.6 billion a year.

However, threats of destruction of marine ecosystem is happening at an alarming rate. Threats from human induced factors will weakens resilience of coral reefs and related ecosystems towards impact from climate change especially sea surface temperature rise, sea level rise and ocean acidification.



And He it is who has made the sea subservient [to His laws], so that you might eat fresh meat from it, and take from it gems which you may wear: And on that [very sea] one sees ships ploughing through the waves, so that you might [be able to] go forth in quest of some of His bounty, and thus have cause to be grateful [to Him].

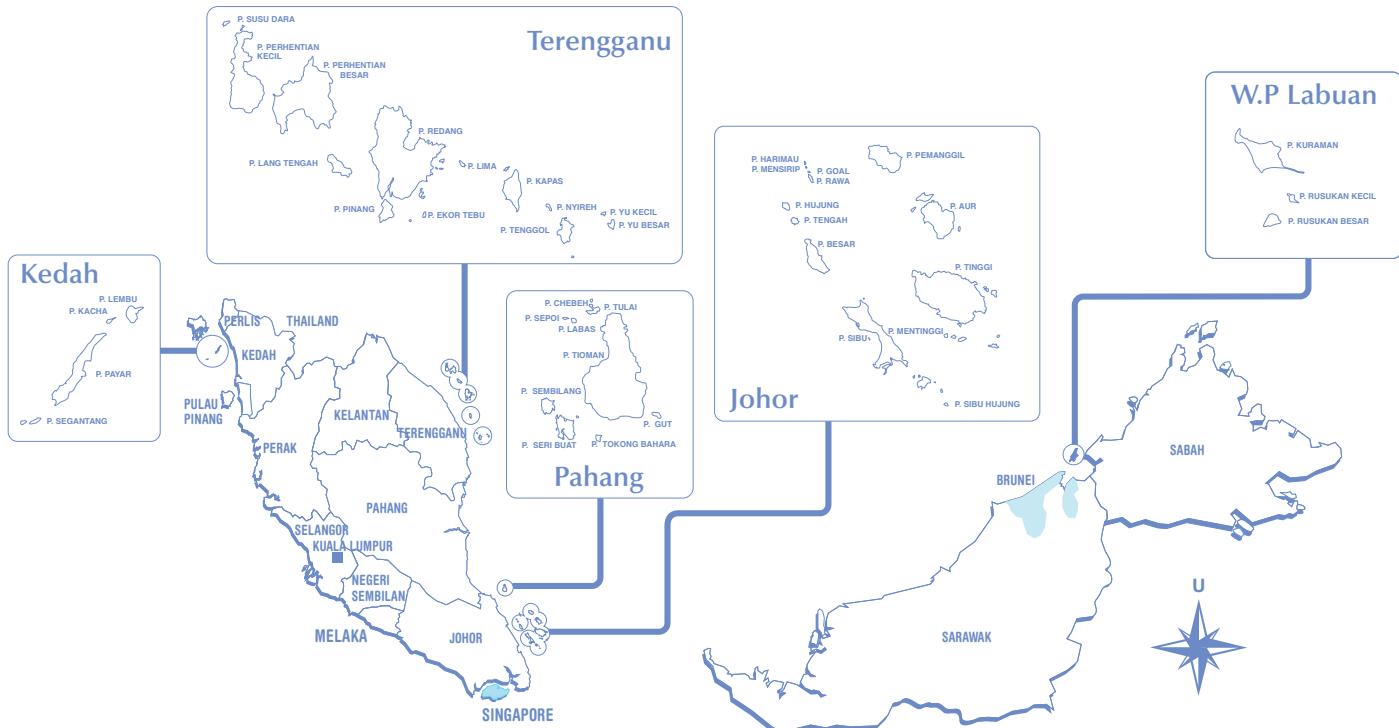
- Surah An-Nabl, 16:14

Reefs without human disturbances will be able to recover naturally. However, anthropogenic threats will affect recovery process and massive coral reefs die offs will occur. If actions are not taken to protect these resources, ecosystem collapse may ultimately compromise the sustainability of humans. Therefore, it is becoming ever more important to secure our national treasures under the sea through gazetttement of Marine Protected Areas. This booklet intends to illustrate the beauty of our marine biodiversity and highlights its value.

As a lesson to all I would like to quote a verse from the Holy Quran: And when Mosses asked for water for his people, We said, "Strike this rock with your staff"; thereupon twelve springs gushed forth from it; each group recognised its drinking-place; "Eat and drink from what Allah has provided, and do not roam about the earth making turmoil in it." Surah Al-Baqarah: 60.


DATO' DR. SUKARNO BIN WAGIMAN
Director General

Malaysia Marine Parks



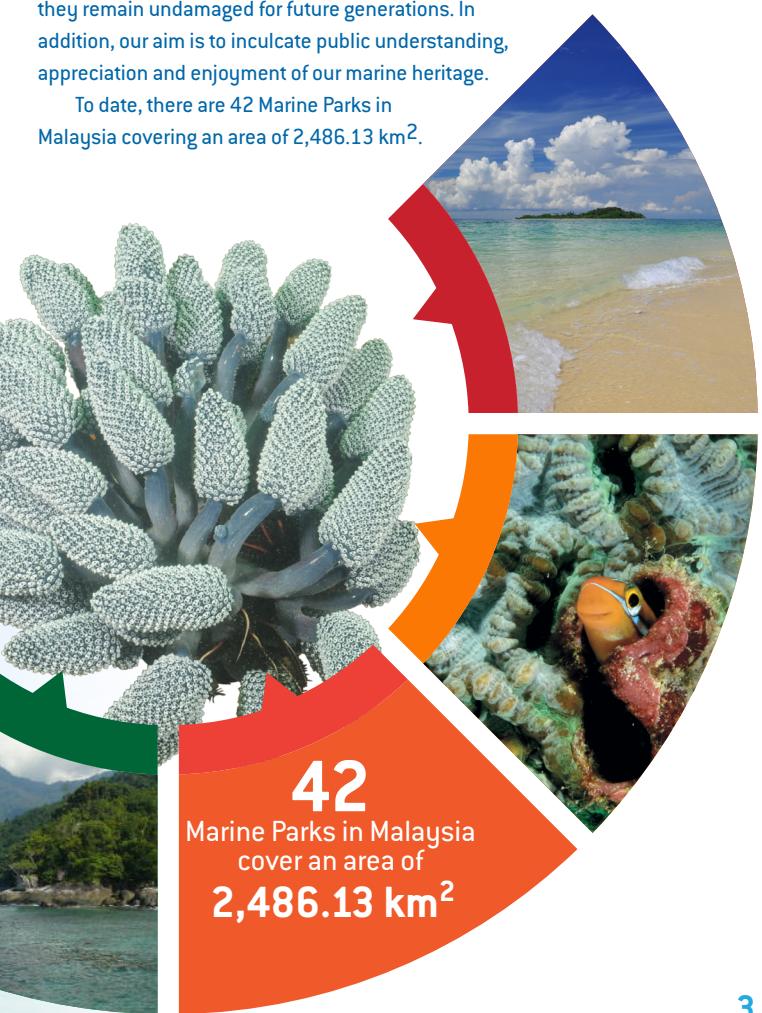
In the early 1980s, it was realized that marine fisheries had experienced a decline. In order to enhance fisheries resources, it was deemed essential that coral reef areas where various commercial fish species live, breed, feed and grow, need to be protected. Coral reef areas are one of the critical habitats because they are exposed to various stressors, which occur naturally or are caused by human activities.

In view of the situation, in 1983, the then Prime Minister of Malaysia, Rt. Hon. Tun Dr. Manathir Mohammad directed the Ministry of Agriculture (Department of Fisheries) to establish Marine Parks in the country.

The setting up of Marine Parks is provided for under Part IX of the Fisheries Act, 1985. The principal goal of establishing Marine Parks in the country is to protect, conserve and manage in perpetuity representative marine ecosystems of significance, particularly

coral reefs and their associated flora and fauna, so that they remain undamaged for future generations. In addition, our aim is to inculcate public understanding, appreciation and enjoyment of our marine heritage.

To date, there are 42 Marine Parks in Malaysia covering an area of 2,486.13 km².



High Economic Value



Fisheries

RM580.4 Million

Coral reefs and their surrounding ecosystems, including mangroves and seagrass beds, provide important fish habitat. In Malaysia, consumption of fisheries product per capita 56kg year which is among the highest in the world. This shows the importance of fish resources to our people. Fisheries industry also contribute 1.3% of our national Gross Domestic Product.

Bequest Value

RM14.5 Million



Bequest value is an intangible value and classified as Non-Use Value. The value is measured from the perspective of the tourist on how far their desire in conserving the future ecosystem of goods and services that is not going to be used at present. The measurement is being proximate on the monetary value which, considering their willingness to pay in the future towards all the goods and services provided in marine parks.



Carbon sequestration is a very important component in supporting the life of community globally by regulating the climate. Carbon dioxide can be sequestered through mangrove, seagrasses and to some extent coral reefs. These ecosystem are commonly found in our coastal areas. These ecosystems coexist to support each other and balance CO₂ emissions, whilst assists to decelerate the greenhouse effect.

Carbon Sequestration

RM30.24 Million



Coral reefs serve as natural barriers to storm surges that can cause great destruction to coastlines and communities. Our coastal zones laced with mangroves and coral reefs were reported to be able to act as barriers for storms, tsunami and coastal erosion. This was proven when areas with mangroves were left intact after the 2004 tsunami in Straits of Melaka. This is an important budgetary saving for the country and our people.

Coastal Protection

RM56.25 Million



of ecosystem services

Tourism

RM4.6 Million

Coral reefs are among the most visited natural areas in the world. SCUBA diving is an important component of marine tourism, a multi billion dollar industry and one of the world's fastest growing recreational sports. Marine Parks in Malaysia receive an average of 630,000 visitors a year with an annual increment of 5%. This shows growing interest of tourists to natural environment especially one that is protected and effectively managed to ensure maximum satisfaction.



Research & Maintenance Cost

RM8.1 Million

Department of Marine Park Malaysia is entrusted to conserve and manage marine parks in Malaysia and therefore carry out research and regular monitoring as well as conservation programmes to ensure sustainability of our marine natural resources.



Researchers around the world have searched for universally valid criteria for aesthetic principles and exploring methods to quantitatively describe the value of beauty and ugliness. A study suggest that human perception of aesthetics is well-aligned with healthy, thriving ecosystems. The World Heritage system, recognises aesthetic values of a property as outstanding universal value. Alongside the presence of values, properties inscribed on natural criteria must also satisfy conditions of integrity. This therefore means value of protecting these areas to ensure integrity and sustainability.



Aesthetic Value

RM8.0 Billion

Generally, it is agreed that the main functions of marine park area is to protect species, habitat and biodiversity. According to Constanza et. al. (1997), these functions in turn provides the goods and services which benefit human populations. Marine parks in Malaysia is home to many endangered species. Endangered species that are found and automatically protected are sea turtles, giant clams, dugongs, and sharks just to name a few. This area serves as refuge from predators, food source, grow out area and breeding grounds.

Biological Support

RM1 Million



Capture Fisheries

spill over effect of MPA

Annual value of services provided by marine parks towards the fisheries industry



Resource conservation for sustainable fishing

Creating an MPA is often considered as an application of precautionary principle. MPAs prevent extinction of heavily exploited populations by providing source for the replenishment of fished out patches. They also provide alternative to conventional fisheries management tools. A study comparing the composition of fish species in a marine park and a non marine park found that a protected area has higher composition of fish species.

RM580.4 Million

Fisheries industry in Malaysia supports more than 64,000 local fishermen. This industry contributes 1.3% of the national GDP with a value of RM 12.7 billion a year. The value of fisheries industry in South China Sea is estimated to worth USD 2.4 billion a year.

64,000 local fisherman

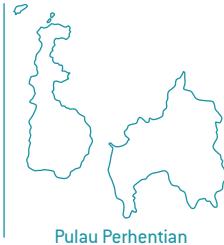
Studies also indicate that human disturbance on the corals had affected fish community especially species that depends on the health of corals for survival. These findings support the fact that marine parks serve as breeding ground and nursery for our marine resources. These new stocks will then migrate out to the open sea for the fishermen. Feedbacks from fishermen in Langkawi Island noted that Pulau Payar Marine Park helped to revive the anchovies fishing in the region. The value that marine parks contribute to the capture fisheries industry is RM580.4 million a year.

Annual Value Per archipelago

RM123.3 M



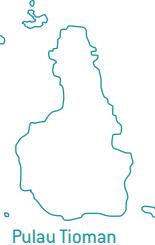
RM 75.4 M



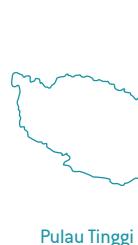
RM85.7M



RM195.2M



RM95.1M



RM5.6M



Eco Tourism

high potential for sustainable development

Annual value of services provided by marine parks towards the tourism industry



Promotion of recreational non extractive activities

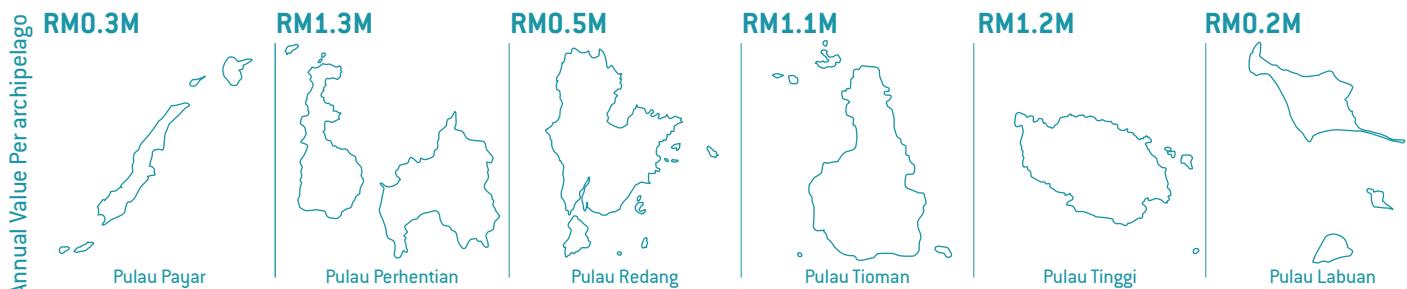
Developing eco-tourism is regarded as a way to translate the benefits of ecosystem preservation into economic terms, thus increase the value of establishment of MPAs and to reconcile ecosystem protection with economic generation. However, an economic analysis of marine protected areas cited that while tourism industry in a MPA can be beneficial to the economics and also to compensate the cost incurred for restricting extractive activities such as fishing and harvesting other marine organism, it will harm the marine ecosystem itself and bring to the downfall of the industry if not managed in sustainable manner. Sustainable tourism management is important to ensure that our marine parks remain as the main choice for tourists and nature lovers.

RM4.6 Million

Marine Parks in Malaysia receive an average of 630,000 visitors a year. It is estimated that the minimum spending of a tourist on a marine park is RM450. Therefore, the marine parks generate around RM 283 million of spending by tourists annually. This directly benefits the locals on the islands who are involve in the industry.

Coral reefs support recreation. The recreational value of reefs, as indicated by income from tourism is enormous. In general, eco-tourism industry that revolves around the coral reefs is estimated to worth USD 9.6 billion a year globally. Department of Marine Park Malaysia is able to generate an average income of RM 4.6 million annually through implementation of Conservation Fees (Conservation Fee is RM 5 per person). These Fees are then use for management and maintenance of the parks.

630,000
tourists annually



Research & Maintenance Cost



information services leads to effective management

Annual costs by DMPM to carry out research and surveys in marine parks



Scientifically sound management

In accordance with the Department's mission to conserve and manage marine resources in marine parks scientifically for sustainability to generate the country's economy, the Department is relentless in carrying out and promote studies and monitoring surveys which could bring about benefits towards managing our marine resources and track changes to our marine ecosystem. The department is granted regular fundings for such studies.

RM7.7 Million

Research institutes, local and international universities are looking to our Marine Parks as marine research destinations. An average of 26 research projects are carried out annually in our marine park waters. Besides that, the Department also promotes studies which are then translated into management practices.

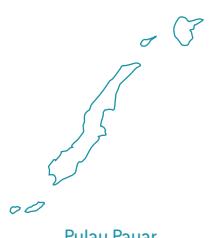
Many researchers are also proposing for long term and continual studies in our marine parks. By stationing their studies in the marine parks, they will get to study the same group of organisms in the same plot of habitat. They may also provide valuable scientific reference areas to serve as controls on trends and the basis for understanding the broader impacts of anthropogenic threats. Besides that, our marine parks which are unique with various types of habitats such as coral reefs, seagrass meadows, and the mangroves also act as outdoor laboratories for both researchers and students.

180
research by
research
institutions



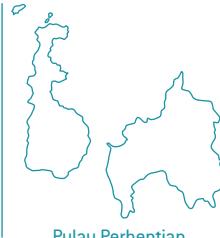
Annual Value Per archipelago

RM1.2M



Pulau Payar

RM0.3M



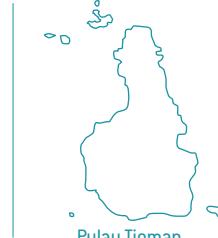
Pulau Perhentian

RM2.8M



Pulau Redang

RM2.8M



Pulau Tioman

RM0.5M



Pulau Tinggi

RM0.2M



Pulau Labuan

Aesthetic Value

aesthetic beauty that attracts visitors



Annual aesthetic value
of marine ecosystem in
Malaysia marine parks



Valuing the Natural Beauty of Marine Park

Malaysia is very fortunate to be blessed with the abundance of biodiversity, especially our waters that cover 60% of our total land and sea mass. The marine ecosystem covers highly diverse habitats especially the coral reefs with a record of 612 coral species, equivalent to 77% of known coral species worldwide. In addition, our maritime area is also strategic as it is identified by scientists to be located within the Coral Triangle.

The natural beauty of this healthy and highly diverse marine environment has attracted the attention of many visitors around the world. Marine Park alone has attracted an average 630,000 tourists each year who enjoy the beauty of Marine Parks while exploring our coral reefs. The pleasure in enjoying the natural beauty of the marine park and intention to conserve it is translated as aesthetic value.

**RM8.0
Billion**

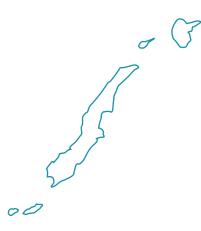
The aesthetic value is a major contributor to more than 80% of the total economic value of Marine Parks in Malaysia. This element was confined to the value of coral reefs and coral fish.

Aesthetic value is one of the sub-components under Use Value, but has been classified as non-extractive. This aesthetic value is very valuable and is the main reason that attracts tourists from all over the world to Marine Parks. The aesthetic value of the Marine Parks has been valued which range between RM 50 million and RM 3.5 billion a year. Based on existing information available, these values are priced according to two factors namely the coral reef area and the density of fish population in the islands of Marine Parks. As a result, high aesthetic values over other economic values continue to show the importance of the Marine Park as a support system of marine biodiversity in Malaysia. It is a great responsibility for the Department of Marine Park Malaysia to protect our marine parks and ensure its integrity and sustainability.

77%
known coral species

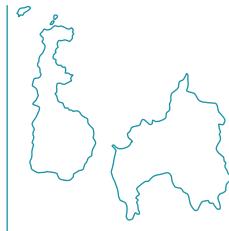
Annual Value Per archipelago

RM50.6M



Pulau Payar

RM967M



Pulau Perhentian

RM265.5M



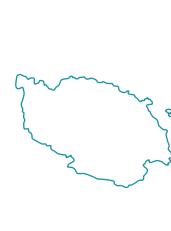
Pulau Redang

RM3.2B



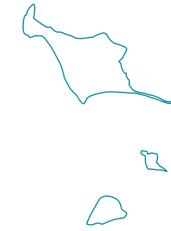
Pulau Tioman

RM3.5B



Pulau Tinggi

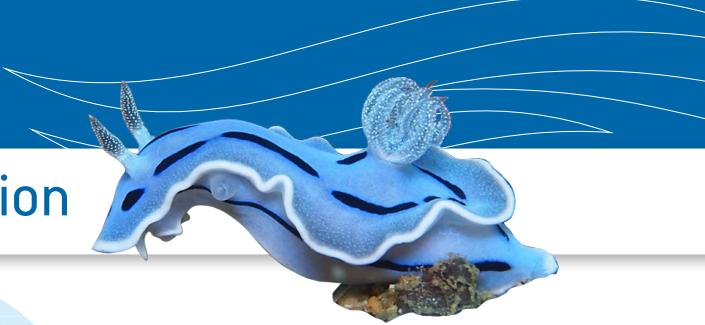
RM33.6M



Pulau Labuan

Biological Support

species protection



Annual value of biological support provided by the marine ecosystem



Supporting the Life Source of Our Marine Resources

The Malaysia marine parks are areas of the sea dedicated to the protection and maintenance of biodiversity as well as natural and cultural process. A lot of the things that we use and depend on everyday contain components or parts that originate from the sea. If our marine resources are improperly managed or overexploited, it would eventually lead to the complete destruction of the marine ecosystem.

It is agreed that the major functions of marine park area are to protect species, habitat and biodiversity. According to Constanza et. al. (1997), these functions in turn provides the goods and services which benefit human populations. Hence, biological support is considered under non-use values that are valued in as much as they provide goods and services for human use. Marine Parks are not only the life source of our marine resources, but they are the sink on which the healthy biodiversity of Malaysian seas and the wealth of the local communities depends.



Each Marine Park island has form unique strengths in view of biodiversity. Generally, all Marine Parks play important role in supporting the sustainability of marine resources in Malaysia. As for turtle conservation activities, programs have been carried out since the establishment of DMPM. There are hatcheries on three Marine Park Centres namely Pulau Redang, Terengganu; Pulau Tinggi, Johor and Pulau Rusukan Besar, WP Labuan. Turtle hatcheries are managed by DMPM with cooperation and support from NGOs and local stakeholders. These turtle hatcheries managed to keep the average turtle hatchlings alive and to be released to sea at a percentage of 78% to 90% annually.

In managing the marine ecosystem as a whole, DMPM together with researchers from universities, NGO's and volunteers are continuously carrying out reef and water quality monitoring to detect changes in the marine environment. Should there be any indication of damage or deterioration, DMPM will then take measures to rehabilitate affected areas at the earliest possible opportunity. The immediate action taken will be to ensure the continued functioning of Marine Park in supporting the biological aspect of the marine resources and its economic values to the people of Malaysia.

up **15,000**
turtle hatchlings
released a year

Annual Value Per archipelago

RM0.08M

Pulau Payar

RM0.9M

Pulau Perhentian

Pulau Redang

RM0.015 M

Pulau Tioman

Pulau Tinggi

Pulau Labuan

Coastal Protection

natural barrier - budgetary saving from building engineering structure

Annual value of coastal protection in Marine Parks



Serving an Essential Function of Coastal Protection.

Malaysia has a coastline of some 4,800km and sits on the geologically stable Sunda Shelf. About half of the coastline is hugged by sandy beaches and slightly less than half is fringed with mangrove forest. Meanwhile the coral reefs are estimated to cover close to 4,006km². All these ecosystems boast distinct, unique and spectacular biodiversity and provide a broad range of ecological and ecosystem services.

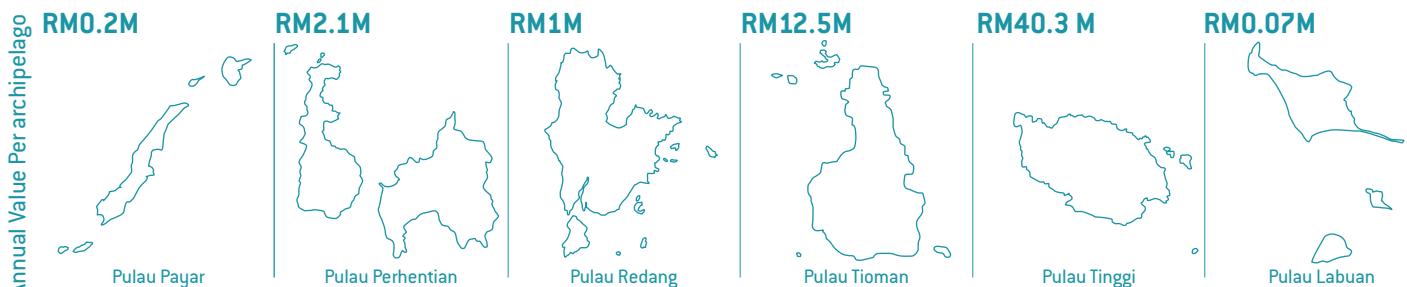
Coral reefs, seagrass beds, and mangrove forests are interconnected ecosystems in protecting coastal areas. Coral reefs can reduce wave energy that leads to land. This energy is further reduced by the presence of seagrass and mangrove forests. Similarly, these ecosystems serve as natural barriers to storm surges and wave erosion that can cause great destruction to coastlines and communities.

Marine Park islands have been identified to contain at least one of these three important ecosystems: coral reefs, mangroves and seagrass. Therefore, the economic value of the Marine Park is also evaluated based on its role in protecting the coastline and coastal dwellings.

Dawning to the impacts of the tsunami in 2004, which have never occurred in Malaysian water, conservation of coastal zones is becoming more important. Our coastal zones laced with mangroves, seagrass and coral reefs were reported to be able to act as barriers from storms, tsunami and coastal erosion.

4,006km²
of coral reefs

The annual value of shoreline protection services provided by coral reefs and mangrove forest in Marine Park islands is estimated to be between RM 67 thousand and RM 40 million every year. Coral reefs are the main contributor to these values as most of the Marine Park area is covered by coral reefs compared to mangrove and seagrass. Empirically, coastal protection is valued by the contribution of the coral reef and mangrove per km². Recognizing the importance of coral reef ecosystems in protecting coastal areas especially in Marine Parks, DMPM has conducted various conservation activities. This includes the coral restoration programs to address the loss and decline of marine habitats in the Marine Park. In addition, the program contributes to Malaysia's obligations in implementing Aichi Biodiversity Target 15, whereby 15% of degraded areas were restored to enhance its resilience and biodiversity.



Carbon Sequestration

climate regulator



Annual value of Carbon sequestration provided by Marine Park Malaysia



Removing CO₂ from the Atmosphere

Climate change is a global issue that has caught the world's attention. Every world leader and international parties are trying to overcome this problem by controlling the greenhouse gas emissions. Alongside such measures is the strong move to preserve the habitats that function as carbon sinks. Previously, habitat preservation efforts were concentrated only in the terrestrial area due to the vast amount of understanding of forest function as carbon sinks. However currently, marine ecosystem function in carbon sequestration has been realized from the results of various studies been conducted globally. Carbon dioxide can be sequestered through coral reef, mangrove and seagrass and balance CO₂ emissions, whilst assists to decelerate the greenhouse effect.

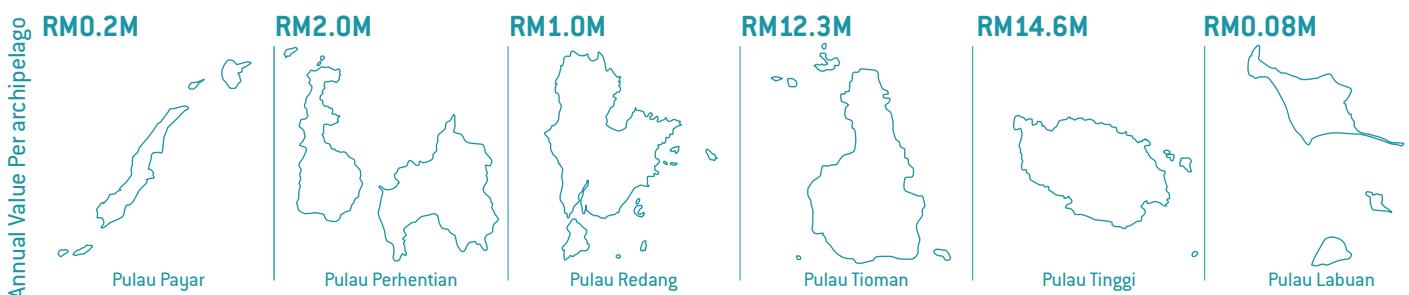
RM30.24 Million

The valuation of services provided by the marine ecosystem as carbon sequestration is intended to associate the economic value to the services provided by the ecosystem. The result is expected to generate economic incentives that support the marine ecosystem conservation agenda.

Marine protected areas such as marine parks have been recognized to play a role in protecting and preserving various marine habitats. With such protection, the function of marine ecosystem to sequester carbon can also be enhanced.

The annual value of carbon sequestration provided by coral reefs and mangroves in Marine Park is estimated between RM 85 thousand and RM14.6 million. The varied estimation are dependent on the coverage of coral reefs and mangroves in the marine park islands.

7,990
standing carbon stocks in mangrove
(g C/m²)



Bequest Value

willingness to pay by visitors



**RM14.5
Million**

On average, the overall willingness to pay (WTP) to conserve the marine ecosystem for future generations or equates the future value of current Marine Park is RM13.80 per person.

This value exceeds the conservation fees charged to local tourists to the Marine Park.

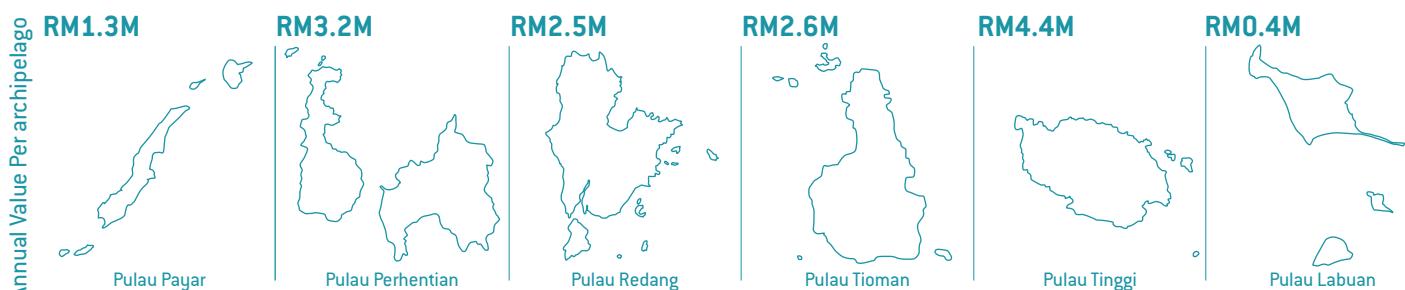


Conserving Marine Environment for Future Generations

From mangrove forest, seagrass and coral reefs, the ocean and coastal surrounding Malaysia are teeming with marine life. These habitats with its resources support and provide people with valuable set of goods and services, including seafood, recreational areas, tourist spots, opportunity for research and education, coastal protection among many more. In addition, the establishment of Marine Park that serve as a protected area, all the habitat and marine resources could secure sustainability for future use. The use of marine resources and its environment for future generation is another important function of Marine Park and to value it in monetary terms is difficult but is no less important. The value can be measured on how much people are willing to pay to ensure the future generation benefits the resources as they enjoy it at present. Some people who have never visited the Marine Parks or may never plan to make a visit, may still be willing to pay an amount to ensure that their children or grandchildren have the opportunity to visit sometime in the future. Still others, may also be willing to pay an amount simply to ensure the existence of the beauty of natural and marine resources for future generations.



Average Willingness to Pay:
RM13.80



Total Economic Value (TEV) according to States

Kedah

Total Economic Value for Pulau Payar Marine Park,
2011

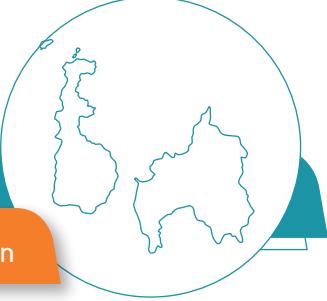
RM174 million



Terengganu

Total Economic Value for Pulau Perhentian
Marine Park, 2015

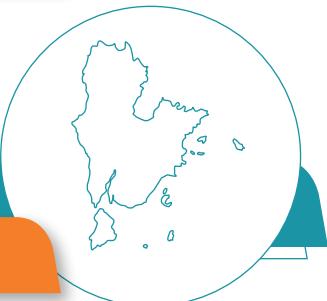
RM1.049 billion



Terengganu

Total Economic Value for Pulau Redang
Marine Park, 2012

RM354 million



Pahang

Total Economic Value for Pulau Tioman
Marine Park, 2013

RM3.441 billion



Johor

Total Economic Value for Pulau Tinggi
Marine Park, 2014

RM3.667 billion



W.P. Labuan

Total Economic Value for Pulau Kuraman
Marine Park, 2012

RM39.6 million



References:

Kamarruddin Ibrahim, Nor Hasni Osman, Azhar Ahmad, Shamir Sivaraj Abdullah, and Albert Apollo Chan; 2013; PULAU REDANG MARINE PARK: Management Effectiveness And Total Economic Value, Department of Marine Park Malaysia, Ministry of Natural Resources and Environment, Putrajaya, Malaysia, 101 pages.

Kamarruddin Ibrahim, Shahima Ab Hamid, Nor Hasni Osman, Azhar Ahmad, Fitra Aizura Zulkifli; 2015; PULAU TIOMAN MARINE PARK: Total Economic Value and Management Effectiveness, Department of Marine Park Malaysia, Ministry of Natural Resources and Environment, Putrajaya, Malaysia, 119 pages.

Norlена Hasnan, Kamarruddin Ibrahim et. al.; Department of Marine Park MAlaysia, 2012, Investigating Total Economic Value of Eco-tourism in Pulau Payar Marine Park, Ministry of Natural Resources and Environment, Putrajaya, Malaysia, 148 pp.

Rasid Mail, Kamarul Mizal Marzuki, Roslinah Mahmud, Dayangku Aslinah Abdul Rahim; 2012; Estimating Total Economic Value of Labuan Marine Park; Universiti Malaysia Sabah [power point presentation].

Sukarno W., Nor Hasni O., Abdul Rahim G.Y., Azhar A., Muntalib J., Mohd. Ridzuan M.A., Fitra A.Z. and Chan, A.A., 2015, Pulau Perhentian Marine Park Total Economic Value & Management Effectiveness, Department of Marine Park Malaysia, Ministry of Natural Resources and Environment, Putrajaya, Malaysia, 151 pages.

Sukarno W., Nor Hasni O., Muntalib J., Azhar A., Fitra A.Z. and Chan, A.A., 2015, Pulau Tinggi Marine Park Total Economic Value & Management Effectiveness, Department of Marine Park Malaysia, Ministry of Natural Resources & Environment, Putrajaya, Malaysia, 83 pp.

Edited by:
LIM AI GAIK
IZARENAH BT MD REPIN



Design & Printed by:
SHIKH HOUSE OF DESIGN
012-2344861
shikhakbar70@gmail.com



The economic valuation of Marine Parks presented in this report are generally specific to the sites. It has allow us to conclude that Marine Parks are regarded as valuable and beneficial to the people locally and globally. In particular, Marine Parks were identified as having high conservation value despite a number of underlying issues such as conflicts between conservation and development needs, lack of well-defined boundaries and scientific rationale and insufficient funding sources. In overcoming these issues the economic valuation assessment such as this, can indirectly contribute to environmental awareness-raising, targeting stakeholder groups who may not be particularly interested in environmental conservation per se, by providing figures that are easy to read and to disseminate. This assessment can also be used to prove that the allocated funds in managing Marine Parks can generate returns of greater economic benefits than the money invested. Moreover, the economic surplus can also be enjoyed by all Malaysians and people around the world.



JABATAN TAMAN LAUT MALAYSIA

Kementerian Sumber Asli dan Alam Sekitar

Wisma Sumber Asli, No 25, Persiaran Perdana, Presint 4, 62574 PUTRAJAYA

+603-8886 1379/1365/1111

+603-8888 0489



www.dmpm.nre.gov.my



tamanlaut@nre.gov.my

Marine Park Malaysia



Jabatan Taman Laut Malaysia Jabatan



Taman Laut Malaysia



Marine Park Malaysia