

Government Valuers' Insights on Current Practices in Marine Ecosystem Valuation in Malaysia

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Abstract

This study investigates the valuation of marine ecosystem services in Malaysia, focusing on government valuers' perspectives. Marine ecosystems are complex environmental assets, but their valuation methods are underdeveloped. The research aims to investigate current approaches, challenges, and challenges in valuing these services, particularly in relation to existing legal frameworks. Through qualitative interviews, the study reveals the current valuation techniques, areas needing standardization, and the importance of clear guidelines for valuation practices. The findings serve as a foundation for analysing valuation methods and addressing the need for tailored laws and standards.

Keywords: Marine Ecosystem Service; Valuation Method; Valuers Current Practice; Economic Value

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1.0 Introduction

Ecosystem services (ES) conservation often lacks market value due to the absence of systematic evaluation grounded in resource demand. Valuation methods seek to quantify the monetary value of ES, thereby highlighting its concrete economic benefits to society. The Total Economic Value (TEV) framework is commonly applied to assess environmental value, determined by the interplay of supply and demand (Bateman et al., 2020; Barbier, 2021). Natural scientists, including ecologists and geographers, focus primarily on understanding and modelling the supply of ES, whereas the characteristics of human beneficiaries play a crucial role in shaping demand (Costanza et al., 2019; Sukhdev et al., 2023).

Since the late 1960s, environmental economics literature has developed numerous financial approaches to valuing environmental goods and services. According to traditional economic theory, the value of environmental assets is shaped by individual preferences for both utilisation and conservation (Pearce & Atkinson, 2019). Economists reconcile demand-side values through the use of market conditions, data precision, and professional expertise (Hanley & Barbier, 2020). However, assigning a direct monetary value to environmental benefits is not always necessary, and the influence of environmental economics on policy objectives remains limited (Turner et al., 2021).

Environmental assets are specialised public service assets that necessitate appropriate valuation methods for effective conservation planning. Comprehending how to value these assets requires an enhanced understanding of their broader significance. The context in which valuation takes place can influence public perception and the values attributed to these assets, and psychological insights can play a crucial role in understanding these valuation contexts (Raymond & Kenter, 2022; Binder et al., 2023).

In Malaysia, the valuation of marine ecosystem services (MES) has seen increased attention due to its significance for conservation and sustainable development. Current valuation methods employed by government valuers often rely on the Total Economic Value (TEV) framework, integrating both direct and indirect values of ecosystem services. Methods such as contingent valuation and cost-benefit analysis are frequently used to assess MES, drawing on both market-based and non-market valuation techniques (Ibrahim et al., 2020; Ahmad & Ismail, 2021). However, these methods face challenges, particularly with accurately capturing the non-market value of MES, as well as integrating complex ecosystem interactions and services that lack a direct economic footprint.

One primary issue is the difficulty in applying traditional valuation methods, which are often ill-suited to the unique nature of marine environments and may not fully account for the socio-cultural and ecological values associated with these services (Hamid & Lee, 2022). Additionally, data limitations and the need for highly specialised expertise impede the effectiveness of current valuation practices (Salleh et al., 2023). Malaysia's valuation approaches are further hindered by inconsistent standards and guidelines, which limit the comparability of valuation outcomes across regions and projects (Rahman & Hassan, 2021).

The application of these valuation methods in Malaysia underscores the need for methodologies that are adaptable to local contexts and capable of capturing the broader ecological and social values associated with marine ecosystems. Establishing standardised guidelines and fostering interdisciplinary collaboration are vital steps to ensure valuation practices reflect both economic and non-economic MES values, enabling more effective conservation and policy decisions (Zainal et al., 2023).

The main focus of this paper to investigate the current practice of ES valuation based on valuers perspective. As of now, prior research has yet to conceptually and empirically investigate an effective method for ES valuation, specifically in Malaysia (Mamat et al., 2020). Future study is suggested to further discussed an emphasis on ES to ensure that the estimated value accurately reflects the economic value of ES; additional considerations must be made while valuing ES. ES is significant because it can integrate the environmental and development sectors and optimize the overall value that resource consumers obtain (Loomis et al., 2019; Perez Verdin et al., 2016).

2.0 Literature Review

2.1 Ecosystem Service Valuation

The term "ecosystem services" (ES) can be used to describe how human activity and the environment interact. It functions as a useful tool for evaluating how well natural resource management is accomplishing the objectives of maximizing conservation effort and attaining sustainable use (Rahmadyani et al., 2023). ES are valued differently from other properties due to limited markets and market prices. From this perspective, the rationale behind ecosystem valuation is to simplify socio-ecological relationships, highlight how decisions made by humans could alter the values of ecosystem services, and express these changes in values in terms of money or other comparable units so that they can be taken into account when making decisions that affect the public.

Market failures, imperfect markets, and absent markets are some of the problems that underlie an economic evaluation of ecosystem services (Azadi et al., 2021; Hermes et al., 2018; Ploeg et al., 2010). Decision makers' unfamiliarity with the terminology and tenets of ecosystem service valuation may worsen the lack of adoption of valuation outputs. As a result, when making daily decisions, the value of many ecosystem services needs to be more recognized and valued (Matthew et al., 2019). Therefore, allocating a value to what nature produces and a cost to what humanity destroys is critical.

Ecosystem service valuation is justified because natural resources are not valued at their full potential, and second, human-caused damage is not documented because it is typically regarded as 'res nullius' (Failler et al., 2015). Best practices, such as having straightforward policy questions and strong stakeholder engagement from the outset of valuation studies, appropriate choice of valuation methodologies, and having the ability to effectively demonstrate causal links between drivers of ecosystem health, change, and

resource users, should be followed in order for ecosystem service valuation to apply to decision makers (Lee et al., 2022).

The critical concept of welfare economics is that an environmental benefit's total economic value is determined by how it affects the well-being of the people who comprise society. The fundamental tenet of economic valuation is shown in Figure 1. The monetary evaluation of the overall economic value of an environmental benefit is, therefore, a crucial problem in policy decisions if society is to maximize the well-being of individuals. Given the variety of value theories, valuation exercises should ideally i) recognize the presence of different valuation methodologies and ii) be clear about the methodology employed and its underlying assumptions.

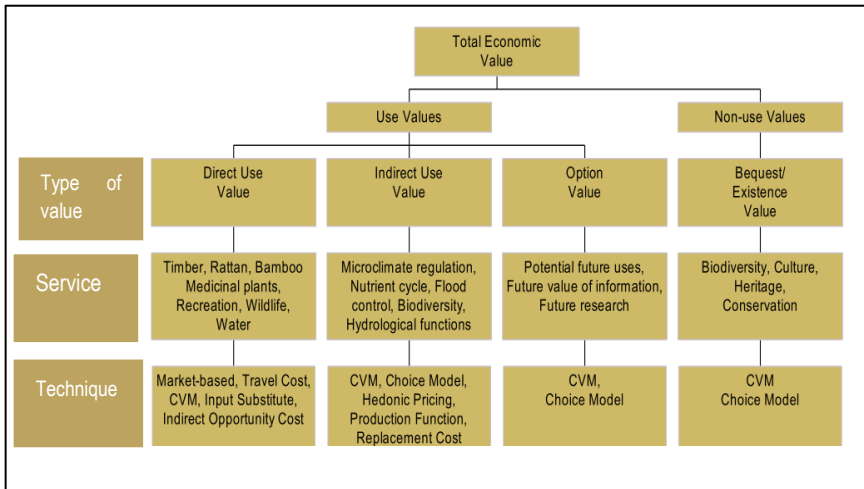


Figure 1: Economic Valuation
(Source: Adapted from Cheng et al., 2019 and Ghani, 2017)

Use values are related to private or quasi-private goods, which typically have market prices. Sometimes, use values are separated into two groups: (a) Direct use value is concerned with the advantages derived from using ecosystem services directly. This kind of usage might be extractive, meaning it involves consumption (like food and raw resources), or it can be non-extractive, like the aesthetic benefits of landscapes. (b) Indirect usage values are typically linked to regulating services, considered public services typically not represented in market exchanges. Examples of these services include erosion prevention and air quality management.

Ecosystem non-use values do not involve the direct or indirect use of the ecosystem service. They represent the happiness people feel when they know that ecosystem services and biodiversity are preserved and that others can or will be able to enjoy them (Navrud & Strand, 2018). When non-use values are related to intra-generational equity problems, they

are typically called existence values in the first case or bequest values regarding inter-generational equity.

Non-use values, tied to moral, religious, or artistic features, present more valuation issues than use values. They differ from other services in producing tangible things or conditions. These services are co-produced by people and ecosystems, with the total value category (TEV) representing the total of these value categories. Table 1 provides an overview of these relationships.

Table 1: Valuing ecosystem services through the TEV framework

Elements/ Category	Service	Direct Use	Indirect Use	Option Value	Non- use Value
Provisioning Service	Includes: food; fibre and fuel; biochemicals; natural medicines, pharmaceuticals; fresh water supply	*	NA	*	NA
Regulating Service	Includes: air-quality regulation; climate regulation; water regulation; natural hazard regulation, carbon storage, nutrient recycling, micro-climatic functions etc.	NA	*	*	NA
Cultural Service	Includes: cultural heritage; recreation and tourism; aesthetic values	*	NA	*	*
Supporting/ Habitat Service	Includes: primary production; nutrient cycling; soil formation	Habitat services are valued through the other categories of ecosystem services			

(Source: Adapted from Pascual et al., 2012)

Environmental benefits can be valued using direct and indirect methods, including option value and stated preference methods. Option value methods involve monetary value without considering people's preferences, while stated preference methods use questionnaires and estimation exercises. Revealed preference methods involve travel costs, hedonic pricing, and averting behavior. Techniques include contingent valuation, contingent ranking, pairwise comparison, and allocation games.

The contingent valuation method (CVM) is a widely used technique for valuing ecosystem services, accounting for both user and non-user values. With contingent valuation, respondents are asked directly to indicate their willingness to pay (WTP) in order to increase the quantity or quality of a certain good which is not traded in a traditional market. Respondents are occasionally asked if they would be willing to accept WTA compensation in exchange for a change in the amount or quality of a particular commodity. It requires respondents to provide preferences for a specific environmental resource or

status change. However, CVM has faced criticism from experimentalists in psychology and economics, who focus on preference elicitation. Supporters focus on testing to address method reliability and validity issues.

Table 2: CVM Strength and Weakness

Author	Strength	Author	Weakness
(Lee & So, 2022)	CVM can provide reliable enough estimates to support not only administrative but also judicial decision processes	(Halkos et al., 2020)	These disadvantages concern the validity and reliability of the results. The format of questions, the possible protest responses due to the nature of goods as well as the fact that the surveys are based on hypothetical scenarios constitute some limitations.
(Sakai & Uchida, 2013)	CVM is the only comprehensive method that can produce concrete estimates on the welfare of environmental programs, some of the antagonists' criticisms are also worth considering.	(Utsunomiya, 2018)	CVM is not usually applicable to appraising social benefits from railway projects because reliable quantitative measures have not really been established
(Nunes, 2022)	CVM method gives immediately a monetary assessment of respondents' preferences. the CVM method is the only valuation technique that is capable of shedding light on the monetary valuation of the non-use values CVM brings with it the advantage that environmental quality changes may be valued even if they have not yet occurred (ex-ante valuation). CVM offers a greater potential scope and flexibility than the revealed preference methods	(Nunes, 2022)	The nature of the CVM application, in terms of policy choice appraisal, makes the value formulation problem more difficult relative to ordinary market decisions
(Richard & Ostensson, 2003)	CV is becoming an accepted tool, mainly since its potential practical value is so large that users are prepared to overlook its faults, and because it provides measures that can be used as a basis for decision-making in difficult circumstances.	(Richard & Ostensson, 2003)	CV is a controversial method that raises difficult issues, not only with respect to economic theory, but also from ethical, philosophical and psychological view- points.

(Source: Adapted from Pascual et al., 2012)

2.2 Issues and Challenge in Valuing Ecosystem Service

Several issues and challenges exist in valuing ecosystem service (ES). These can be listed as methodology limitations, numerous limitations, bias on approach, ES valuation standard, and policy failure. The issues and challenges in valuing ES are shown in Figure 2.

National			
No	Author	Ecosystem	Issues
1	Mamat et al., 2020	Natural area (forest & lake)	Not readily quantified because of the unavailable market price. The interest to measure non-use or passive value is one of the reasons on the extensive use of CVM and the only way to capture non-use value is through a survey method.
2	Hassin et al., 2020	wetland ecosystems	
3	Vianna et al., 2018	Marine-shark	Lack of standardized valuation studies become available, to implementation of management and conservation strategies
4	Abdulkarim, 2017	forest	
5	S. L. Lee et al., 2022	Mangrove Forest	Valuation practitioners may have limited understanding of the circumstances and realities of policy making.
6	Ghani, 2017	Ecosystem	Lack of public perception and awareness of ecosystem service
7	Arabaniyry et al., 2013	Marine Park	
8	Othman & Jafari, 2019	Urban Lake Recreation	The need a straight forward task, identification and qualification of marine and coastal ecosystems of goods and services. In the absence of knowledge of the marginal cost of provision.
International			
1	Filho et al., 2022	Marine	Economic theory and research fail to incorporate environmental value and disregard their economic impact on human welfare.
2	Bourguignon, 2015	Ecosystem	
3	Snail et al., 2014	Recreational Ecosystem Service (RES)	Ecosystem services are not yet incorporated into decision-making through incentives and price signals.
4	Hermes et al., 2018		
4	Azadi et al., 2021	Ecosystem Service	The lack of or distorted markets for ecosystem services. As a result, estimated ecosystem service values will be skewed and will not provide reliable data on which to base policy decisions
5	Palola et al., 2022	Environmental	The single ontology/epistemology of neoclassical environmental economics, leading to a mis- or un-representation of other understandings of environmental value

Figure 2: Issues and Challenge in Valuing Ecosystem Service
(Source: Adapted from researcher analysis)

2.3 Provision on the valuation method

The state government must assist the federal government in executing its powers under this article.

Article 94(1) states:

"The executive authority of the Federation extends to the conduct of research, the provision and maintenance of experimental and demonstration stations, the giving of advice and technical assistance to the Government of any State, and the provision of education, publicity, and demonstration for the inhabitants of any State, in respect of any of the matters concerning which the legislature of a State may make laws; and the agricultural and forestry officials of any State shall accept any professional advice given to the Government of that State under this Clause." Several laws, National Policies, and Projects related to economic valuation are shown in Figure 3.

No	Law/ National Policies/Projects
1	Fisheries Act 1985 (Amended 1993)
2	Environmental Quality Act 1974
3	National Policy on the Environment 2002
4	National Policy on Climate Change 2010
5	Aichi Target 2020 & National Biodiversity Action Plan (NBAC)
6	The Economics of Ecosystems and Biodiversity (TEEB)
7	System of Environmental and Economic Accounting (SEEA)
8	Intergovernmental Panel on Biodiversity and Ecosystem Service (IPBES)
9	Integrated Coastal Zone Management (ICZM)
10	Integrated Lake Resources Management System (ILRM)
11	Integrated Water Resources Management (IWRM)

Figure 3: List of Provision of Ecosystem Economic Valuation in Malaysia
(Source: Source: Saad et al., 2012)

In Malaysia, several laws relating to the Convention on Biodiversity exist, but this sectoral approach often leads to duplication, conflict, and gaps in implementation. The laws, such as the Forestry Act, Conservation of Wildlife Act, National Parks Act, and the Environmental Quality Act (EQA), are enforced by various departments. A noticeable gap in the reporting and management of the ecosystem service.

3.0 Methodology

The snowball sampling method was used to carry out a series of in-depth interviews with participants, and experts in fields linked to ecosystem service (ES) valuation were used to gather the data. These experts are more knowledgeable and experienced in their industry. Three experts in cost-benefit analysis, valuation, and ES officers were interviewed (Junainah et al., 2015). Experts were contacted for in-depth interviews, which may occur online using the Gmeet platform or face-to-face. The respondents stated that because their answers would be so individualized, they could not provide insightful responses to the questionnaire. As a result, the study decided to collect data via semi-structured interviews. Every interview session lasted 30 to 1 hour, and all the audio was digitally recorded. For this interview, a set of semi-structured questions was created. The purpose of the questionnaire was to serve as a guide throughout the interview. Following the interview, all the data were transcribed, line by line, and classified to fit into multiple categories according to the similarities and differences. Time constraints resulted in certain limitations for the current investigation.

Based on the interviews, all the coded data which was found to be informative and valuable has been obtained. Later, they were grouped accordingly into subcategories based on their similarities and patterns. At an early stage, the researchers faced difficulties in identifying lists of valuers that had experience with ES valuation. Therefore, for

identification purposes, the corresponding valuers were contacted via email. Based on the responded email from the participant, three valuers were chosen for an interview session. Figure 3 shows the respondents' profile. Afterwards, the respondents were contacted to set a date for interviews. The followings texts discuss the findings based on the outcome of the interview. Three focuses of the discussion are 1) current methods and their weaknesses, 2) factors that influence its value. The discussion will also focus on the readiness of valuers to adopt new innovative methods and the current legal provisions in economic valuation.

Respondent	Gender	Position	Working Experience	Attending the seminar on Es Valuation
1	Male	Senior Valuer	More than 10 years	No
2	Female	Penilai Daerah Kota Kinabalu	More than 10 years	Yes
3	Male	Penilai Daerah Sungai Petani	More than 10 years	Yes

Figure 3: List of Provision of Ecosystem Economic Valuation
(Source: researcher analysis)

4.0 Results

All of the coded information that was deemed relevant and helpful has been gathered based on the interviews. They were then sorted into subcategories, following their patterns and similarities.

4.1 Current Methods and Their Weaknesses

Based on the findings, all the respondents agree that several approaches to valuing ES exist to ascertain the economic value of the supply of ecosystem services. By using the term "economic value," we do not mean that they are values derived from the market-driven selling and acquisition of those goods and services. In fact, most of these services are not transacted through markets. According to Azadi et al., (2021), these approaches have significant shortcomings in terms of evaluating ESs. These are mostly brought on by distorted or non-existent markets for environmental services. Because of this, predicted ecosystem service values will be biased and are unlikely to offer trustworthy information for making policy decisions.

In addition, when we refer to these services' "economic value," it means their value to individuals in terms of how much they improve their well-being. A significant amount of research has been done on methods for calculating those "values," which are typically expressed in monetary terms. Different types of ecosystem services are typically valued in monetary units using different valuation methods because not all techniques are appropriate for estimating all ecosystem services. (For applied examples of several, see: change in the value of output; preventative expenditures; replacement cost; hedonic pricing; travel cost and contingent valuation method; acceptance of compensation; choice modelling; production function). Although there are several establishes where the

approach's application might be improved, they maintain that the approach was selected with valuation as its primary goal. Hermes et al., (2018) added the difficulty in putting monetary values on ES has arisen mostly from the absence of market surrogates that can roughly represent the costs of these non-excludable items.

4.2 Factors that Influence ES Value

There has been an improvement in the economic valuation of ecosystem services within the past 25 years. Improvements have been made to the ecological knowledge of these services and the monetary methods of valuations, particularly for the more difficult-to-measure cultural and regulatory services. Economic valuation is a valuable tool for estimating the effects of particular modifications on a particular environment. In the end, it can aid in the protection of ecosystems and biodiversity by helping to estimate the value of natural capital, which can be considered when making decisions about indicators, accounting systems, and policy.

As reported by Jabatan Taman Laut Malaysia, (2015) and increases by year, the marine biodiversity found in Malaysia's marine parks provides numerous advantages for the nation, in particular, toward nearby communities. Several studies were carried out to determine the overall economic value of our marine resources. The six archipelagos make up the privilege of marine ecosystem service, which have so far been valued at RM 8.7 billion. These advantages encompass a broad spectrum of ecosystem services, such as supplying fishery resources, boosting the ecotourism sector, protecting coastlines, controlling the climate, and recycling nutrients. As determined by our stakeholders, the value also encompasses bequest and aesthetic value. Additionally, "Benefit transfer is mostly used to regulate services (climate regulation), while the market price is primarily used to value the financial goods and services provided. Market prices for goods and services, such as food, fish, and lumber, are easily accessible and reasonably priced. Therefore, this approach helps determine the monetary value of providing services, particularly when data are limited.

However, feasible of ES difference for every ecosystem. If neglecting to include all the elements could lead to an undervaluation of some ecosystems. According to Himes Cornell et al. (2018), recreation and ecotourism easily fit into an economic framework, and we have the resources to value them. The "research and education" service, although less typically valued, is also easily valued using monetary values derived from grants, salaries, and field and research expenses. Consequently, the remainder of the debate will not take cultural ecosystem services subgroups into account. The other ES, such as spiritual, aesthetic, and existence values, are where our knowledge gaps lie.

4.3 Valuers' Readiness to New Innovative Methods

Before 2009, most research concentrated on the monetary valuation of environmental services (ES). However, since then, there has been a shift in the trends of ES assessments in Malaysia. More studies are now using integrated approaches (economic valuation and mapping, assessments of human perception and mapping, economic valuation and other quantitative assessments), as well as alternative assessment approaches (ES mapping,

modelling, assessments of human perception, and other quantitative assessments) (Dang et al., 2021).

Formulating a strong valuation approach that fits the local environment and can effectively communicate relevant data to decision-makers is one of the main recommendations for valuation practitioners. Tonin, (2018) reported the current findings that enable the use of a national economic valuation and multiscale approach for each ES; however, there exist notable variations amongst them, thus care needs to be taken when extrapolating the findings from one area to another.

The funding concluded as the respondents were aware of ES-related elements in valuation but struggled to focus due to lack of technical expertise. They emphasized the importance of considering the valuation's aim when developing a successful strategy. This study presents results based on three themes: current methods, criticisms, factors to consider in ES valuation, and valuers' readiness to adopt a new innovative method. The respondents acknowledged the importance of considering the purpose of valuation in developing an effective approach, which may influence their acceptance of the new innovative method.

4.4 Current Legal Provisions in Economic Valuation

On June 24, 1994, Malaysia became an adherent to the Convention on Biological Diversity. Several policy papers, including the 1998 National Policy on Biological Diversity (NPBD) and the recently introduced National Environment Policy, uphold Malaysia's commitment to biodiversity conservation. Since the Third Malaysia Plan period (1976–1980), Malaysia's five-year growth plan, known as the Malaysia Plan, has acknowledged the significance of environmental protection in development planning. The policy includes:

Firstly, "Panduan Penilaian Ekonomi Ekosistem Marin". Secondly, apart from adopting the Fisheries Act 1985, Sabah also implemented the Sabah Fisheries Ordinance 1964. Thirdly, guidelines on the economic valuation of the environment impact for EIA project. Nonetheless, this analysis shows that it is feasible to implement strict governance instruments, like MPAs, to preserve biodiversity. The protection of ES is vital because they offer both people and animals priceless and irreplaceable services. For instance, numerous parties will need to make promises in order to find solutions to stop the declining trend of habitat loss that is occurring in many parts of the world. Government-enacted and enforced policies are one aspect of that protection, but they probably are unlikely to be enough on their own. Effective conservation and restoration strategies can be implemented with the assistance of a global review of studies. When these restoration projects are implemented, the local population's support and dedication are crucial because they have a strong desire to protect these habitats from activities like coral harvesting, which might be used for personal gain.

5.0 Discussion

It is obvious that economic value is still in its infancy when used in emerging economies. Furthermore, it is evident that using valuation methodologies in emerging economies presents substantial scientific, practical, and policy challenges. Many of these issues are a result of the specific political and socioeconomic circumstances that exist in developing nations, which may make a direct transfer of techniques inappropriate. The impact of uncertainty coming from gaps in knowledge regarding ecosystem dynamics, human preferences, and technical challenges in the valuation process affects valuation techniques in general and stated preference methods in particular. In addition to acknowledging the limitations of valuing methodologies in cases of extreme uncertainty or ignorance of regime shifts, uncertainty issues must be taken into account in valuation research.

Therefore, it's possible that some modification of conventional methods will be needed to undertake high-quality valuation studies in emerging nations. Many of these issues are brought to light in the Viti et al., (2022) assessment of ES valuation in nations with limited resources. In this case, methodological, practical, and policy concerns receive particular emphasis. Although some research has matched findings to policy requirements, their impact on policy still seems minor.

Consequently, more evidence-based assessments, including trade-off analyses and validation supported by ecosystem modelling, are required in Malaysia to support decision-making better. For example, Friess et al., (2020), quantified the scientific value of coastal ecosystems by developing a tiered set of indicators that included innovative spatial indicators. Ecosystem Impact Factor and Site Impact Factor are two examples of these indicators. Having examined these indicators using the case study of coastal and marine ecosystems in Singapore, an island nation in Southeast Asia, even though our intention is for indicators to be generally relevant to all ecosystems (including terrestrial ones).

In addition, standardized policies that offer such evidence may be made more accessible with the help of comprehensive instructions on how to map and evaluate ecosystems and include an ecosystem framework in planning and decision-making processes. The ecosystem framework can be improved to better support decision-making by increasing stakeholder cooperation, increasing science-policy dialogues, increasing data accessibility, and boosting stakeholder engagement in ecosystem management.

6.0 Conclusion

Ecosystem Service (ES) undoubtedly contributes to a nation's economic success (Department of Fisheries Malaysia, 2023; Jabatan Taman Laut Malaysia, 2015) and highlights the significance of an efficient ES valuation technique. Before developing a practical approach, it is crucial to understand the state of the practice and the perspectives of people involved in the exercise.

Therefore, the valuation of ES assets should come under scrutiny. Valuers need to understand and adopt the right and most suitable approach in valuing ES assets. Consequently, it is important to choose an approach that aligns with the goals and objectives for managing the ES and reflects the true value of the asset. Zin et al., (2019)

supported that the goal of the valuation process is to estimate the best possible value for a specific property. For this reason, an ES valuation methodology is needed to quantify the value of ES assets by considering the tangibles asset and the intangible elements, including overall asset use. The problem of finding the price or economic value attached to an environment and natural resources can be solved by adopting an appropriate method of valuation. Valuation is concerned with interpreting the methods for deriving empirical evaluation of environment value.

In general, there are reasons to be cautiously optimistic about the contribution that economic valuation techniques can make to environmental management and policy. The extent of meaningful monetary valuation in the environmental setting will have a limit, but it is still up for debate what that limit is. It is necessary to go beyond the current state of affairs, where asset value data is gathered from a variety of separate environmental asset valuation studies. It will be necessary for policymakers to have classes of environmental commodities and value measures that are strong enough to be able to be consistently combined, divided, and potentially applied across national borders. This paper will enrich the current body of knowledge and benefit practitioners who could apply the study's output to real practice.

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Article Contribution to Related Field of Study

This will push the current research to next stage of innovating a mixed method for marine ecosystem service valuation.

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