Marine Recreation Valuation: A Review

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Abstract: Marine and coastal ecosystems are main tourist attractions around the world. Being public goods, they are constantly become subjected to degradation. Estimation of economic values and proper appropriation of such values is a necessary requirement for their conservation and management. This study intends to review economic valuation studies on marine and coastal recreational areas with a view to identify trends and gaps and to formulate a research agenda towards sustainable management of the resource. Published literatures were explored with keywords such as marine, recreation and valuation using mainly google scholar and other search engines such as Science direct and individual journal web sites. The values of the studies were established in common currency unit of US$ and converted into 2026 prices using GDP deflator values.

Results indicate diverse valuation approaches adopted and the variety of types of values that have been estimated. Both local and global focus were common and conceptual frameworks of total economic value and ecosystem service concepts have been equally adopted. All major ecosystems and their components and variety of uses have been the focus of the valuation studies. The adoption of values in the policy context however was rarely sought. The diversity of the valuation studies was lesser among the developing countries. The upcoming global threats such as climate change and the common resource degradations issues have not been adequately understood by the valuation studies. Towards the future, the trade-offs between the different ecosystem services as well as the synergies need to be correctly identified in order to minimize the conflicts among different user groups of the marine resources. The essentially global nature of the marine resources has to be correctly established to avoid future climate change related grand depletion of the resource. The complex dynamics of the ocean resources and increasing anthropogenic threats have to be understood with more interdisciplinary research and at least all key ecosystems have to have their baseline values established in the face of the rapid degradation due to increasing incidence of marine oil spills and unprecedented levels of other anthropogenic threats.

Keywords: marine; recreation; valuation; GDP deflator; ecosystem services.

JEL Classification: Q26; Z32.

Introduction

Marine recreation is one of the main tourist attractions in coastal countries especially in the tropical region. Marine resources are often being neglected and subject to degradation owing to their public good nature. Regulations have been ineffective with poor enforcement has been difficult leading to further degradation. These reasons suggest the need for estimating the correct value of marine resources which could highlight the contribution of these resources to the national income and thus justify often neglected conservation efforts. Reviewing the existing literature will be an important first step towards the valuation exercise which will help to understand the status quo, gaps and policy linkages both in the local and global contexts.

This review is distinctive in its comprehensive synthesis of marine and coastal recreation valuation studies across diverse ecosystems, countries, and methodological approaches, standardized to 2026 US$ values for comparability. Unlike earlier reviews that focused narrowly on specific ecosystems or valuation techniques, this study integrates findings across wetlands, coral reefs, beaches, marine protected areas, and deep-sea environments, thereby offering a holistic perspective on global valuation trends. Its novelty lies in identifying critical gaps - such as the limited policy uptake of valuation results, the underrepresentation of developing countries, and the insufficient integration of climate change impacts - while simultaneously proposing a forward-looking research agenda. By establishing baseline values and emphasizing trade-offs and synergies among ecosystem services, this study provides an essential foundation for interdisciplinary approaches to sustainable marine resource management and strengthens the case for embedding economic valuation into national and international policy frameworks.

1. Ecosystem Services and Value of Conservation

Ecosystems offer numerous life support services that are essential to sustain the life of humans and other living beings. Ecosystems provide benefits known as ecosystem services (ES).

Based on the UN Millennium Ecosystem Assessment (2005), ES are classified under four major categories-provisioning or extractive services, regulating, supporting and cultural services which contribute to the various aspects of human wellbeing. Marine recreational areas offer all four major types of ES. Surrounding communities obtain benefits from these multiple ES, especially provisioning services, for their livelihoods on continuous basis.

Major provisioning services of these areas include extraction by local communities of edible and non-edible species to cater demand from local and foreign markets. Provisioning services generate market-based values and people extract them for short-run economic gains and are usually private in nature. As a result, there is a tendency for overexploitation of provisioning services that offer short-term economic values. Ecosystem services (ES) are interconnected and unsustainable use of provisioning services could lead to overall loss of flow of other ecosystem services. Especially, overexploitation of provisioning services often lead to compromise the ecosystems' capacity for offering supportive and regulating services, which are usually involved with indirect nonmarket values.

In contrast, regulating and supporting services are public goods that are usually non-market in nature. Despite the fact they do not offer cash benefits to private users, they play an important role in maintaining the sustainability of the system in the long-run. Without the support of regulating and supporting services, the long-term sustainability of even provisioning and cultural services could not be guaranteed. Hence, the conservation of regulating and supporting services are indispensable for maintaining the sustainability of ecosystems.

Recent rise in the variety of tourism and recreation activities related to marine ecosystems implies expanded profile of cultural services. Though the recreation services are non-extractive in nature, they could lead to degradation of the resource base due to congestion and exceeding the carrying capacity.

2. Need of Valuing Marine Recreation

Sustainable development goals have identified valuation of marine resources as a priority area (Goal 14). Therefore, need arises to value and inform the policy makers about their values to guide them towards prompt action. Economic value estimates for natural environment could guide both decision makers including environmental managers towards decisions that minimize costs maximize social benefits (Lew *et al.* 2010; Tuttle and Heintzelman 2015; Schuhmann and Mahon 2015) thus achieving social efficiency (Ruckelhaus *et al.* 2015). Information on values of marine resources including values of conservation and restoration efforts of species and habitats and direct benefits of humans (Camacho-Valdez *et al.* 2013) when presented in monetary values provides a useful guide in allocating resources of an economy given all other competing demands (Kaffashi *et al.* 2012). Economic values incorporated into national accounts provides a more correct picture of each sector in terms of their contribution to national wealth (Dharmaratne and Strand, 1999; Mwebaze and MacLeod 2013; Brander *et al.* 2013). In addition, values of nature help in understanding and resolving tradeoffs between marketed values and non-market values (Ressurreição *et al.* 2011; Ahtiainen and Vanhatalo 2012). Monetary values enable this comparison since alternative uses of natural resources create a range of impacts, which are usually not in comparable units (changes in fish stocks, water or air quality changes, or reef degradation) (Brander *et al.* 2006). Schuhmann and Mahon (2015), Hanley *et al.* (2015), Beaumont *et al.* (2008) have carried out reviews on marine recreation related studies.

The number of coastal and marine management settings where valuation researchers have attempted to make a contribution is rising fast. However, there is no equivalent increase in the application of values in managing marine resources (McVittie and Moran 2010) which lead to the question of lack of policy relevance of valuation

(Shivlani *et al.* 2003 and Hanley and Torres, 2017). However, Svensson *et al.* (2008) and Laurans et al, (2013) are on the view that valuation has helped in increasing awareness but in order to include such values in the policy context, there need to be inputs from multidisciplinary perspectives. Hanley *et al.* (2015) emphasize similar ideas with enhanced interaction between disciplines of political and social sciences "to communicate Ecosystem Services (ES) research more effectively and to improve understanding of the realities of policy makers to economists and marine and coastal scientists".

As stated by O'Garra, (2012) and Ruckelshaus *et al.* (2015) "the pace at which the theory of ES valuation is being incorporated into real decisions has been painstakingly slow, with disapprovingly few success stories". Park and Leeworthy (2002) and Laurans *et al.* (2013) argue that, despite the role of valuation in demonstrating values of sustainable management, the values are mostly used as just a source of information but have not been used in the technical sense to make decisions.

Economic values explain and quantify the necessary link between ecosystem services with wellbeing of the humans (Schuhmann and Mahon 2015). Proper valuation and communication of such values to decision makers would result in necessary improvements in the environmental management sector in coastal and marine management (Barr and Mourato 2009; Brander *et al.* 2012; Jobstvogt *et al.* 2014).

This paper is organized as follows: the next section outlines the methodology adopted which is followed by results, analysis of gaps, recommendations and conclusions.

3. Methodology

The literature sources were searched with keywords related to marine ecosystem and their use and management aspects including coastal, recreation, mangroves, lagoon, marsh, swamp, fishing, beach, corals, valuation, degradation, extinct, exploit and coral bleaching. Environmental valuation techniques such as choice experiment, contingent valuation, travel cost were also used as keywords within search engines such as Science direct and Google scholar and journals dedicated to marine valuation. From the search, 120 studies have been considered for the study with 4 review papers. The available values of each valuation study were converted to 2019 $ values using GDP deflator figures for easy comparison. The studies were then classified based on the ecosystem types and management areas. Eg: wetlands mangroves, Further, details were summarized according to application of various environmental valuation methods to value marine ecosystems. Studies were also tabulated based on specific focal areas such as water quality aspects and trends related to marine valuation research were identified.

4. Results on Valuation Literature

Table 1 presents ecosystem-based valuation summary. Specific ecosystem types were categorized under the main categories of coastal and marine ecosystems. Wetlands, Mangroves, Marshes and Samps were considered and under each geographical location are indicated.

Table 1. Ecosystem types and management areas

Specific Ecosystems	Country	No. of Papers	Reference
Coastal ecosystems			
Wetlands	Indonesia Mexico Iran France USA Sri Lanka Australia	11	Brander *et al.* (2012), Brander, *et al.* (2013), Camacho-Valdez *et al.* (2013) Kaffashi *et al.* (2012) Westerberg *et al.* (2010) Woodward *et al.* (2001), Shivlani *et al.* (2003) Rathnayake RMW Prayaga *et al.* (2017)
Mangroves	Ireland Tanzania Malaysia Indonesia Sri Lanka Colombia	7	Whitehead *et al.* (2008) Lange and Jidawi (2009) Pascoe *et al.* 2014 Brander *et al.* (2012), Brander, *et al.* (2013) Rathnayake (2016) Rojas *et al.* (2019)
Marshes	Indonesia Mexico	4	Brander *et al.* (2012), Brander *et al.* (2013), Camacho-Valdez *et al.* (2013), Barr and Mourato (2009)
Swamps	Indonesia Mexico Iran	3	Brander *et al.* (2012), Camacho-Valdez *et al.* (2013) Kaffashi *et al.* (2012)

Specific Ecosystems	Country	No. of Papers	Reference
Subtotal for wetlands		**25**	
Beaches	U.S.A China Sri Lanka Greece Australia	11	Beharry-Borg *et al.* (2010), Bhat (2003), Font (2000), Landry *et al.* (2020) Huang (*et al.* 2007) Rathnayake RMW, Sivakumar (2016), Sivakumar (2019) Kontogianni *et al.* (2014) Zhang (2015)
Subtotal for beach		**11**	
Coastal protected natural areas	Mexico U.S.A UK Sri Lanka Spain Italy China India	15	Barr & Mourato (2009), Camacho-Valdez *et al.* (2013), Almendarez *et al.* (2020) Beharry-Borg and Scarpa (2010), Brumbaugh *et al.* (2008) Ghermandi and Nunes (2013), Ghermandi (2015) Hanley *et al.* (2003) Balasuriya (2018), Jayasekara and Gunawardena (2019), Jayaratne *et al.* (2016) Jayaratne *et al.* (2019) Rodrigues *et al.* (2016) Tonin (2019), Bertram *et al.* (2020) Liu *et al.* (2019) Mukhopadhyay *et al.* (2020)
Capes	UK	1	Hanley et al, (2015)
Peninsulas	UK	1	Hynes *et al.* (2013)
Barrier islands	UK	1	Kline and Swallow (1998) etc
Subtotal for coastal area		**18**	
Rivers and streams	USA UK Philippines	5	Ojeda *et al.* (2010), Liu & Stern (2008) Lipton *et al.* 2014, Luisetti *et al.* (2011) Samonte-Tan *et al.* (2007)
canals,	USA	1	Ojeda *et al.* (2008)
Lakes	UK USA Ireland	4	Torres *et al.* (2017), Voke, *et al.* (2013) Wilson *et al.* (2005) Whitehead *et al.* (1993)
Reservoirs	UK USA Ireland	4	Hicks *et al.* (1999), Siderelis *et al.* (1995), Wilson *et al.* (2005) Whitehead *et al.* (1993)
Deltas, estuaries and catchments	USA, Spain	3	Ojeda *et al.* (2010), Duijndam (2020) Pouso *et al.* (2020)
Subtotal for river basin		**17**	
Bays	UK USA Sweden Iceland	8	Jobstvogt *et al.* (2014), Wattage *et al.* (2011) Barbier *et al.* (2011), Rönnbäck *et al.* (2007) Hasler (2016) Cook *et al.* (2020)
Gulfs	Sweden Ireland USA UK	4	Hasler (2016) Hynes *et al.* (2018) Huang *et al.* (2007) King (1995)
Sounds, Fiords	USA	1	Kaoru (1995)
Inland Seas and Sea Waters near the coast	Australia Sri Lanka	3	Liu and Stern (2008) Hettige *et al.* (2014), Prakash *et al.* (2019)
Subtotal for coastal water		**16**	

Specific Ecosystems	Country	No. of Papers	Reference
Marine ecosystems			
Coastal coral reef	Jamaica France New Caledonia Zanzibar USA Australia Indonesia UK Sweden Philippines Israel Thailand Japan	25	Cesar and Chong (2004), Cesar *et al.* (2000) Westerberg *et al.* (2010) Marre *et al.* (2015) Ngazy *et al.* (2004) Laurans *et al.* (2013) Prayaga (2017), Peachey (1998) Brander *et al.* (2012) Rees *et al.* (2015) Rönnbäck *et al.* (2007) Samonte-Tan *et al.* (2007) Wielgus, *et al.* (2002), Wielgus *et al.* (2003) Tapsuwan and Asafu-Adjaye (2008) Carlson (2015)
Subtotal for coral reef		**25**	
Deep sea	Zanzibar	1	Lange and Jiddawi (2009)
Open ocean (Including Cold-Water Corals)	UK	4	McVittie and Moran (2010) Wattage *et al.* (2011)
Subtotal for deep sea		**5**	
Marine conservation zones	Australia Seychelles Malaysia Vietnam USA Sri Lanka Japan	8	Carlsen and Wood (2004) Mwebaze and MacLeod (2013) Pascoe *et al.* (2014), Yacob *et al.* (2009) Svensson *et al.* (2008) Jeong and Haab (2004) Ranjan *et al.* (2017) Shah *et al.* (2019)
Subtotal for marine protected areas		8	
Marine Parks	Sweden Greece, USA Sri Lanka	4	Paulrud (2004) Remoundou *et al.* (2009) Rees *et al.* (2010) Jayaratne *et al.* (2017)
Subtotal for marine parks			
Marine Reserves	USA	1	Rees *et al.* (2015)
Subtotal for marine reserves		**1**	
Marine Sanctuaries and Marine Critical Habitat Units	USA, Sri Lanka	2	Chong and Cesar (2004) etc, Senarathne *et al.* 2015
Subtotal for marine sanctuaries and marine habitat		**2**	
Total		**132**	

According to the table, coral reefs and deep sea have received the most attention. Few studies have been done on inland and transitional waters and the researchers have been particularly interested in contributing to the management of wetlands, beaches, coastal waters and Marine Protected Areas (MPAs). Some researchers for example, Brander *et al.* (2012), Brander, *et al.* (2013) have carried out research in multiple countries and in multiple ecosystems.

The main focus of many MPA studies has been on coral reefs. Moreover, wetlands and coastal areas also have been under the focus and many valuation studies have positively contributed to management of such areas (Whitehead *et al.* 2008) and (Castaño-Isaza *et al.* 2015; Hanley *et al.* 2003; Loureiro *et al.* 2013 and Torres and Hanley, 2017). The main aim of many valuation studies was to provide inputs towards the management of marine resources. This publication pattern has also been found for studies that have valued services provided by inland and transitional waters, (Parsons *et al.* 2013; Miller *et al.* 2015). Majority of papers focusing on services offered by coastal waters, coral reefs and MPAs have been published during the last decade (Brander *et al.* 2012; Torres and Hanley, 2017). This is especially true for studies on deep-sea services, which have received attention by the scientists and economists recently. (Wielgus *et al.* 2009; Lange and Jiddawi 2009; Beharry-Borg and Scarpa 2010; Ghermandi *et al.* 2010).

4.1 Values of Coastal and Marine Ecosystem Services

In early research, value classifications had their focus on the concept of Total Economic Value (TEV) (Hanley *et al.* 2003). Majority of the recent studies have adopted the Ecosystem Services (ES) (Prayaga, 2017). The main focus has been on cultural services especially recreational values provided by coral reefs and coastal habitats (Söderberg et al, 2014 and Börger*et al.* 2014). Significantly high benefits have been reported along with correlations to the quality of the environment being valued (Onofri and Nunes 2013). The estimated use values provide sound justification for further protection of these areas and estimation and incorporation of non-use values of marine resources would provide additional justifications (Lange and Jiddawi 2009).

4.2 Diversity of Methods of Valuation

The results indicate a wide variety of valuation methods adopted by different studies. Among the 120 studies, 37 have used choice experiment, 30 have adopted contingent valuation method and 30 were based on travel cost method. Other methods included Combined Stated and Revealed Preference Approach, Hedonic Analysis, Productivity Change Method, Random Utility Models and Value Transfer Approaches. Values on number of studies done and mean value in US$ under each category are presented in Table 2. Many researches have estimated recreational values including both local and global values. The concepts of total economic value and the ecosystem service framework have been commonly used in the studies. Valuation focus was wide ranging including economic value of ecosystem services in the coastal regions, value of wetlands in supporting recreational fishing, benefits of coral ecosystems, indirect and existence value of coastal and marine biodiversity, recreation value of coastal lagoons and values of beach erosion control.

According to table 1, many studies have been done in developed countries (61%) compared to developing countries (39%). Table 2 illustrates a summary of valuation studies carried out in different countries for different ecosystem types. Many Asian countries have focused on valuing coral reefs since it is main tourist attraction which positively contribute to Gross Domestic Product (GDP) for developing countries (Asafu-Adjaye and Tapsuwan, 2008; Senarathne *et al.* 2015; Pascoe 2014) etc. Another way to classify valuation studies are based on single country vs. multiple countries. For example, some studies have covered several countries in the European region Ahtiainen and Vanhatalo (2012) while many studies have focused on individual countries. Certain valuation studies have focused on specific aspects of marine ecosystems such as eutrophication (Ahtiainen and Vanhatalo, 2012) or pollution, oil spills over exploitation issues etc.

Value of Ecosystem Services has been carried out in Sri Lanka for, Bar Reef Marine Sanctuary (Senarathne *et al.* 2015) and Pigeon Island National Park (Jayaratne *et al.* 2016). Marine ecosystem conservation has been valued by (Jayaratne *et al.* 2019) for Hikkaduwa National Park and recreational values also has been estimated for Hikkaduwa National Park (Jayasekara and Gunawardena, 2019). In Sri Lanka several studies have been done to protect certain species e.g.: (Rathnayake, 2016). Table 2 represents the valuation method and the number of studies conducted under each method and basic statistics related to estimated values.

According to the below table majority of studies have adopted choice experiment method (39). Maximum value under CE method is 113.23 and minimum value is 0.48. Whereas the standard deviation is 34.83 and the mean value is 32.35. There are 36 studies on travel cost method. Maximum consumer surplus is US$ 18075 billions and minimum is US$ 1.43. Standard deviation of the travel cost studies is US$ 361.43 and the mean value is US$ 648.97. Maximum value of the contingent valuation studies is US$ 3600 million per year and minimum value is US$ 1789 million per year. Standard deviation is US$ 1450 million per year and the mean is US$ 1754million per year.

Table 2. Application of various environmental valuation methods to value marine ecosystems

Method	No. of Studies	Unit US$	Maximum	Minimum	Standard Dev.	Mean
Contingent Valuation Method	33	Aggregated value Millions/year Per person	3600 120	1789 2.02	1450 48.58	1754 44.37
Choice Experiment Method	39	per person	113.23	0.48	34.83	32.35
Combined Stated and Revealed preference method	5	Billions per year	8200	125	3057	3732.6
Value Transfer approach	3	Billions per year	4748	1770	2353	3259
Travel Cost Method	36	Total consumer surplus (Billions)	18075	1.43	361.43	648.97
Decision Tree	2	Billions/year	142	114	22.62	128.45
Hedonic Analysis	5	Billions/year	32.45	12.23	14.29	47.65
Random Utility Models	5	Billions/year	42.65	2.53	28.36	38.54
Productivity Change Method	4	Billions/year	1.25	0.12	0.79	0.25

Table 3 provides a summary of travel cost studies done and the consumer surplus values. Accordingly highest Consumer surplus amounts to US$23 billion per year and the lowest consumer surplus amounts to US$1.63 (increased consumer surplus per trip).

Table 3. Summary of travel cost studies

Topic	Author	Value (2026)
Recreational value of Coastal and Marine Ecosystems in India a macro approach	Mukhopadhyay *et al.* (2020)	23 billion
Valuing coral reefs: a travel cost analysis of the Great Barrier Reef	Carr and Mendelsohn (2003)	1232 million to 2.82 billion
Estimating the potential impact of entry fees for marine parks on dive tourism in South East Asia	Pascoe *et al.* (2014)	6.07 billion per year
Monetary valuation of recreational fishing in a restored estuary and implications for future management measures	Pouso *et al.* (2020)	1.70 million per year
Management of a marine protected area for sustainability and conflict resolution: Lessons from Loreto Bay National Park (Baja California Sur, Mexico)	Stamieszkin *et al.* (2009)	434.7 million
Can people value protection against invasive marine species? Evidence from a joint TC–CV survey in the Netherlands	Nunes and van den Bergh (2004)	417
Divers' willingness to pay to visit marine sanctuaries: an exploratory study	Arin and Kramer (2002)	150.5
An economic assessment of marine recreational fishing in southern California	Wegge, *et al.* (1986)	159.6
Recreation demand and economic value: An application of travel cost method for Xiamen Island	Weiqi *et al.* (2004)	88.9

Topic	Author	Value (2026)
Travel cost analysis of recreation value in the Wet Tropics World Heritage Area	Driml (2002)	90.3
Studies on marine ecosystem services and valuation: a case of Nanji Archipelagos Natural Marine Reserve	Pan *et al.* (2009)	33.50
The efficiency of the environmental management charge in the cairns management area of the Great Barrier Reef Marine Park	Farr (2011)	26.40
Recreational Value of the Coral Surrounding the Hon Mun Islands in Vietnam: A Travel Cost and Contingent Valuation Study	Nam *et al.* (2004)	29.4
Fees for reefs: economic instruments to protect Mexico's marine natural areas.	Rivera and Muñoz (2005)	24.2
Incorporating users' perceptions of site quality in a recreation travel cost model	Siderelis *et al.* (2000)	25.1
The recreational value of Lake McKenzie, Fraser Island: An application of the travel cost method	Fleming and Cook (2008)	17.70
Travel cost methods for estimating the recreational use benefits of artificial marine habitat	Milon (1988)	32.6
An economic analysis of coral reefs in the Andaman Sea of Thailand	Seenprachawong (2016)	4.28
"Should 'ParaviwellaBeach'in Sri Lanka be Preserved for 'Sea Bathing'?": A ZTCM Approach.	Rathnayake (2015)	4.32
Economic valuation of the Hon Mun Marine Protected Area	Nama *et al.* (2005)	1.63

Table 4 provides a summary of travel cost studies done and the values are based on per person values. Accordingly highest value has been recorded as US$ 2358 and lowest value amounts to US$ 1.82 per person.

Table 4. Studies done based on travel cost method

Topic	Author	Values ($2026) per person US$
Economic valuation of sportfishing in the surroundings of Cerralvo Island, Baja California Sur, Mexico using the travel cost method	Almendarez *et al.* 2015	2358
The value of Tiger Shark diving within the Aliwal Shoal marine protected area: a travel cost analysis	Du Preez *et al.* (2012)	1420 (per tiger shark)
Recreational benefits from a marine protected area: A travel cost analysis of Lundy	Chae *et al.* (2012)	620 to 991
Economic evaluation of the recreational value of the coastal environment in a marine renewables deployment area	Voke *et al.* (2013)	178
The value of coastal lagoons: Case study of recreation at the Ria de Aveiro, Portugal in comparison to the Coorong, Australia.	Clara *et al.* (2018)	165 per day

Topic	Author	Values ($2026) per person US$
Contingent Behavior and Asymmetric Preferences for Baltic Sea Coastal Recreation	Bertram *et al.* (2020)	140 (Finnish sample) 296 (German sample) 56 (Latvian sample)
Access to marine parks: A comparative study in willingness to pay	Peters and Hawkins (2009)	137.53 per day
Valuing beach width for recreational use: Combining revealed and stated preference data	Parsons, *et al.* (2013)	113 overnight access value
Application of non-market valuation to the Florida Keys marine reserve management	Bhat (2003)	60
The recreational value of gold coast beaches, Australia an application of the travel cost method	Zhang *et al.* (2015)	24.34
Managing the marine environment: is the DPSIR framework holistic enough?	Atkins *et al.* (2011)	23
Valuing snorkeling visits to the Florida Keys with stated and revealed preference models	Park, *et al.* (2002)	2.99
British tourists' valuation of a Turkish beach using contingent valuation and travel cost methods.	Blakemore & Williams (2008)	1.82

Table 5 and 6 provides a summary of contingent valuation studies. Based on the 30 studies recorded, some studies have provided per person values and some studies have provided aggregated WTP values. Highest value has been recorded as US$ 4577 million per year. Lowest value has been recorded as US$ 0.43 per person as an entrance fee.

Table 5. Summary of contingent valuation studies

Study	Author	Value $ (2026)	Unit
International public preferences and provision of public goods: assessment of passive use values in large oil spills	Loureiro and Loomis (2013)	Spain 179.47, UK 116.65, Australia 128.53	Per household
User fees as sustainable financing mechanisms for marine protected areas: An application to the Bonaire National Marine Park	Steven (2010)	78 to 170	Per person
Valuing marine turtle conservation: A cross-country study in Asian cities	Jin *et al.* (2010)	1.83 (Beijing),1.56 (Davavo) 1.40 (Bangkok) 1.22 Ho Chi Minh	Per person
Contingent valuation of marine protected areas: Southern California Rocky intertidal ecosystems	Hall, *et al.* (2002)	208.49	Per household
Looking below the surface: The cultural ecosystem service values of UK marine protected areas (MPAs)	Jobstvog *et al.* (2014)	152.56	Per person
Divers' willingness to pay to visit marine sanctuaries: an exploratory study	Arin and Kramer (2002)	133.49	Per person
Economic valuation for the conservation of marine biodiversity	Beaumont *et al.* (2008)	122.05	Per person per year

Study	Author	Value $ (2026)	Unit
Recreational diver preferences for reef fish attributes: economic implications of future change	David *et al.* (2015)	80.09	Per person
Economic valuation of beach quality improvements: comparing incremental attribute values estimated from two stated preference valuation methods	Loomis and Santiago (2013)	68.65	per visitor day
Valuation of natural marine ecosystems: an economic perspective	Remoundou *et al.* (2009)	35.6	Per person
A contingent valuation study of scuba diving benefits: Case study in Mu KoSimilan Marine National Park, Thailand	Asafu and Tapsuwan (2008)	34.33	per person per year
Valuing multi-attribute marine water quality	Eggert and Olsson (2009)	27	Per person
Hotel managed marine reserves: A willingness to pay survey	Svensson *et al.* (2008)	12.2	Per room per night
Economic evaluation of the recreational value of the coastal environment in a marine renewables deployment area	Voke *et al.* (2013)	11.82	Per person
Marginal WTP and distance decay: the role of 'protest 'and 'true zero 'responses in the economic valuation of recreational water quality	Söderberg and Barton (2014)	9.53	Per person
Economic valuation of environmental services sustained by water flows in the Yaqui River Delta	Ojeda *et al.* (2008)	4.84	Household per month
Collective versus voluntary payment in contingent valuation for the conservation of marine biodiversity: an exploratory study from Zakynthos, Greece."	Stithou, *et al.* (2012)	3.83	Per person
Contingent valuation of ecotourism in Marine Parks, Malaysia: implication for sustainable Marine Park revenue and ecotourism management	Mohd *et al.* (2009)	3.26	Per visit
Willingness to pay as an economic instrument for coastal tourism management: Cases from Mersin, Turkey	Birdir *et al.* (2013)	3.23	Per adult beach visit

Study	Author	Value $ (2026)	Unit
Estimating the value of marine resources: a marine recreation case	King, (1995)	2.57	Per person
A contingent valuation study of marine parks eco-tourism: The Case of PulauPayar and PulauRedang in Malaysia	Yacob *et al.* (2009)	2.40	Per local visitor
Valuing marine parks in a developing country: a case study of the Seychelles	Mathieu *et al.* (2003)	0.43	Entrance fee
Economic Values of Coastal Erosion Management: Joint Estimation of use and existence values with recreation demand and CVM data	Landry *et al.* (2020)	27.97	Per household per year
Evaluation of the non-use value of beach tourism resources: A case study of Quingdao coastal scenic area China	Liu *et al.* 2019	12.71	Per year

Table 6. Summary of contingent valuation studies (aggregated values)

Study	Author	Value $ (2026)	Unit
Charging for nature: marine park fees and management from a user perspective	Uyarra *et al.* 2010	4577	millions Per year
Benefits of meeting nutrient reduction targets for the Baltic Sea - a contingent valuation study in the nine coastal states	Ahtiainen et al. (2014)	4189	Millions aggregated WTP
Valuing marine and coastal ecosystem services: an integrated participatory framework	Mathieu and Videira (2013)	3313	Millions aggregated WTP
Access to marine parks: A comparative study in willingness to pay	Peters and Hawkins (2009)	2275	Millions aggregated WTP
Can people value protection against invasive marine species? Evidence from a joint TC - CV survey in the Netherlands	Nunes *et al.* (2004)	414	Millions per year
A contingent valuation approach to estimating the recreational value of commercial whale watching - the case of Faxafloi Bay Iceland	Cook *et al.* 2020	1.25	Millions per year
The recreational benefits of coral reefs: A case study of PulauPayar Marine Park, Kedah, Malaysia	Yeo (2004)	644,900	Recreational value of the reefs in the park
Valuing recreational benefits of coral reefs: The case of Mombasa Marine National Park and Reserve, Kenya.	Ransom and Mangi (2010)	492,000	aggregated WTP
Estimating the use and preservation values of national parks	Lee and Han (2002)	605,000	aggregated WTP

Table 7 gives a summary of choice experiment studies. Based on the recorded studies highest value recorded amounts to US$ 253.4 (per year). Lowest value that has been recorded amounts to US$ 0.20 for an increase of fish catch by 10%.

Table 7. Summary of choice experiment studies

Study	Author	Value $ 2026	Unit
Valuing a Caribbean coastal lagoon using the choice experiment method: The case of Simpson Bay Lagoon, Saint Martin	Duijndam *et al.* (2020)	14.95 Mn	Per year
Valuing marine ecosystem service damage caused by land reclamation: Insights from a deliberative choice experiment in Jiaozhou Bay China	Shan *et al.* (2020)	253.4	Per year
Public willingness to pay for recovering and down listing threatened and endangered marine species	Wallmo and Lew (2012)	53.8 & 98.3	Per household for Chinook salmon & Per household for north pacific right whale
Valuing marine and coastal ecosystem service benefits: Case study of St Vincent and the Grenadines' proposed marine protected area	Christie *et al.* (2015)	13.9 & 34.1 US$	Locals per household per year and Tourists per household per year
'Turtle watching': A strategy for endangered marine turtle conservation through community participation in Sri Lanka	Rathnayake (2016)	0.94 for locals & 19.3 for foreigners	Per visit
Economic valuation of the non-use attributes of a south-western coastal wetland in Bangladesh	Ghosh and Mondal (2013)	0.64 million	Per year
Impact of a local, coastal community-based management regime when defining marine protected areas: Empirical results from a study in Okinawa, Japan	Shah *et al.* 2019	0.20, 0.80,0.64	for a 10% increase in the number of fish catch, for 10% increase in the extent of coral coverage
Economic Valuation of sport fishing in Sweden	Paulrud and Anton (2004)	187.3	net value per day
Economic valuation of beach quality improvements: comparing incremental attribute values estimated from two stated preference valuation methods	Loomis and Santiago (2013)	130	per visitor day
A boating choice model for the valuation of lake access	Siderelis *et al.* 1995	189	Per household per annum
Valuing the benefits of improved marine environmental quality under multiple stressors	Tuhkanen *et al.* (2016)	103	per household per year
Economic valuation of recreational fishing in Western Australia:	Raguragavan *et al.* (2013)	93	per person
Ecosystem service values for mangroves in Southeast Asia: A meta-analysis and value transfer application	Brander *et al.* (2012)	86.5	per ha per year
Conservation of maritime cultural heritage: A discrete choice experiment in a European Atlantic Region	Durán *et al.* (2015).	78.7	per year
Economic valuation and conservation: Do people vote for better preservation of Shadegan International Wetland?	Kaffashi *et al.* (2012)	79.6	per person
Economic evaluation of the recreational value of the coastal environment in a marine renewables deployment area	Voke *et al.* (2013)	72	per person
Estimating indigenous cultural values of freshwater: A choice experiment approach to Māori values in New Zealand	Miller *et al.* (2015)	53	per year
Non-market use and non-use values for preserving ecosystem services over time A choice experiment	Baptiste *et al.* (2015),	32.8	per visitor

Study	Author	Value $ 2026	Unit
application to coral reef ecosystems in New Caledonia.			
Conservation of maritime cultural heritage: A discrete choice experiment in a European Atlantic Region	Duran *et al.* (2015)	31.5	Per person
Valuing multi-attribute marine water quality.	Eggert and Olsson (2009)	21.28	Annual tax
Cultural bequest values for ecosystem service flows among indigenous fishers: A discrete choice experiment validated with mixed methods	Oleson *et al.* (2015)	30.8	Per person per year
Valuing conservation benefits of an offshore marine protected area	Borger *et al.* 2014	25.1	Per visitor
Valuing public goods: the purchase of moral satisfaction	Kahneman and Knetsch (1992)	27.5	Per person
Evaluation of the non-use value of beach tourism resources: A case study of Qingdao coastal scenic area, China	Liu *et al.* (2019)	12.8	Per visitor per year
Valuing climate change mitigation: A choice experiment on a coastal and marine ecosystem	Remoundou *et al.* (2015)	8.3	Per person per year
Public and expert preference divergence: evidence from a choice experiment of marine reserves in Australia	Rogers (2013)	6.0	Per person per month
Consumers' willingness to pay for the color of salmon: a choice experiment with real economic incentives	Alfnes, *et al.* (2006)	5.7	Per kilogram of fish
Social welfare and marine reserves: Is willingness to pay for conservation dependent on management process? A discrete choice experiment of the Ningaloo Marine Park in Australia	Rogers (2013)	4.6	Per month per 10% increase in live coral cover
Valuation of environmental improvements in a specially protected marine area: A choice experiment approach in Göcek Bay, Turkey	Can and Alp (2012)	4.25	per person per visit
Recreational SCUBA divers' willingness to pay for marine biodiversity in Barbados	Schuhmann *et al.* (2013)	4.15	per person per year
Conservation values and management preferences for the Ningaloo Marine Park: a discrete choice experiment	Rogers (2012)	3.9	Per person per month
Valuing enhancements to endangered species protection under alternative baseline futures: the case of the Steller sea lion	Lew. *et al.* (2010)	4.1	per person
Effects of coral reef attribute damage on recreational welfare	Wielgus *et al.* (2003)	4.0	per dive
Economic valuation of regulating services provided by wetlands in agricultural landscapes: A meta-analysis	Brander *et al.* (2013)	2.0	per ha per year
Economic value of conserving deep-sea corals in Irish waters: a choice experiment study on marine protected areas	Wattage *et al.* (2011)	1.56	per year
Ecosystem benefits from coastal habitats - A three-country choice experiment	Kosenius *et al.* (2015)	1.06	As annual tax
Valuing improvements to coastal waters using choice experiments: An application to revisions of the EU Bathing Water Directive	Hynes *et al.* (2013)	0.64	annual tax
Recreational diver preferences for reef fish attributes: economic implications of future change.	Gill *et al.* (2015)	0.63	Per dive
Preferences for Coral Reef and Fishery Management in Okinawa, Japan.	Carlson (2015)	0.60	per month for 10% increase in biodiversity

4.3 Role of Environmental Valuation (EV): in Developing Country Settings

Coastal and marine resources have significant contribution to livelihood of the surrounding communities especially in the low-income countries (Oleson et.al 2015). These resources play an additional role in reducing income disparities and valuation exercises are important in highlighting such contributions (Lange and Jiddawi 2009; Loomis *et al.* 2013 and Voke *et al.* 2013). Valuation studies have played an important role in highlighting cultural service values over other direct and indirect uses (Ngazy *et al.* 2004). According to studies done in India (Atkins *et al.* 2007), Madagascar (Oleson *et al.* 2015), Southeast Asia (Brander *et al.* 2012), Seychelles Mathieu *et al.* (2003) and Tunisia (Westerberg *et al.* 2010) bequest values have provided foundation to cultural, social and ecological sustainability in the long run. According to studies done in Mexico by Barr and Mourato (2009), payments for ecosystem services could be used as mechanisms to address poverty issues (Czajkowsk *et al.* 2015, Castaño-Isaza *et al.* 2015 and Ojea *et al.* 2010).

In developing countries like Sri Lanka, policies have rarely paid attention to incorporate values of environment. The challenge is to make use of economic values to design appropriate management and policy strategies so that the value expressed by respective user categories of these recreational resources are captured to ensure the long-term sustainability of these valuable natural assets. The findings call for the need of taking appropriate measures for minimizing the activities which cause environmental degradation. Applications in green accounting can be used to incorporate the economic values more effectively. Further policy instruments can be used in fisheries management and coastal area development. A suitable institutional mechanism would be required in order to avoid congestion and resultant overexploitation of ES. Also, existing governance structure has to be strengthened appropriately to ensure the sustainability of the ecosystem.

Table 8 provides a summary of marine ecosystem valuation studies done in Sri Lanka. The most commonly adopted methods are CVM and TCM.

Table 8. Marine ecosystems valuation studies done in Sri Lanka

Author	Method used	Value Range US$ (2026)	Value focus
Senarathne *et al.* (2015)	CVM	0.38 million per year	Bar reef Marine Sanctuary
Jayaratne *et al.* (2016)	CVM	Visitors 0.42 million per year Households 11,230 per year	Pigeon Island National Park
Jayasekara *et al.* (2019)	TCM	8.75 per local visitor	Local recreational value
Rathnayake (2016)	CVM	Mean WTP for local visitor 0.93 and 1.43 (for two scenarios) foreigners 19.16 and 24.27	Two different management scenarios for turtle conservation
Rathnayake (2015)	TCM	$0.046 million (consumer surplus)	Local recreational value

Table 9 provides a summary of recreational and environmental quality aspects of marine/coastal areas of Sri Lanka. According to Buultjens *et al.* (2016) and Prakash *et al.* (2019), there has been several attempts towards proper management of whale watching. Properly executed valuation method may help in attaching a price tag based on visitor's willingness to pay for whale watching and such values are helpful for the policy makers to make informed decisions.

Hettige *et al.* (2014) has attempted assessment of coastal water quality along the Western Province coastal line and recommended means of mitigating the pollution. Calculation of cost of such pollution could guide the decision makers on improving the quality of water. Replacement cost approach could be used to measure the cost incurred in converting the water to the usable quality.

Table 9. Recreational and Environmental quality aspects of marine/coastal areas of Sri Lanka

Author	Topic
Balasuriya (2018)	Coastal Area Management: Biodiversity and Ecological Sustainability in Sri Lankan Perspective.
Buultjens *et al.* (2016)	Whale watching in Sri Lanka: Perceptions of sustainability
Hettige (2014)	Water Pollution in Selected Coastal Areas in Western Province, Sri Lanka: A Baseline Survey
Prakash *et al.* (2019)	Current perceptions and the need for a strategic plan for the whale watching industry in Mirissa, Sri Lanka
Ranjan *et al.* (2017)	Service Quality and Its Impact on the Level of Tourist Satisfaction in Marine Based Recreation

Sivakumar (2019)	Assessment of marine water quality and its suitability for recreational activities in Pasikudah beach
Sivakumar (2016)	Preliminary assessment of marine water quality in bathing, surfing and fishery areas of arugam bay
Wilhelmsson, D (2002)	Monitoring the trends of marine ornamental fish collection in Sri Lanka

Sivakumar (2016 and 2019) based on scientific evidence (such as dissolved oxygen level, nitrate and phosphate values) established suitability of Pasikudah beach for recreation and Arugam Bay. Economic value can be estimated for these beaches to inform the policy makers about the importance of these areas.

4.4 Valuation Studies with Special Focus on Environmental Aspects

Some other studies have focused on individual species (Aanesen *et al.* 2015; Brumbaugh *et al.* 2008; Lew *et al.* 2010; Rathnayake 2016) while some research have focused on pollution, water quality aspects oil spills and similar overexploitation issues. The following table represents the studies based on water quality aspects.

Table 10. Studies based on water quality aspects

Topic in brief	Country	Mean value US$ (2026)	Reference
Water quality improvements	Denmark	6.33	Atkins *et al.* (2007)
Valuing quality changes in Carrabin coastal waters	Tobago	2.93 on average to visit a beach with up to 2 boats near the coastline.	Beharry-Borg and Scarpa (2010)
Benefits of coastal water quality improvement	UK	12.63 per person	Hanley *et al.* (2003)
EU Bathing water directive (valuing improvements to)	Europe	9.93	Hynes *et al.* 2013
European water framework directive	Europe	67.70	Kataria. et.al. (2012)
Measuring the recreational benefits of water quality improvement	Japan		Kaoru, Y. (1995).
Economic valuation of recreational water quality	Norway		Söderberg et al, 2014
Hedonic analysis of lake water quality	USA	4529 (marginal value of a loon)	Tuttle and Heintzelman (2015)

Evidence shows that assessment of water quality has been mainly established in developed countries. Developing countries like Sri Lanka has not attempted such studies. Studies such as Tuttle and Heintzelman (2015) indicates how property values are affected by water quality. Such results illustrate the influence of water quality on various sectors of the economy.

4.5 Trends in Marine Valuation Research

CVM has been applied in a wide range of empirical context in the last two decades. Different valuation methods are shown to produce widely different values.

King (1995) has used open ended WTP method and used multiple linear regression method to arrive at the value of the ecosystem using contingent valuation method. Recreational values of coral reefs have been mainly assessed by the CVM. Different coral reef valuation studies have estimated a variety of welfare measures (Beaumont *et al.* 2008). Arin and Kramer (2002) have estimated willingness to pay of divers for marine sanctuaries. Hall *et al.* (2002) have used the CVM approach to estimate benefits from better management of MPA that could avoid depletion of coastal ecosystems.

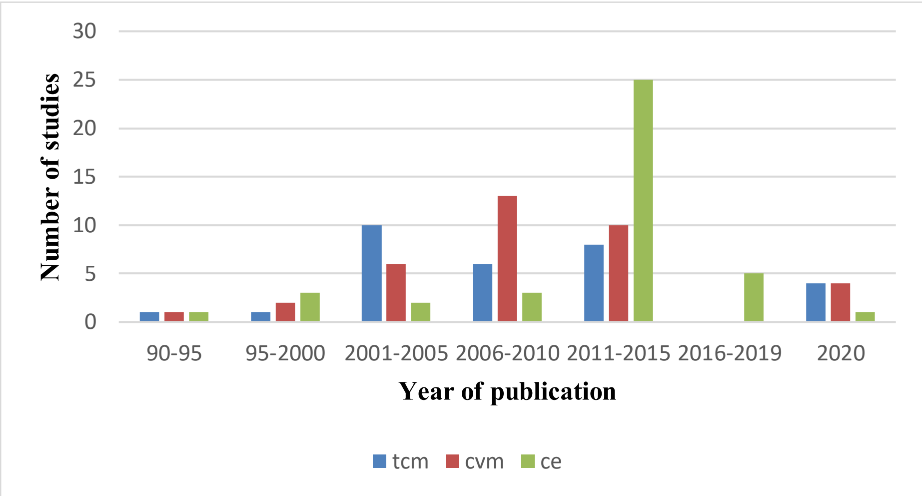
Benefits of scuba diving in Thailand Mu Ko Similan Marine National Park has been estimated by Asafu-Adjaye, and Tapsuwan (2008) using CVM. They have calculated the present value of these aggregate benefits (ranges between US$31 and US$71 million), using a social discount rate of 3%. Yacob *et al.* (2009) have applied dichotomous choice survey design-CVM to investigate empirically the willingness to pay (WTP) of the visitors for ecotourism resources in two selected marine parks in Peninsular Malaysia. It has used Logit and Probit models to estimate the visitor's WTP responses for conservation the marine parks for ecotourism. Liu *et al.* (2008) have analyzed 39 contingent valuation papers with 120 observations to conduct the first meta-analysis of the ecosystem service values provided by the coastal and near shore marine systems. Their results show that over three quarters of the variation in Willingness to Pay (WTP) for coastal ecosystem services could be explained by variables in commodity, methodology, and study quality.

Travel cost method (TCM) which has been most commonly used to value marine resources has been criticized for its inability to capture non use values of unique marine habitats. According to Aanesen *et al.* (2015) stated preference methods need lot of effort to capture the knowledge. Therefore, choice experiment method has evolved.

The theoretical background behind choice modelling (CM) was developed by economists and mathematical psychologists. The method is based on the Here, the individual decision making process is modelled in a specific context. CM is the common method that has been applied in the recent years. It is a non-market valuation method and is widely used in guiding ecosystem conservation. In recent research by Shah *et al.* (2019) choice experiment method has been used to derive to assess the substitutability between man-made and natural capital for MPAs.

Below mentioned graph illustrates the trends of marine valuation studies carried out over the years. From 1990 to 1995 only a few studies have been done and with the passage of time number of research done has been increased. Initially, studies have adopted mainly CVM and travel cost methods and at the latter stages more studies have adopted choice experiment method.

Figure 1. Trend of research done over the years



Source: compiled by the author

5. Gaps in Current Research

In the global context, there is a significant volume of coastal and marine valuation (Menzel *et al.* 2013). However, this has not yielded equivalent rise in the adoption of economic values in the policy context or in management decision making. Economic values have only been a source of information (Font, 2000, Marre *et al.* 2015 and Laurans *et al.* 2013). It is important to overcome the limitations of valuation and according to Hanley *et al.* (2013 and 2015) mainly focus on the limitations of Economic Valuation and emphasize that "the need to communicate ES research more effectively and to improve understanding of the realities of policy makers to economist and marine and coastal scientist". Collaboration between economist and natural scientist is also lacking at present. Sustainable ecosystem management requires integration of natural and social science disciplines.

In the Asian region, the main marine attraction are coral reefs and it is urgently required correct information that are useful in park management tasks. In Sri Lankan context, many marine MPAs have demonstrated failures in achieving their conservation objectives-(Wattage, *et al.* 2011 and Perera and Vos, 1997). Main problems faced by developing countries like Sri Lanka are lack of economic instruments, economic values often not been estimated and not recognized, non-incorporation of potential climate change impacts on coastal and marine ecosystems within the policy context. Further, lack of economic values applications and marine resource related comprehensive reviews is also an issue in Sri Lanka.

6. A Marine Recreational Research Agenda for the Future

A deeper look into the available research indicates that much of the ecological complexities of the marine ecosystems have not been in the center of many studies. There is only little attention paid towards complex dynamism that underpins the flow of marine recreational services. Therefore, there is a need for novel approaches that combine underlying sensitivities of the ecosystems and sustainable flow of resources and the economic values.

Individual marine ecosystems are under constant influence from the rest of the large ocean governed by global currents and other climatic variables which are subjected to the variations brought by the climate change. Marine resources are therefore having characteristics of public goods that it is constantly been subjected to degradation from activities taken place in immediate proximity and from distant locations. It is therefore important to establish baseline resource valuations due to the uncertainty that surrounds on the short and long term and proximate and distant changes that might impact the resource in question. Developing countries face inequities from two directions: Their ocean resources are being depleted by the major greenhouse gas–emitting nations. At the same time, in order to earn much-needed foreign exchange through tourism, they often sacrifice short-term provisioning services for their own populations and instead prioritize cultural services for foreign visitors. As a result, both immediate provisioning services and the potential cultural services that could benefit the majority when they achieve higher income levels are compromised. These countries remain victims of climate change impacts caused by polluters, despite having little or no role in generating those emissions.

The demand for key ocean and coastal based provisional services in developing nations are arising from two main sources: firstly, the declining productivities and increasing costs of the land based agriculture implies higher demand for food from ocean and secondly, increasing income of the population implies upward demand for food from oceans.

Quality of recreational resources will not be affected from the direct threats as traditionally understood. Many threats are unknown and unseen. Threats to marine organisms from chemicals and land based pollution is also high. Therefore, valuation of the baseline is important with attention paid towards potential threats. Pollution from micro plastics is one such issue that can bring long lasting impacts on the coastal resources. Maritime accidents pose another significant threat and Sri Lanka is currently facing one of the worst chemical accidents in the world maritime history. Sea level rise will also bring a significant threat and therefore valuing marine resources and the associated potential losses would be important which can be added to the cost side of the climate change and to justify the implementation of the adaptation measures. Land expansions towards the seaside are also on the rise. Coastal stability largely depends on sand supply from the land side. Lack of understanding on such dynamics can lead to excessive erosion in the coast leading to multiple losses. The burden of such activities will be on the already stressed recreational activities and supporting natural infrastructure.

When the incomes of the developing country are on the rise, there is a tendency that they seek for avenues that increase quality of life and therefore more recreational resources. The novelty of the resources and the variety of experiences have to be maintained in order to cater for the ever-increasing demands for recreation. This is especially true for tropical coastal states and developing countries.

7. The Need for Global Regional Cooperation with Respect to Sustainable Development Goals

Focusing only on sustainable development goals 14 and 15 is not enough there is a need for a long term all-encompassing global authority that could govern and ensure health of the coastal and marine ecosystems. The links between marine resources and the main economic activities need to be identified without delay.

A learned focus on synergies between different ecosystem services is worth attention. Many intact cultural services implies proper flow of provisioning services. Properly functioning intact coral ecosystem means fishery resources are abundant. Similarly, intact mangroves is a source of recreational values as well as it enriches the fish productivity. Fisheries sector and recreational sector are therefore synergistic as long as the sustainability of the service flows are guaranteed.

Understanding this ground reality is important in the valuation context. Extractive values such as fishing should not damage the coral structure (or any other intact ecosystem) and coral viewing should not damage the coral itself (case of glass bottom boats) and the associated fish need to be protected. Valuation exercises need to emphasize / highlight such jointly feasible /synergies more often than tradeoff stories.

Functional relationships have to be established among resources such as mangroves and fish productivity, mangroves and coastal stability, mangroves and coastal scenery etc.

Nonuse values have always given a lesser emphasis within the valuation literature since coastal resources are more of ‘used ‘resources than ‘non-used’ resources. When the focus is on non uses, the recreation and infrastructure will become irrelevant. However, the resources have to be maintained to the maximum extent possible. Yet, the relationships between status of conservation and nonuse values is a little understood subject. Future research may be designed to address such gaps.

The carrying capacity aspect of marine recreational resources has largely been understudied. It is important to combine carrying capacity studies with the valuation studies. Coupling of valuation with crowding will enable to plan the resources properly (Rathnayake and Gunawardena, 2014). For example, visitor management strategies need to be coupled with the recreational clusters which provide similar level of recreational opportunities. Preferences towards such recreational resource clusters could be estimated before designating them as clusters. Currently these are missing in the valuation literature.

The phenomenon of crowding suggests that many environmentally responsible uses of resources are displaced by non-use values. The central challenge, therefore, is how to elevate these concerns to the forefront of the research agenda. In particular, the problem of free-riding highlights the need for institutional mechanisms that safeguard resources on behalf of non-users. One possible approach is the formal designation of certain resources as strict conservation areas, thereby ensuring that the preferences and concerns of non-users are adequately represented in policy and practice.

In summary, valuation has to be focused on establishment of baseline valuation studies with potential degradation issues in mind especially, climate change related land-based overexploitation related, ship accident related, conversion to other uses related, crowding related etc. Decision making tools such as cost benefit analysis need to be applied more rigorously in these areas to arrive at more informed decisions. Provisioning and cultural services nexus – sustainable limits of provisioning services are both very important to be in the top priority in the marine valuation agenda. Valuations on costs of exceeding sustainable capacities are not available - future research agenda need encompass all these. In addition, more coordinated efforts have to be in place among neighbouring countries to get a more complete overview of the various facets of the total value of the marine recreational resources.

Another area of concern is where the local communities are constrained by income and their valuations may not reflect the true preferences. In addition, when the local communities are unfamiliar on the hypothetical market structures, there may be errors in the estimated values. The valuation methods can be designed to reflect such concerns in further research. (Kataria *et al.* 2012, Schuhmann and Mahon 2015).

8. Discussion: Implications for Education, Culture, and Public Policy

The findings of this review not only highlight methodological diversity and ecosystem-specific valuation trends but also underscore broader implications for education, culture, and public policy. From an educational perspective, the synthesis of valuation approaches provides a valuable resource for curricula in environmental economics, marine science, and sustainability studies. By incorporating case studies and valuation outcomes into teaching materials, universities and training institutions can cultivate a new generation of professionals equipped to apply economic valuation in practical conservation and management contexts.

Culturally, the recognition of recreational and non-market values associated with marine ecosystems reinforces the importance of these resources as part of community identity and heritage. Valuation studies that capture cultural services - such as recreation, aesthetic appreciation, and spiritual connections - help articulate the intangible benefits that coastal and marine ecosystems provide to societies. This strengthens arguments for conservation not only on economic grounds but also in terms of preserving cultural continuity and social wellbeing.

In terms of public policy, the review reveals a persistent gap between valuation research and its application in decision-making. Bridging this gap requires institutional reforms that integrate valuation outcomes into national accounts, coastal zone management plans, and climate adaptation strategies. Policymakers can use valuation evidence to justify investments in marine protected areas, restoration projects, and sustainable tourism initiatives. Furthermore, embedding valuation into policy frameworks enhances transparency in resource allocation and ensures that trade-offs between competing uses of marine ecosystems are addressed systematically. Ultimately, the integration of valuation into education, cultural discourse, and policy processes can foster a more holistic and sustainable approach to marine resource governance, aligning conservation priorities with societal values and long-term economic resilience.

Conclusion

Correct estimation and appropriation of economic values of marine and recreational resources can provide essential information for the day-to-day management as well as long term planning of these resources with correct level of resource allocation. There are various threats that could bring significant degradation of these resources and establishment of baseline values are important especially in the case of climate vulnerable coastal states with high population that are located in heavy maritime traffic areas.

Valuation experts need to think ahead to plan the valuation studies that can cater for the local and global needs with long term sustainability of these resources in mind. Each country needs to prepare their research agendas considering the needs of policy makers, conservationists, local managers, local communities, users, non-users and future generations in mind.

Declarations

Credit Authorship Contribution Statement:

Full Name of Author 1: write the contribution of first author choosing the relevant actions, but not limited to (Conceptualization, Investigation, Methodology, Project administration, Software, Formal analysis, Writing – original draft, Supervision, Data curation, Validation, Writing – review and editing, Visualization, Funding acquisition);

Full Name of Author 2: write the contribution of the second author choosing the relevant actions, but not limited to (Conceptualization, Investigation, Methodology, Project administration, Software, Formal analysis, Writing – original draft, Supervision, Data curation, Validation, Writing – review and editing, Visualization, Funding acquisition);

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Declaration of Use of Generative AI and AI-Assisted Technologies: The authors declare that they have not used generative AI and AI-assisted technologies during the preparation of this work.

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