

# **Towards More Standardization in the Collecting and Reporting of Marine Ecosystem Service Valuations**

by

Megan Jungwiwattanaporn

Dr. Linwood Pendleton, Advisor

Dr. Xavier Basurto, Advisor

April 2012

~Submitted in partial fulfillment of the requirements for the  
Master of Environmental Management Degree in the Nicholas School of the Environment, Duke  
University~

## Abstract

Over the past two decades the valuation literature for coastal and marine resources has rapidly expanded. This has led to a wealth of valuation estimates for policy makers and resource managers to incorporate into their decision making. The rapid growth of the literature has been supported by a wide variety of approaches, methodologies, and contexts leading to a broad and diverse field. Although the diversity of the field can lead to innovative ideas and perspectives, the variations in approaches and reporting has also lead to uncertainty and differing interpretations of values.

This Master's Project works with the Marine Ecosystem Services Partnership (MESP) and their partner the World Resources Institute (WRI). The purpose was to analyze the current state of ecosystem services valuation and the feasibility of bringing standards to the field. Standards could help improve the reliability of estimates, increase comparability of studies, and encourage better communication within the field.

A three part study, this project 1) analyzes the MESP database of values for gaps and trends, 2) interviews economists to gather their views on standardization, 3) interviews data users of the WRI Coastal Capital project to see how they have used the project and how they would improve it going forward. This Master's Project focuses on three ecosystems: coral reefs, mangroves, and seagrasses. At the end of the project, recommendations were given to the MESP on how they could improve their database and ways to better facilitate a discussion concerning the needs, obstacles and opportunities surrounding standardization.

## Table of Contents

<b>1. Introduction</b>	
Why bring standards to Ecosystem services valuation?	3
Rising Popularity of Ecosystem Services Valuation	4
Description of the MESP, and WRI's Coastal Capital Project	5
Why focus on coral reefs, mangroves, and seagrass areas?	6
<b>2. Objectives</b>	6
<b>3. Methods</b>	
Analyzing the Database	7
Interviewing Economists	8
Interviewing Data Users	8
<b>4. Results &amp; Discussion</b>	
Analyzing the Database	9
Coral reefs	10
Mangroves	11
Seagrass	13
Interviewing Economists	14
Interviewing Data Users	21
<b>5. Conclusion &amp; Recommendations</b>	29
<b>6. Acknowledgements</b>	34
<b>7. Literature Cited</b>	35
<b>8. Appendices</b>	
Executive Summary	36
WRI Coastal Capital Interview Questions	39
Analysis of Coral Reef Valuation Studies	40
Analysis of Mangrove Valuation Studies	45
Analysis of Seagrass Valuation Studies	50

## 1. Introduction

Over the past two decades the field of ecosystem services valuation has produced a wealth of information on marine ecosystems and has garnered the attention of policy makers throughout the world. The importance of the environment to human health has too often been left out of decision making, as ecosystem services are taken for granted or thought of as ‘free’. However, the economic valuation of ecosystem services offers decision makers a means to quantify the costs and benefits of various development scenarios, while emphasizing the link between ecosystem services and development goals. This can be especially important in tropical coastal areas where policy makers must weigh the value of new developments for locals and tourists against degraded coral reefs, mangroves, and seagrass beds. However, while more values are becoming increasingly available, such information has not been developed or reported in a standard unified way. Organizations such as the Marine Ecosystem Services Partnership (MESP) and the World Resources Institute (WRI) have expressed interest in improving the accessibility and clarity of the field. This project works with these two organizations to gain a better understanding of what data users and producers want from the valuation field and to assess the viability of bringing standards to ecosystem services valuation.

### 1.1 Why bring standards to Ecosystem services valuation?

Ecosystem services valuation is a broad field of study consisting of a diverse set of methodologies, data producers, and data users. Methodologies include revealed preference methods, stated preference methods, benefits transfer and meta-analysis [Table 1]. Further, valuation data is produced in a numerous set of contexts at varying geographic and time scales, focusing on various ecosystem services and policy issues. The diverse breadth of the field has led to various means of reporting, which has led to values that can be difficult to understand, compare, and sometimes trust. The problem is compounded by a lack of a common nomenclature both for methodologies and the ecosystem services themselves. This is an issue that has been addressed numerous times by economists in the literature. Researchers continue to point out that there is no one set definition for ecosystem services as a whole [1-3] while numerous typologies for classifying the various services continue to be developed [4-7]. The lack of a common terminology is not only confusing but can lead to double counting and less accurate results. Methodology specific terminology has also been criticized as being too vague [8] while methodological techniques are also under scrutiny [9].

**Table 1: Main economic valuation methods**

Methodology	Description
<b>Revealed Preference</b>	
<b>Financial Analysis</b>	Uses observed market prices to assess economic activity related to good or service
<b>Effect on productivity</b>	Assesses how a change in an environmental good or service affects the value of a produced good or service
<b>Replacement cost</b>	Values the environment by determining the value of a manmade good needed to replace the environmental good or service
<b>Avoided damages</b>	Estimates costs avoided because environmental good or service is present (i.e. flood control)
<b>Travel cost</b>	Derives a demand curve from visitation data and actual travel costs to environmental good or service

<b>Hedonic pricing</b>	Extracts affect environmental goods or services have on the price of a good (i.e. beach views for real estate)
<b>Stated Preference</b>	
<b>Contingent Valuation Method</b>	Asks respondents their willingness to pay (WTP) for a defined good or service, or a change in the defined good or service
<b>Choice Modeling</b>	Asks respondents to choose their preferred option from a set of defined alternatives
<b>Other</b>	
<b>Benefits Transfer</b>	Uses results obtained from an existing study and applies to a new context
<b>Meta-analysis</b>	Combines results from several studies to explain variations in values

Table adapted from [10] and [11]

The lack of reporting standards mean many studies do not include information necessary for comparing values between locations and over time. This can make it difficult for a resource manager to note trends in his area; it can also hinder meta-analyses of the literature as well as benefit transfers. As economists Luke Brander et al note in their paper “The recreational value of coral reefs: A meta-analysis” [12]:

Many of the valuation studies collected for this meta-analysis lack fundamental information .... This inadequate reporting is reflected in the fact that we collected 166 studies but only 52 of these yielded sufficient information for inclusion in a statistical meta-analysis. The scope for performing meta-analysis on coral reef valuation studies, and on the economic valuation literature in general, would certainly be improved if there were a standard protocol for the reporting of valuation results (p.215)

Standards could thus be applied in several ways – for reporting, for specific methodological techniques, and to bring typologies and definitions to the field as a whole. Such standards could bring clarity and trust to the values while enabling better comparisons. Over the long run, standards would also help establish the field so that ecosystem service values could be included in national accounts. Currently accounts such as Gross Domestic Product (GDP) do not include natural capital stocks or the flows of ecosystem services. However, green accounting, which would include such items, is currently hampered by the lack of a standard language or standard accounting units [13]. Just as goods and services in the market economy are weighted by units such as prices, so must ecosystem services be measured in standard units if they are to be included in national accounts.

Despite the current obstacles to green accounting, the idea of including nature in national accounts has gained momentum in recent years. For example, The Economics of Ecosystems and Biodiversity (TEEB) recommends updating national accounts to include ecosystem services in their Synthesis Report [14] while the United Kingdom’s National Ecosystem Assessment (UK NEA) represents the first country-sponsored study of a whole nation’s environmental assets [13].

## 1.2 The Rising Popularity of Ecosystem Services Valuation

TEEB and the UK NEA along with other large scale studies such as the Millennium Ecosystem Assessment (MA) are evidence of the rising popularity of ecosystem services

valuation. Each project supports the integration of ecosystem services valuation into decision making and involved large teams of social, economic, and natural scientists working together.

The TEEB study was proposed in 2007 to assess the economic significance of global biodiversity loss. The study is a global effort hosted by UNEP and funded by the European Commission, Germany, the United Kingdom, Netherlands, Norway, Sweden and Japan. Researchers from around the world were involved in assessing the costs of biodiversity loss; and have developed reports targeting both policy makers and business. In their Synthesis Report TEEB recommends “mainstreaming the economics of nature” so that natural capital is included in development decisions. The Synthesis Report also recommends including natural capital in national accounts and encourages specifying standards for the field of valuation ([14], p.25).

The UK NEA was published in 2011 with the purpose of identifying and developing proper policy responses to environmental degradation in the kingdom. One of its main objectives was to raise awareness concerning the importance of the environment to economic prosperity. The development of the UK NEA involved over 500 natural scientists, economists, and social scientists; as well as stakeholders from NGOs, government, academic and private sector institutions. The UK NEA followed a similar framework to the Millennium Ecosystem Assessment [15].

The United Nation’s Millennium Ecosystem Assessment (MA) was initiated in 2001 to assess the state of the world’s ecosystems, how changes to ecosystems could affect human well-being, and to study the science needed to improve environmental conservation. The MA involved the work of over 1,360 experts from a variety of disciplines worldwide; the results of which were published in five technical volumes and six synthesis reports in 2005 and 2006. The MA offered its own framework for analyzing ecosystem services and their valuation, dividing all ecosystem services into four broad categories: provisioning, regulating, cultural and supporting services. [7] The MA classification is “Despite its recent publication date...one of the most widely used” [2]; yet its acceptance is not universal and economists do perceive problems with the classifications.

Nevertheless, the MA, UK NEA, and TEEB studies do point towards an increased interest in ecosystem services valuation from researchers and decision makers around the world. The increasing popularity of such valuation is further emphasized by the ever increasing number of studies published on the topic, a trend noted by many researchers [5, 16]. In response to the growing number of studies and increasing interest, a number of initiatives and databases have begun to organize the literature and the field. Some of these projects have organized at the ecosystem level including the International Coral Reef Initiative’s (ICRI) Ad Hoc Committee on Economic Valuation. ICRI is a partnership of governments, international organizations, and non-government organizations promoting coral reef conservation under Agenda 21. The purpose of the Ad Hoc Committee was to compile an inventory of studies and articles to aid ICRI members in coral reef valuation. The Ad Hoc Committee was co-chaired by the Mexico-United States ICRI Secretariat as well as the World Resources Institute (WRI). It was one of the forces that led to the creation of the Marine Ecosystem Services Partnership (MESP). [17]

### **1.3 The Marine Ecosystem Services Partnership and the World Resources Institute**

This project works with both the MESP and WRI to assess the opinions of researchers and data users regarding the standardization of ecosystem services valuation. Launched in 2010 the MESP is an initiative led by Duke University’s Nicholas School of Environmental Policy Solutions. Partners include organizations such as the World Resources Institute,

NOAA, Conservation International, the IUCN, and UNEP-WCMC, among many others. The group offers an online portal for valuation researchers and policy makers to communicate, find new studies, and keep up on the latest developments in the field. The MESP's website offers an interactive database holding nearly 1500 marine ecosystem services values. It is free and open to the public at <http://marineecosystemservices.org>. The database houses marine values from four partner databases including: the Ecosystem Services Valuation Database (ESVD), the Gulf of Mexico Ecosystem Services Valuation (GecoServ) database, Conservation International's Consvalmap.org database, and NOAA's Coral Reef Valuation Database. The latter two databases have recently been retired and can no longer be accessed online except through the MESP portal. The ESVD database consists of derived data, unlike the other three databases which report values straight from valuation studies. It should be noted that each of these databases report valuation data using their own typology, as no standard exists. This typology had to be modified for use by the MESP.

The World Resources Institute, a partner of the MESP, is a global environmental think tank that works on environmental projects in a variety of fields. One such project is the Coastal Capital series which was launched in 2005. The purpose of the Coastal Capital project was to provide decision-makers in the Caribbean with information and tools linking the health of coastal ecosystems to development goals. WRI worked with local partners to develop reports for the following countries: Belize, the Dominican Republic, Jamaica, Trinidad and Tobago, and St. Lucia. The reports offered values for key coastal resources in each of the respective countries. WRI is interested to know how the Coastal Capital reports have been used in these countries and how future valuations could be made more useful.[11]

#### **1.4 Why Coral Reefs, Mangroves, and Seagrasses?**

This project focuses on the services provided by coral reefs, mangroves, and seagrasses. Coral reefs are an ecosystem of particular interest given their charismatic beauty, high biodiversity, and contributions to lucrative tourism and fishery industries. They have been emphasized by organizations such as ICRI, WRI, and are well represented in databases such as the MESP's database. The wealth of coral reef valuation studies make it an excellent target for study. Coral reefs, however, do not stand alone but rather exist interconnected with other tropical ecosystems including mangroves and seagrass beds. The ecosystem services provided by one ecosystem are often influenced by the health of services offered in another. Recognizing this connectivity, this project includes a broader focus in the hopes policy makers will also include such considerations in decision making.

#### **2. Objectives**

The overall objective of this project is to give recommendations to the MESP on how to approach current and future partners when discussing standardization. The information collected in this project will better enable the MESP to facilitate a discussion on the needs, obstacles and opportunities surrounding standardization. This project sets out to answer the following questions:

- 1) Are there gaps in the MESP's coral reef, mangrove, and seagrass data that hinder the MESP in providing a comprehensive view of the valuation of these ecosystems?
- 2) Are there any trends in this data in regard to methodologies, data types, geographies, origin of publication etc?
- 3) How do economists feel about standardization and do they have recommendations for standards?

- 4) How was the Coastal Capital project data used and do these data users have recommendations on what they would like to see in the future?

### **3. Methods**

This project consisted of three parts: analyzing the coral reef, mangrove, and seagrass data in the MESP database, interviewing economists and policy makers, and interviewing users of the Coastal Capital project data.

#### **Part 1: Analyzing the database**

The MESP provided an Excel spreadsheet containing the bibliographic information for all studies in its database as of July 2011 (the MESP database is undergoing updates however no new studies have been added as of April 15, 2012). The analysis focused on studies labeled ‘coral reef’, ‘mangrove’, or ‘seagrass’ as well as studies labeled ‘multiple’. The ‘multiple’ designation often included studies on the relevant ecosystems and such studies were also included in the analysis. The MESP spreadsheet included basic information for the valuation studies including the country the studies took place in, the year the study was published, the ecosystem and ecosystem services valued, and comments on the values reported. Such information was pulled directly from the database for the purpose of this analysis. The database does not currently include information on methodologies or the geographic scope of the study. Using the bibliographic information provided, I returned to each individual study when available and updated my copy of the database with such information. Not all studies could be located online and so not all studies could be included in this part of the analysis. Ultimately I read or looked through 115 coral reef valuation studies, 49 mangrove studies, 21 seagrass studies; and updated my working database accordingly. These counts include studies previously labeled ‘multiple’ and there may be overlap in studies between ecosystems. The analysis looked at the following components:

- Goods and services evaluated (as reported by MESP)
- Types of values derived (as reported by MESP)
- Methodology used
- Geographic location and scope of the study
- Who authored the study and what type of publication was used (i.e. peer reviewed journal, consultant report, working paper etc)

This study is not meant to be a meta-analysis or gap analysis; as such only descriptive statistics were used in the analysis. Gross counts are provided for each component by ecosystem in order to help the MESP understand the state of the ecosystem services knowledge currently at hand.



## **Part 2: Interviewing Economists and Policy Makers**

A total of 15 interviews were conducted for this stage of the project. The purpose of this stage was to gain a general idea of current opinions held by valuation economists/policy makers and was not meant to be a comprehensive survey. As such, fifteen interviews were deemed to be a sufficient number given the time frame of the project. In the same vein, random sampling was not used although economists/policy makers from various countries and backgrounds were sought out. The first round of respondents was chosen for having reports published within the past 10 years in the MESP database. This timeframe was chosen in the hopes that the respondents would still be involved in ecosystem services valuation. The study then used snowball sampling to find further respondents – at the end of each interview the economists/policy makers were asked if they knew anyone who would be useful to talk to.

Interview questions were developed with the director of the MESP, Linwood Pendleton (also an advisor for this project). The questions were chosen based on the interests of the MESP and interviews were conducted according to Duke University's IRB guidelines. All interviews were conducted over Skype or phone as the interviewees were rarely close by. Unfortunately the interviews were not fully pre-tested due to time and resource constraints. Future studies could be improved by pre-testing the interview schedule to ensure comprehension and clarity of interview questions.

The interviews were semi-structured and consisted of several open ended questions:

- How have you used (coral) valuation in your work?
- Do you continue to see a need for valuation studies in the future? Why and where?
- What basic kinds of info should a valuation study collect?
- Do you think it would be worthwhile to create basic standards?
- What other decision makers would be useful to interview?

Further questions were often asked to clarify interviewees' answers or to expand on interviewees' area of interest. Given the open ended nature of these interviews, different avenues of questioning were pursued with each interviewee. However, every interviewee addressed the questions stated above.

A qualitative analysis was then performed to identify trends in the participants' opinions. Given the small sample I opted to not use software such as NVivo.

## **Part 3: Interviewing Coastal Capital Data Users**

These interviews were conducted on behalf of the World Resources Institute to learn more about their Coastal Capital project. The Coastal Capital project was launched in 2005 by WRI in the following countries: Jamaica, Belize, the Dominican Republic, Tobago, and St. Lucia.

The World Resources Institute gave an initial list of contacts they thought would be helpful. Again, the respondents were asked at the end of the interview if they knew further contacts that would be useful to talk to. Data users from the five Coastal Capital countries were contacted with the goal of answering two overall questions:

1. How have the WRI Coastal Capital studies been useful/influential?
2. What kinds of marine/coastal valuations would be most useful/influential in the future?

A list of specific questions were provided by WRI [Detailed interview schedule in Appendix]. I also held a mock interview with a WRI employee to ensure I understood the full intent and meaning behind WRI's questions. This set of interview questions was not fully pretested however due to a lack of proper contacts for pre-testing and time. Again, all interviews were held over Skype or phone, and all interviews were conducted according to Duke University's IRB guidelines. Twelve interviews were completed with an additional two interviewees offering replies through email. A qualitative analysis was performed and results provided to WRI as well as the MESP.

#### **4. Results and Discussion**

##### **Part 1. Analyzing the Database**

The MESP database was examined for gaps and trends in its coral reef, mangrove, and seagrass data. A broad overview is given here; specific numbers and tables can be found in the Appendix. A note on language is perhaps important to differentiate between "study", "value", and "entry". The MESP database is currently organized by ecosystem service so that one study may occupy multiple lines; one line may hold multiple values. This can be seen in the example below:

source	bibliographic	pub_year	country	Eco system	Ecosystem _service	mesp_value_detail	mesp_value
<b>NOAA's Coral Reef Valuation Database</b>	Drimil, S. 1999. Dollar Values and Trends of Major Direct Uses of the Great Barrier Reef Marine Park. Research Publication No. 56. Great Barrier Reef Marine Park Authority.	1996	Australia	coral reef	fisheries	Gross financial value of fishing at the Great Barrier Reef Marine Park in 1995 from (a) commercial fishing (b) from recreational anglers	(a) \$143 million (b) \$122.5 million
<b>NOAA's Coral Reef Valuation Database</b>	Drimil, S. 1999. Dollar Values and Trends of Major Direct Uses of the Great Barrier Reef Marine Park. Research Publication No. 56. Great Barrier Reef Marine Park Authority.	1996	Australia	coral reef	multiple	Total gross financial value of direct uses of the Great Barrier Reef Marine Park in 1995	\$912.5 million
<b>NOAA's Coral Reef Valuation Database</b>	Drimil, S. 1999. Dollar Values and Trends of Major Direct Uses of the Great Barrier Reef Marine Park. Research Publication No. 56. Great Barrier Reef Marine Park Authority.	1996	Australia	coral reef	recreation / tourism	Gross financial value of commercial tourism at the Great Barrier Reef Marine Park in 1995-1996 from (a) reef trips (b) mainland accommodation (c) island resorts (d) in total	(a) \$167.4 million (b) \$236.3 million (c) \$243.3 million (d) \$647 million

As seen here, one study (a paper with the same title and authors) can occupy multiple lines in the database (where each line is an entry). Multiple values can be found in one entry, where a value is a dollar figure assigned to an ecosystem service. In this analysis the database is examined by both the number of values represented and the number of studies.

### Coral Reefs

Studies Labeled as “Coral Reef”	Related Studies Labeled as “Multiple”	Studies Accessible Online	Values in Database
124	13	115	722*

\*For studies labeled as “coral reef”, studies often hold more values than contained in database.

The MESP database has a substantial number of coral reef studies as compared to previously conducted gap and meta-analyses. Examples of such analyses covering coral reef systems include Pendleton et al’s 2007 study of the National Ocean Economics Program (NOEP) database [18], Brander et al’s meta-analysis on the recreational value of coral reefs [12], and Naber et al’s gap analysis of marine ecosystem services literature [10]. The Pendleton et al NOEP study of US based peer-reviewed literature included one reef study out of 73 publications. The Brander et al meta-analysis collected 166 coral reef studies. The Naber et al report included 128 studies and 590 values, 34% of which pertained to coral reefs. As these studies show, while the MESP database does not hold all coral reef studies currently published, the database does seem to hold a substantial portion of them.

Currently the majority of MESP coral reef values are for recreation and tourism (422 values) followed by values for fish and fisheries (72 values). The majority of these values are for studies conducted within the United States (269 values, 20 studies); followed by Jamaica (65 values, 15 studies), the Philippines (61 values, 8 studies), Indonesia (54 values, 8 studies), and Australia (34 values, 11 studies). Studies vary in their length and the number of values they hold. This leads to some studies being represented in the MESP database to a greater degree than others. For example, the 2001 report “Socioeconomic Study of Reefs in Southeast Florida” by Johns et al offers 172 values on its own.

If the studies are grouped by region, certain regions are certainly represented more than others. Although the coasts of South Asia, Africa, and Pacific Island Countries are lined with reefs these regions have few studies within the MESP database. This difference becomes even more pronounced when considering studies published within the last ten years.

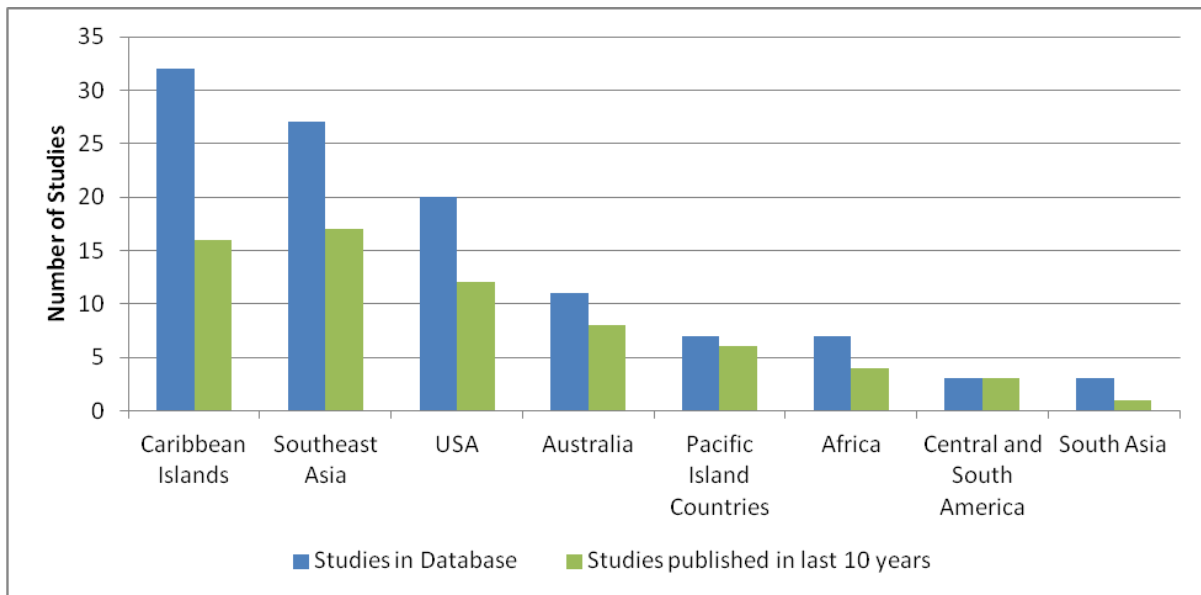


Chart 1. MESP Coral Reef Studies by Region

The majority of the studies used a stated preference method such as contingent valuation (45 studies), followed by financial analysis (40 studies). Interestingly, a large portion of the studies (17) did not report primary data but rather cited previous literature. This may be something the MESP would like to highlight in the future. It is perhaps also notable that a majority of the studies are not from peer-reviewed journals but are rather reports published by government agencies, consulting firms, or NGOs. Only 41 of the 115 studies found online (36%) were from peer-reviewed journals.

Studies were conducted at varying levels of geographic scope with studies at the marine protected level (41 studies) being the most popular followed by studies at the single (15) or multiple island (13) level. Values from the ESVD database led the types of values held in the MESP database (145 values). Currently these values are not described in any detail within the MESP database. This may be an area for future improvement going forward. The next most popular value types were consumer surplus values (126), Willingness to Pay (86), and net present value (78). No one author or journal seemed to dominate the database. The most published author in the MESP database was H. Cesar (10 studies), L. Burke (7), and P. van Beukering (6).

### Mangroves

Studies Labeled as “Mangrove”	Related Studies Labeled as “Multiple”	Studies Accessible Online	Values in Database
58	4	48	210*

\*Labeled as “mangrove”, 16 further values labeled as “multiple”

The MESP database contains fewer mangrove entries than it has for coral reefs. However, when compared to the Naber et al gap analysis of marine ecosystem values, the MESP

database seems to offer a comparable number of values. The Naber study looked at 128 studies of all ecosystem types including 590 values, of which 18% pertained to mangroves (106 values). The MESP database would seem to have almost double this number at 210 mangrove values obtained from 58 studies.

The majority of mangrove values were for fisheries (39 values) followed by other raw materials (26) and coastal protection (26). The majority of these values came from the ESVD database (141 values, 67% of all mangrove values). ESVD values are derived values and are perhaps best understood within the context of the ESVD database. The next most popular value types are “annual values” (50 values), often phrased as a variation of “the annual value of (ecosystem service) per (mangrove area)”. This phrasing is as listed in the MESP database; changes may have occurred between the original study and entry into the database.

Most of the mangrove values in the MESP database were for Southeast Asia with Thailand heading the list at seven studies and 29 values followed by Indonesia (16 values), Malaysia (13 values), and the Philippines (13 values) holding places three through five. The second most reported place in the database for mangroves was Sri Lanka with 19 values from two studies. Again, analyzing the studies’ location by region shows certain areas of the world are underrepresented. All regions outside Southeast Asia have fewer than five studies in the database within the past ten years.

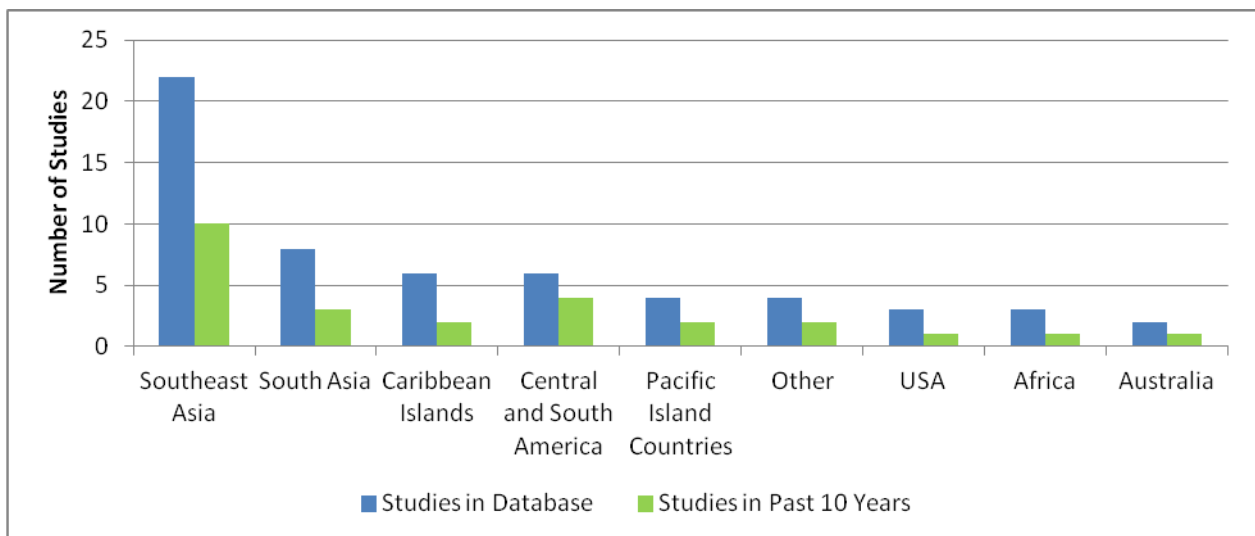


Chart 2. MESP Mangrove Studies by Region

In terms of geographic scope the studies varied from local site specific areas to country wide and regional values. Leading the way were studies at the forest/bay/lagoon level (10) followed by country wide studies (6). Although no one author dominated the MESP database as whole, some authors are over-represented regionally. For example, 22 of Thailand’s 29 values were developed by S. Sathirathai and 18 out of 19 of the Sri Lankan values came from one study.

Most studies used a price dependent methodology such as financial analysis or effect on production for a total of 29 price dependent studies. This was followed by contingent valuation studies (9).

Of the studies accessible online, the majority are journals (25 studies, 52%) although a substantial number of the studies are reports issued by international organizations, governments and NGOs. Few studies were collected for 2010 (1) or 2011 (0). The lack of studies for these most recent years could be due to slow circulation of studies or the young age of the MESP database.

### Seagrass

Studies Labeled as “Seagrass”	Related Studies Labeled as “Multiple”	Studies Accessible Online	Values in Database
17	4	21	42

Seagrass studies are not well represented in the MESP database. The database currently holds only 17 studies labeled seagrass with an additional four relevant studies labeled as covering “multiple” ecosystems. It is difficult to tell whether this gap is specific to the MESP database or is representative of a lack of seagrass research in the valuation field as a whole. The gap analysis performed by Naber et. al. included 590 marine ecosystem values only 1% of which were for seagrass. It thus seems probable that a large number of seagrass valuation studies have yet to be performed.

The values the MESP have for seagrass are largely for fish and fisheries (7 values), followed by other raw materials (6 values). Under the MEA’s typology for ecosystem services (cultural, provisioning, regulating, supporting) the majority of the seagrass values would be provisioning values. The MESP database has zero cultural values for seagrass and only two values in the regulating category.

Most of the values were listed as the “annual value” or simply “value of” a seagrass good or service (15 values). This is closely followed by ESVD values of which there were 14. The values are for sites around the world with no particular region dominating. The top three reported areas are: Australia (4), Jamaica (3), Philippines (3).

It is interesting to note that the leading methodology for these values is benefits transfer. It could be useful to go back to these studies and note where the values being transferred originate. Unfortunately, few of these studies are for seagrass alone; it may be difficult to discern how values for seagrass specifically were developed.

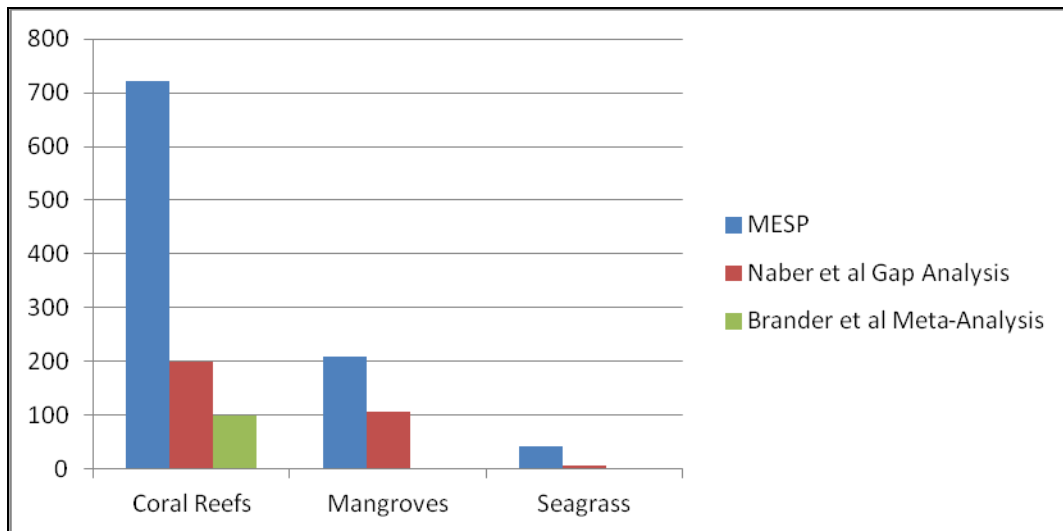


Chart 3. Comparison of MESP values to other analyses

Overall the MESP seems to represent the coral reef, mangrove, and seagrass ecosystems well as compared to one gap analysis. However, within each ecosystem, geographic gaps do exist.

## Part 2. Interviewing Economists

I interviewed 15 economists involved in ecosystem services valuation. Nine of these economists currently have at least one study represented in the MESP database. The remaining six were recommended during an interview. The majority of these interviewees were chosen based on their experience with coral reefs (12 people); one was chosen based on her research with mangroves. Two of the interviewees do not focus on marine ecosystems but were recommended for their knowledge concerning valuation practices. The interviewees came from a variety of institutions based around the world according to the following breakdown:

- 8 university professors\*
  - 4 US based [U1, U2, U3,U4], 3 Australian based [A1, A2, A3], 1 based in The Netherlands [TN1]
- 4 research economists at non-profit organizations
  - 1 at an Italian research institution [It1], 1 at an Indian research institution [In1], 1 in the Caribbean [C1], 1 at an international conservation NGO in Washington DC [DC1]
- 2 from the United States' National Oceanic and Atmospheric Administration (NOAA) [N1, N2]
- 1 from the Commonwealth Scientific and Industrial Research Organisation (CSIRO), the Australian government's scientific research agency [A4]

\*Interviews are coded by a letter and number, designated within the brackets above

Interviews lasted between 30-60 minutes depending on the interviewees' availability and willingness to talk. Given the open-ended nature of the interviews, questions were not always asked in the same order. Follow up questions were also often asked.

The interviews offered the following results:

### **How have you used (reef, mangrove) valuation in your work?**

The interviewees stated a variety of ways their valuation work has been used, from decision making by policy makers, to damage assessment cases, to more academic efforts. The main difference in responses seemed to center on how academic, policy, or client oriented the interviewees' body of work had been. The university professors tended to be more academic but some also performed consultant work. Of the academic crowd some carried out valuation work to build models, improve valuation methods, or simply increase the number of values in databases. Several of the interviewees that self-identified as primarily academic said their work can be used for policy purposes:

- “In my case I’m an academic, my work in valuation is mostly in improving the methods and increasing databases and just getting data out there, hopefully for policy makers to use .... It’s purely an academic interest with added benefit that it might be useful to policy makers.” [A1]
- “I lean to academics ... we focus on values relevant to policy, but we’re writing for an academic audience” [A2]
- One university professor noted that his work had been used by the EPA and in damage assessment cases [U3]

Several of the respondents answered this question by mentioning either a recent project (i.e. I worked in place X) or by mentioning specific methods (i.e. stated and revealed preference, meta-analysis). Those involved in consulting emphasized the importance of explaining results to their clients:

- “So long as the person explains to the policy maker...at the end of the study there’s usually a summit or workshop where I explain everything so it’s not just giving them a report” [DC1]
- “Certainly once we present the results, it’s definitely important to make them aware it’s full of uncertainties. Need error margins, need to point out limitations.” [TN1]

### **Do you continue to see a need for valuation studies in the future? Why and where?**

All of the interviewees felt valuation studies would continue to be important in the future. There could be bias in the answers considering the interviewees are all heavily involved in the field. Only a few respondents expanded their answers in reply to the “why and where” portion. Some spoke geographically such as the Coral Triangle in the West Pacific or doing a gap analysis of where more studies were needed; others however thought more methodologically.

- “where I think it needs to go and is heading is real integration of ecological/economics/human dimensions”. This interviewee would also like to see more “sound ecological models”. [N2]



- “Combining revealed and stated preference data.” [U3]
- “We should, try to become more and more specific. Currently look at tourist values and recreation value – next would be the type of tourist being valued – one resolution higher in sort of specific-ness. Same holds for spatial resolution as well.” [TN1]

### **Do you think it would be worthwhile to create basic standards?**

Replies to this question ranged from strong to cautious support for bringing standards or guidelines to ecosystem services valuation. A central concern was that standards could be too restrictive and limit the development of the field. In general 13 of the 15 interviewees seemed to support the idea of broad guidelines and reporting standards. There was an issue in the way respondents interpreted the word “standards” or “guidelines”. It is important to take the respondent’s definition into account as it likely influenced their answers. I was interested in how the interviewees initially interpreted this question. My follow up questions however focused on their support for reporting guidelines.

Interpreting “standards”:

The interviewees responded to the initial question in a number of ways depending on how they interpreted the word “standards”. Some considered methodology specific or field-wide guidelines. Others thought this referred to methods of normalizing values in order to make them more comparable. One person first thought of national accounting standards to bring about Green GDP. These different interpretations refer to projects of varying scope and size. Respondents seemed more likely to support “guidelines” in terms of broad suggestions, rather than programs which called for everyone to normalize their values.

- The economist that interpreted standards in terms of national accounting, emphasized the scope of such a project saying “If we’re going to take it seriously we have to set up the infrastructure to do that – things similar to what we find at the Bureau of Labor statistics or Bureau of Economic Analysis. Can’t be a volunteer effort” [U2]
- Another economist noted that “for different methods and focuses, standards will vary. Creating standards for ecosystem services valuation would be a very long book. It would be like creating standards for medicine” [U1]

Such projects would likely be too large for the MESP to undertake with its current resources. Reporting guidelines and broad rules of thumb would likely be more achievable goals.

Gauging support for standards:

Support was stronger for standards that focused on definitions, reporting, and broad guidelines. Respondents who were less supportive of standards focused on comparing and normalizing values.

- Two of the interviewees responded positively to the initial question, with little reservation:

- One said “unambiguously yes...standards are badly needed”, referring to the way values are defined and interpreted, the current ambiguity between final and intermediate services, as well as the lack of economic theory in certain studies [U1]
- Another answered “absolutely”, saying reporting standards would greatly help in doing meta-analyses [TN1]
- Two interviewees liked the idea of standards but thought the field needed to mature more first:
  - One responded “I love the idea. I think it’s important to be able to pick up an application and put it down somewhere else to compare Site A and Site B. But it’s messy...I’m not terribly optimistic. Maybe 20 years down the road.” [U4]
  - Another said “Ideally I would like standards, but I’m not sure we’re at that point yet”. Referring to a specific methodology, he added “Literature in benefits transfer has not realized a level of maturity, in that it would be easy to specify a set of standards”. [U2]
- Only one interviewee had an initial aversion to the idea of standards. She interpreted the question as normalizing the numbers saying:
  - “We have to take into consideration what’s the real purpose -what unit would be useful to whoever is making the decision. I think you’re looking at people who want to do meta-analysis to make their lives easier for the second person that comes along. If that’s the purpose, I would not agree with that. It’s already costly to do economic valuation, if I standardize everything, I may fail to provide information to the user.” [DC1]
- One interviewee did think standardizing the values themselves would be useful saying “We need standardization. People report in such different ways...the key is to record a standard array of info that allow these values to be converted into [comparable] units”. This interviewee thought it would be useful to create conversion factors that would help future researchers convert values to the units they need – rather than having the publishing researcher do it. Examples included how to convert from a per household figure to a per person figure. [C1]

#### Support for broad, non-restrictive guidelines:

The bulk of respondents (13/15) supported broad guidelines so long as they were flexible and non-restrictive. The following interviewees supported broad guidelines but cautioned against guidelines that were too restrictive, saying:

- “We don’t want to write standards that put people in a straight-jacket. Science is always moving forward.” [N1]
- “I don’t think you can start saying to people ‘this is how you have to do this’ – methods evolve.” [C1]
- “It makes me a little bit nervous ... they [standards] can I think inhibit some exploration in different ways of approaching the problem....The advancement of the methodologies.” [U3]

- “I think it would be useful to have guidelines on how to develop a valuation study and how to implement it...maybe best practices on how to report...but guidelines shouldn’t be prescriptive in terms of what type of valuation method would be better or worse or what type of econometric model should be used” [A1]

#### Reporting guidelines:

In general reporting standards were seen as the kind of standard that could be useful without being too restrictive. The types of information that the interviewees would like to see reported are explored more under the heading “What basic kinds of info should a valuation study collect?” (p.20).

- One interviewee said “I love the idea of common reporting standards, that should be something we approach as a discipline, here’s what you’ve got to report at a minimum” [U4]
- Every interviewee gave examples of items they’d like to see reported. One noted that reporting standards could be difficult to implement for two reasons. First, journal criteria often conflict with what researchers would like to see reported. Second, reporting standards would take time, effort, and energy on the part of researchers and there are “really no professional rewards for doing so”. [U2]

#### Standards and the MESP:

Two interviewees familiar with the MESP database suggested ways the MESP database could promote standards:

- One interviewee familiar with the MESP database suggested “I think it would be useful to have guidelines - basic minimum standards – to say we will not host any documents [in the database] that don’t achieve these minimum standards” [N2]
- The second interviewee had previously offered recommendations to the MESP regarding information the database should include. She felt offering information such as sample size and the valuation tool used could help promote standardization.

#### Addressing language issues:

A few of the interviewees felt that definitions within the field ought to be addressed so that it was clear what was being measured and studied:

- One felt that: a “Key problem is defining the good or service or the change that we’re asking people to value.” This interviewee felt, for example, that “nutrient balance” was not an ecosystem service. Too many researchers were not connecting their ecosystem services back to the people and communities involved. An example of an ecosystem service where nutrient balance might be involved is water quality affecting an area people care about. [N1]
- “People should describe what is being measured.” This interviewee felt if water clarity was being measured, the researchers should be specific about what indicators were being used. This interviewee also felt language was sometimes too vague: i.e. “high biodiversity – what does that even mean?” [U1]

References to previous guidelines:

Four interviewees referenced the contingent valuation guidelines put out by a NOAA Blue Ribbon Committee in 1993. Three interviewees mentioned guidelines put out by Ian Bateman. Other guideline authors mentioned included Brendan Fisher, Anna Alberini, and Rob Brower.

- One interviewee said that while it would be useful to have guidelines she was “not confident these don’t exist”. [A1]
- Two people seemed to think the field was naturally evolving standards. One said that in Australia the “techniques are starting to become institutionalized...we’re heading in that direction”. [A4] Another said that Alberini, Bateman, and NOAA offer core concepts that won’t change even though methods do evolve. [It1]
- One interviewee felt that “standards are already out there” and that standards have been laid out for several methods. However, these standards are often ignored and so are still “badly needed”. [U1]
- One person referenced the NOAA contingent valuation guidelines saying they ought to be updated. [C1]
- Another referenced the NOAA guidelines saying they were too restrictive. He noted that stated choice models, which are considered state-of-the-art today, would not be supported by the old NOAA guidelines. [N1]

Such references do bring up the question of whether basic standards need to be “created” or rather updated and disseminated instead.

Reasons for standardization:

Many of the respondents felt that applying standards to the field could increase the credibility and comparability of studies.

- Two respondents discussed how standards could improve the quality of the field:
  - One respondent felt strongly that the field was not as scientifically rigorous as it should be, saying that: “the self-identified ecosystem services literature, in general, has some great work and also has some really, really lousy work; and in general as a field of research is very sloppy about how it defines values, how it interprets them, what they mean.” This respondent also felt some published studies violated “numerous fundamental precepts of economic theory”. [U1]
  - Another said, we “can maintain the quality of science through standards” [N1]
- Two respondents mentioned the importance of comparability. One saying, currently “people report in such different ways...a bewildering array”. The other noting the usefulness of comparing “site A and site B”. [C1]

- One respondent suggested standards could increase trust in a study, saying it's "very valuable for agencies and users to have that little stamp of approval or certification" [U3]
- Four interviewees said they'd like to see data sets made available to improve meta-analyses and transparency within the field
  - "It takes so much time to record crucial data for meta-analysis – would only take limited time for researchers themselves because they probably have the data" and "should have data somewhere for transparency reasons" [TN1]
  - "for transparency, anyone who wants to do meta-analysis can use the information—especially if people are going to use for meta-analysis there needs to be some comparability" [N2]
  - "Enhances trust in system to share data." [A2]
  - "My plea to the scientific world is that there should be data sets...for transparency and accountability and to perfect the work". [It1]

Thoughts on the growth of the field and non-economists:

- I asked one economist why he felt existing standards were not being used. He replied, "It's such a popular field that a lot of people are jumping in who simply have no experience. So they're learning as they go but because they don't have the training in it they don't know where to look. They don't know what journals to look in. In some cases they don't have the expertise to read the information in these journals". He later added that "these readymade decision support tools and things that are up on the web encourage people to jump in and think it's easy, oh yeah I'll just do it. And the result is really bad research...But the real danger is that if that gets to policy makers, policy makers are making decisions on numbers that are bad" [U1]
- One economist working in the policy realm felt "What would be difficult or what needs to be closely examined are studies done by non-economists. That's where you have to be critical and really look at what they're actually doing here." Asked if studies done by non-economists could still be useful she replied "Actually, I don't waste my time reading those anymore". [DC1]

### **What basic kinds of info should a valuation study collect and report?**

A few themes for this question included: reporting sampling and surveying methods, all data needed to replicate the study, reporting the research question, and defining the ecosystem services in question.

Nine of the fifteen interviewees mentioned to some extent the importance of reporting sampling and surveying methods. This could be because of the high use of stated preference methods in coral reef systems. Most of the interviewees commented along the lines of "sample size is important" or "sampling is important". A few of the interviewees also emphasized the importance of developing a survey properly with pre-tests and focus groups. One mentioned that budget constraints and alternatives should be made clear to survey

respondents. One interviewee noted that proper sampling is important but doesn't always show up in reports:

- “Researchers don't want to say chances are they don't have a random sample. People that don't have a random sample need to be more forthright about saying it. That this is not a random sample, it's a convenience sample and as such results might be biased. How were the data collected, when were the data collected, how big was the response rate - those are sort of minimum accepted things, but they don't always appear in reports or the published literature either.” [U4]

Two respondents commented on how big the size of the sample should be, with differing views.

- “maybe say a minimum sample size should be 200 for contingent valuation...I think it should be more than that – but I've seen people do 50 which is just not enough”[C1]
- “I don't think you can give specifics because circumstances will vary. I've seen recreation studies use as few as 75 or 100 observations – they're informative” [U3]

Four of the interviewees mentioned the importance of publishing data sets either for transparency reasons or so the study could be replicated. One when asked what should be reported replied “Everything required to replicate it. That's what pushes science along”. [N1]

Five of the interviewees discussed the importance of having a clear policy question. Also mentioned was the importance of defining what trade-offs were being made. A few interviewees mentioned the importance of doing sensitivity analysis with one emphasizing the importance of noting uncertainties:

- Studies should report “uncertainties, ranges, certainly can have an average or median value, but just reporting one single value is a false way of presenting result. Presenting in ranges is useful” [TN1]

Other ideas included reporting ecosystem characteristics such as “for coral reefs, need to know the dive sites, surface area of reef, quality, variation in quality, ecological indicators”. [TN1] Two people felt knowing more about demographics and socioeconomic variables could help [TN1, A2]. One felt that the scientific data sources upon which ecological assumptions were made were poorly reported. [A1]

### **Part 3. Interviewing Data Users**

This portion of the project involved interviewing data users familiar with the World Resources Institute's Coastal Capital project. As WRI describes it, the project “aims to provide decision-makers in the Caribbean with information and tools that link the health of coastal ecosystems with the attainment of economic and social goals”. The Coastal Capital project included valuation studies conducted at national and local levels. At the end of the Coastal Capital project reports were distributed to various stakeholders within the country. The following information has been sent to WRI's Coastal Capital team to inform them on

how useful the Coastal Capital project has been in Belize, the Dominican Republic, Jamaica, Tobago, and St. Lucia.

## **Belize**

I interviewed four professionals that worked for either an international conservation initiative, foundation, or non-profit (B-1, B-2, B-3, B-4). All four of these interviewees had a positive experience with the Coastal Capital project and felt that ecosystem service values were being widely used within the country.

The Coastal Capital values have been used in a variety of ways in Belize and overall “many NGOs have been using the numbers” (B-1). This is likely due to a good dissemination and outreach program as well as good timing. The Healthy Reefs Initiative seemed to be a key partner in disseminating the Coastal Capital values. The Healthy Reefs Initiative is a multi-institutional effort tracking the health of the Meso-American reef system. In 2008 the initiative used Coastal Capital values to inform their *Report Card for the MesoAmerican Reef*. This report card was launched at a “Year of the Reef” gala attended by the Prime Minister and several other prominent politicians. All of Belize’s media houses covered the event where booklets and information on the Coastal Capital project were also handed out. One interviewee noted that not even two weeks later information from the project was being quoted in reports (B-3). Three of the interviewees mentioned Healthy Reef’s gala. One said she could not remember if WRI met with people in the government, tourism, and private sector, but that it would be useful to do so if WRI had not (B-2).

The Coastal Capital numbers do seem to be widely used in Belize. Three of the interviewees saw the numbers being used for both advocacy and policy making. One noted that conservation entities were focusing on advocacy, but the numbers have also appeared in policy papers, press releases, and national management plans as well as tourism development plans (B-4). The fourth interviewee felt the numbers have been used by her non-profit “far more for advocacy”, adding that the numbers came out too late to be used in her marine reserve’s management plan.

The interviewees listed several specific examples of how the values have been used in Belize thus far. The Healthy Reefs Initiative report card was mentioned by all four interviewees. Coastal Capital values were also used to inform a high profile damage assessment case. In 2009 the Westerhaven cargo ship grounded against the Belize Barrier Reef destroying over an acre of the healthy coral there. In the largest settlement Belize has seen, the Westerhaven was ordered to pay the Government of Belize BZ\$11.5 million or US\$5.9 million (this was later reduced to about BZ\$4 million post-appeal) (B-1, B-3). The Coastal Capital values have also been used by a coalition of roughly 40 organizations campaigning against offshore oil drilling in Belize (B-1, B-2). Further, a recent campaign by WWF and Oceana used the numbers to obtain a ban on bottom trawling in Belize (B-1).

The tourism industry is considered well aligned with conservation and there is not currently a push among NGOs to target the industry as a whole (B-1). Meanwhile, “a small percent of the Belize government understand ecosystem services valuation, but are increasingly becoming used to seeing such numbers” (B-1).

I asked the interviewees if they felt the numbers offered by the Coastal Capital project were large enough to be effective. One noted that the main numbers her organization used

were the total value of the reefs and mangroves. She also mentioned that her organization had added some of the numbers in the report together to get a larger aggregate number that would be even more eye-catching (B-1). Another mentioned that the values were large enough and that she was happy ranges were also given (B-4). One referred to the marine reserve her organization helps manage saying, “the value of the reserve to tourism and fisheries is very high compared to the investment the fisheries department puts it. The WRI values underline the fact that the reserve should have more investment”.

The interviewees seemed to have similar views on what sorts of values they’d like to see in the future. All four said Belize was a small enough country that a national number was useful. One felt the numbers were “more powerful” at a national level and referred to the oil drilling issue as an example where national numbers can be particularly useful (B-3). Two of the interviewees felt having MPA level values along with the national values could also be helpful (B-2, B-4). I asked if it was more helpful to have the overall value of the resource or a value showing the marginal changes due to management and policy decisions. One interviewee noted that overall values of coral resources have been the most used, but showing a marginal change in value due to management could be useful as long as the confidence level was known (B-1). Another voiced concern over capturing marginal changes in value saying that “we are not very good at collecting data, maybe we need to improve data collection” (B-3). Only one was adamant that showing a change due to management and having baseline numbers would definitely be useful (B-4). Concerning accuracy, three of the interviewees said the values should be as accurate as possible. Only one was more specific saying that greater accuracy is needed for legislation, while values used for education have “more wiggle room”. This interviewee suggested an accuracy level of 70-80% (B-3). Finally the interviewees were asked whether it was enough to measure a value in a given year or whether time series data with predictions of future values would be more useful. All felt that time series data with predictions of the future would be useful, but were cautious as to how accurate these values would be. The interviewees also felt that values should be updated regularly and that the study should be replicated every 5 years or so (B-1, B-2, B-3, B-4).

Overall the interviewees were happy with the Coastal Capital project. One admitted to being skeptical of the project at first. She said she was worried the project would be a “bunch of scientists looking at their methods...but fast forward a few years, WRI included people”. She ended the interview saying WRI had “done a really good job quite frankly” (B-3). Another felt that “The Coastal Capital report came out at a good time when there was good traction in Belize – the report coincided with the reef report card and the oil issue.” (B-1). When asked how the values could be further leveraged one interviewee suggested giving the values to the development agencies that provide money to the government (B-4). Another mentioned that education and reaching out to the next generation will continue to be important (B-3).

## **Dominican Republic**

I conducted three interviews with Coastal Capital users in the Dominican Republic including the country director of a conservation non-profit (DR-1), the country coordinator of



a conservation network (DR-2), and the director of a resort committed to sustainability (DR-3).

Overall it seems the Coastal Capital project was not widely used within the Dominican Republic. One interviewee said that “other than Reef Check, I don’t think another NGO has used it” (DR-2: not an employee of Reef Check). She adds though that she has seen Coastal Capital values cited in some newspaper articles. Another interviewee however notes that he has not seen the values referenced regularly (DR-3). The resort director has used the Coastal Capital values in grant applications, but acknowledges that overall he has not made great use of it. He says “...we haven’t thought of other creative ways to use the information. If there are other ways that WRI had in mind, we just didn’t connect with that or realize it” (DR-3).

One issue cited was a lack of distribution and follow up activity. One interviewee noted that while the information in the report was useful, “more marketing and distribution of the concept is necessary” (DR-1). In particular, he suggested targeting the tourism industry as well as government appointees. He also felt that private individual meetings with developers and government officials would be more effective than large presentations. Another interviewee asked if the Coastal Capital project would be a “living breathing document” that monitored changes and compared values over time – or if it was “just done” (DR-3).

Two of the interviewees cited a corrupt government as a reason for the relatively low use of the Coastal Capital values. One interviewee seemed to feel strongly about this saying she was “sure the current administration have no clue about this study” and that the study would be valuable “if we have resource managers who care...but they do not care” (DR-2). Ultimately she felt that conservation efforts would have very little effect until a change of leadership took place. However she also felt that there was very little institutional memory as people in the government keep changing. Another interviewee commented that “the government is lax on enforcement and the government is corrupt. Since politicians are politically driven, it is harder to convince them with the data” (DR-1). This interviewee also suggested that the report might be of more use to the private sector as they have money to be made off the long term health of coastal resources.

It seems the Dominican Republic is not eager for new valuation studies at this point in time. If a new study were to be performed however, the interviewees seemed to be more interested in localized values rather than national numbers. This would enable people to connect better with the values – i.e. this is the value of ‘my’ fish (DR-1, DR-3). One interviewee did note that businessmen may find national numbers useful (DR-1). In terms of accuracy two interviewees felt that the more accurate the data the better, but one did not want to turn down a number if that data was all that was available (DR-1). Overall none of the interviewees were too specific about what they’d like to see for future valuation projects. Broader issues such as increasing outreach, awareness, and enthusiasm were the important points for these interviewees.

## **Jamaica**

WRI provided the contact information of four people knowledgeable about the Coastal Capital project in Jamaica. One of these contacts was unavailable as she was on jury

duty at the time of this study. Three interviews were thus conducted for Jamaica including one local university professor (J1), an employee of Jamaica's National Environment and Planning Agency –NEPA (J2), and an employee of a regional conservation NGO (J-T1).

Overall there seemed to be a positive response to the Coastal Capital project in Jamaica and data users within the country would like to see more market valuations for their coastal resources.

All three interviewees noted that there was a great deal of interest in using valuation information in Jamaica. However, current use of such values seems to be geared more towards education and advocacy rather than policy making (J1, J2). The Coastal Capital values have been quoted in presentations and documents primarily targeted towards the general public. They have also been used in classrooms at the university level. One interviewee suggested that policy makers would like to see more valuations covering various scenarios, locations, and methodologies before using such information in decision-making (J1). Further, the government is currently determining how to integrate natural resource valuation into its Environmental Impact Assessment (EIA) process. They anticipate having guidelines by September, and are hesitant to use values in decision making until then (J2).

The Coastal Capital project was disseminated to a large cross section of people and a lot of interest in the valuation project was generated at the time of its initial presentation. During the launch of the final project there was a 'media blitz' that targeted the public, government ministries, and NGOs. Although the 'right people' were reached during the initial launch, the Jamaican government has since changed leadership. These new leaders will need to be re-engaged (J1, J2) and it is too soon to tell how receptive they will be to this kind of information (J2). The University professor is worried that the current report is still too long and that a one page ministerial brief may be more effective (J1).

The University professor also felt that involving more local scientists in the actual development of the report could help improve its credibility. He mentioned this more than once adding that local environmental scientists also wanted more ownership of such projects; and that capacity building over time would be important as well.

There have been several other valuation projects conducted in Jamaica, but the WRI project is the most comprehensive and holistic one performed so far (J1). Most of the work conducted so far has been on Jamaica's north coast, where many of the hotels are and where the University of West Indies Marine Lab is located. Yet there remains a high demand for valuation projects, including around Kingston and Black River (J1).

The NGO employee (J-T1) would particularly like to work with WRI on assessing how specific management initiatives add value to local areas. Jamaica has recently invested in marine protected areas or 'fish sanctuaries'; some of which are quite large - up to 10 miles long by 2 miles wide. The NGO employee notes that Jamaica is starting at a low baseline with overfished and badly degraded reefs. However, recent management efforts appear to be working, with fishermen patrolling the fish sanctuaries and fishing effort coming down. The economic and social impact of these management initiatives should be measured to show the success management can bring. He believes Jamaica could become a success story and model for other nations in the region.

The NGO employee further feels that such a project should probably not be led by the government but rather done in conjunction with the government. Jamaica's fisheries division

is currently underfunded. Also, fishermen don't pay taxes, have unrecorded landings, and hold little power in government. These factors make it difficult to increase investments towards improving fisheries.(J-T1)

In terms of the size of the Coastal Capital values the interviewees seemed to think small values were still useful. The NGO employee in particular emphasized the importance of measuring the change in value due to management going forward. He also emphasized the importance of obtaining local values saying "if we can go down to smaller areas, we can engage the local stakeholders much more effectively and provide information relevant to their community" (J-T1). The NEPA employee however noted that it was important to have a mix of values at the country level as well as site specific levels. He also felt that having annual values was useful especially when presenting to politicians. The NEPA employee also suggested that relating values to employment would also be an effective measure.

All three interviewees felt that time series data would be very valuable to help track changes over time. All three also said that accuracy was important. The university professor felt that while accuracy was important he also wanted a timely management tool. So, accuracy must be balanced with resources and a reasonable schedule. The NGO employee noted that businessmen in particular can be cynical before even picking up a report and thus methodologies must be very robust. All three interviewees felt WRI's methodology was good.

## **Tobago**

I conducted two interviews to assess the usefulness of the Coastal Capital project in Tobago. Both of the interviewees are connected to a local non-profit focused on marine conservation and research on the island. One was a former government official now working as the director of the non-profit (T-1). The second was the former director of the non-profit, now working for a regional organization (J-T1: also included in Jamaica interviews). An attempt was made to speak with someone in the government. WRI had offered a contact for someone in the Division of Agriculture, Marine Affairs, and Environment. This contact had since moved to a new division and felt he could no longer speak on the use of the Coastal Capital project or the use of marine valuations in Tobago. I spoke briefly with two employees in the Marine Resources & Fisheries Department. One, a park manager, said she was aware of the report but had not heard of it being used. The other, a research officer, said she had not seen a copy of the report and suggested WRI send another copy.

The two interviewees I spoke to reported different views of Tobago's conservation movement and the use of valuation information there. The local interviewee, currently based in Tobago, seemed to have a more positive outlook (T-1) while the regional interviewee felt more was being done for coastal resources elsewhere in the Caribbean (J-T1).

Both interviewees I spoke to said there was good dissemination and outreach when the Coastal Capital report was first issued. The respondent currently working in Tobago said "A number of copies were printed and we took steps to get to all in the Tobago House Assembly that we felt was necessary". He added, "I say a fairly good effort was made to circulate to the community in Tobago" (T-1). This interviewee noted that copies of the report

were sent to a number of divisions in the government including the Water and Sewage Authority, the Drainage Division, the Infrastructure and Works division; as well as various organizations involved in the conservation movement and the University of Trinidad and Tobago. Asked if he felt there was a good response to the report, he replied “Yes, well a lot of people like me. They share my view, this was extremely educational, a unique thing...a serious piece of work” (T-1).

The second interviewee agreed that initial dissemination was good, noting that “The documents were presented to a whole range of stakeholders in Tobago – private sector, communities, government. I think it did have an impact on their thinking, this straight-forward argument: coral reefs are generating a lot of revenue for the country” (J-T1). Further, he felt that “Workshops in Tobago were very thorough and clear and well attended. Briefs published were very nicely laid out, easy to read, disseminated widely.”

This second interviewee however added that “Tobago has a bad record in implementing management plans or really thinking through some of the needs for natural resource management. Reason is that they have a lot of oil and gas in Trinidad- that’s really where their economy is based.” This interviewee felt that since oil and gas were the resources funding the annual budget and keeping people employed, the government was not as concerned with tourism related resources. He cited other countries such as Granada, the Grenadines, St. Lucia, Jamaica, and Barbados as placing more importance on coastal resources.

In terms of current use, the local interviewee felt the information was being used. He said people have been quoting it in their speeches and presentations on coral reefs. Specifically he said he’s seen the Chief Secretary in the Tobago House of Assembly use it as well as people in the university system. His own organization has used it in “anything we have to do with respect to the reef or with respect to conservation” including conservation projects and management schemes.

The regional interviewee did not cite specific examples of the study’s use saying instead, “The work is extremely important and very useful. One of my questions would be - is it getting through to the right people. That’s something I can’t answer. I hope it is. I trust it is”. His focus lay more in future valuations, which he felt should center on value changes resulting from management. He felt this was lacking in the Coastal Capital report, but could be very useful going into the future. There currently exists “some cynicism, that the problems that affect reefs are problems management cannot solve. Although they may be valuable – management programs might not make a difference to their decline”. Having numbers that showed management decisions improved the state of the coastal resources would thus be very useful to have. Such a study may be more useful in another country however – such as Jamaica where management programs are underway – rather than Tobago. Asked if such a study would be useful in Tobago he replied, “If there was a management program actually starting up, but there isn’t right now. So you wouldn’t see any change”.

The regional interviewee also answered questions regarding geographic scope, accuracy, and time series data. He felt it was important to have local values that engaged stakeholders at the local level. Studies “should aim to be accurate, very accurate” to avoid cynicism from stakeholders. He emphasized the importance of having robust methods, which

he thought WRI did have. He also felt that “time series data is extremely important especially when linked to interventions so can show value of intervention”.

The local interviewee did not voice as strong opinions on what future valuation studies should look like. When asked about preferences for the geographic scale of valuations he said it’s “better to do an island wide thing. It doesn’t take away from the fact that this one [the Coastal Capital project] was very valuable and important”. He felt that values representing the overall reef rather than marginal changes might be better. Also, the resources available and stakeholders involved would drive the level of accuracy required in future studies. He placed emphasis on making reports clear so that policy makers could understand them and not just scientists. However, he felt the Coastal Capital project did a good job in this ending with: “I can’t say the Coastal Capital report was too scientific, I understood it quite well. And I am not a scientist”. (T-1) The regional interviewee also emphasized the importance of communicating this information to policy makers. He suggested using video clips as the issues involved are quite visual and “people do not like to read documents”.

## **Saint Lucia**

WRI offered contact information for seven contacts in St. Lucia. Of these two were too busy to interview during the time of this project, two had moved to new departments and could not discuss the project, one said he was not familiar enough with the project, and one had passed away. I spoke with one program officer from St. Lucia currently working for an inter-governmental organization focusing on sustainable development in the Caribbean. I also received emailed replies from a project coordinator at the same organization; as well as a brief email communication from an officer in St. Lucia’s fisheries department.

The email communication from St. Lucia’s fisheries department relayed that a staff member within the fisheries department had received training in the Coastal Capital tool, but the tool had not been used directly as of yet. Information and data contained with the Coastal Capital publication has been used in articles, press releases, panel discussions, and interviews. However, “from a policy-convincing level, we still feel that valuation just does not seem to be yet a keen interest of policy makers as it does not fit into calculation of GDP. Maybe sensitization of policy makers in this area still needs to be continued”.

The second email communication said the Coastal Capital tool has “been referenced a number of times at various forums...However, to my knowledge the methodology for valuation of coastal resources has not been used by management agencies in Saint Lucia”. This contact felt that while there was adequate dissemination and outreach while the project lasted, “no sustainability was built in to ensure that the methodology was actually used”. She mentioned that developing an “average value of types of systems: indices” would be useful and repeated this idea several times in her replies. However, she did not elaborate on what these indices would like. Going forward she felt that national scale and site specific values would be useful as well as values for specific economic sectors. She also felt that “Given the general dearth of data in the region- ball park (best estimated values) would be useful”.

The person I interviewed said his organization has “been utilizing it more as a reference, we don’t use it as a day to day tool. When issues come up regarding coastal resources it is a document we cite”. He noted that the Coastal Capital values have been cited

for a combination of both advocacy and policy work. Asked if there was enough dissemination and outreach he said “my quick answer is no, but is there ever enough?” He felt that people within his organization and conservations in St. Lucia often “get sidetracked and never get any further than saying ‘wow this is great’”. He would like to see people say “Let’s take that information and do something that will change behavior.” However, conservation staff are very busy with multiple projects to handle already.

This interviewee would like to see valuation data and conservation methods put into popular announcements and television reports. He also mentioned the importance of reaching out to youth through social media such as Facebook and other internet portals. He felt that the way conservation information in general was currently offered and where the general public look for information was “out of sync”.

This interviewee repeatedly emphasized the importance of connecting values back to tangible implications. He commented that “very often coastal resources, their valuation from the political standpoint tends to be the contribution to GDP. Unless you can link it back to gross domestic product ... it tends to be lost”. He would like to see values such as: “coral reefs contributed to 20% of gross domestic product”. He further commented that “Our valuations have got to be in terms of things that have an impact on the average person”.

In terms of future values he answered questions regarding geographical scale, accuracy, and time series data. He felt having data for many site-specific areas would be useful, but the site-specific data had to be combined with a broad view that was connected back to the broader socioeconomic area. For accuracy he acknowledged that more precise values are better but greater accuracy needs to be balanced with costs. He felt that “For me if you could give me something that is reasonably cost effective and accuracy of 80% I would be willing to work with that in terms of policy.” He also felt time-series data was always better but again practical concerns of costs had to be factored in. I asked how often a valuation study should be repeated so data was new enough to be convincing. The interviewee replied that many politicians and policy makers in St. Lucia work on a five year cycle. A study repeated every five years, plus or minus a year and a half would thus be most useful.

Asked if he had any general thoughts about the Coastal Capital project the interviewee replied “I would like to see it done for all of the OES [Organization of Eastern Caribbean States] countries. I think the methodology is reasonable, but the important thing is to do it for many more countries.” In general the interviewee seemed satisfied with the Coastal Capital project itself, but felt that more needs to be done in-country to promote the value of coastal resources.

## **5. Conclusion and Recommendations**

This project explored three important components of the valuation field: the data, the data producers, and the data users. It is hoped that if the MESP understands these three components well, they can better position themselves as moderators of future dialogues concerning the standardization of the valuation field. The examination of these components

was guided by four questions as outlined in the ‘Objectives’ of this project. In answer to these questions, recommendations have been formulated for the MESP to consider:

- 1) Are there gaps in the MESP’s coral reef, mangrove, and seagrass data that hinder the MESP in providing a comprehensive view of the valuation of these ecosystems?

The MESP seems to already be in a good position as a gateway for data. It is difficult to know whether observed gaps in the data are due to gaps within the field as a whole or whether the MESP is missing studies. Only one gap analysis of marine and coastal values was located [10] which limits the scope for comparison. However, the MESP does well when compared to the Naber et al study for seagrass, mangroves, and coral reefs.

There does seem to be a shortage of seagrass studies within the field as a whole and the MESP may want to use its network to encourage further research on this ecosystem. Currently the database has a global coverage of 21 studies reporting seagrass values. This is far too few for effective policy making, especially when large swaths of the world are not valued at all.

Further research appears to also be needed for mangroves in all regions outside of Southeast Asia. According to one source [19] the countries with the largest area of mangrove cover are (as of the late 1990s): Indonesia, Brazil, Nigeria, and Australia. Yet the MESP has only 1 mangrove study each for Brazil, 0 for Nigeria, and 2 for Australia. Considering when studies were published is also important. Southeast Asia is the most represented region in the database at 31 studies, yet only 12 of these have been published in the past 10 years. Recent information is likely to be of the most use to resource managers and policy makers.

The coral reef studies also have geographical gaps that the MESP may want to look into. An argument could be made that more studies are needed for all reefs (are 20 studies enough for the highly threatened Coral Triangle?). However, areas such as the Pacific Island Countries, Africa, Central/South America, and South Asia all have fewer than 10 studies currently in the database. This is likely not enough for effective policy making, especially for such large regions of the world.

Aside from geographical gaps, the MESP may also want to consider gaps in the coverage of ecosystem services. Coral reef recreation, tourism, and fishery values are currently the most represented in the database. However, coral reefs do provide other services such as coastal protection. The MESP may want to look into obtaining further studies on these other ecosystem service types.

In sum, although more studies in all areas would certainly be useful, critical gaps include the following:

<b>Coral Reefs</b>
<b>Fewer than 10 studies currently in database for:</b>
<ul style="list-style-type: none"><li>• <b>Pacific Island Countries</b></li><li>• <b>Africa</b></li><li>• <b>Central/South America</b></li><li>• <b>South Asia</b></li></ul>

## Mangroves

**Fewer than 10 studies currently in database for:**

- **Caribbean, USA, Australia, Pacific Island Countries, Africa, South Asia, Central and South America**
- **MESP may want to consider emphasizing countries with large forests such as Brazil, Australia, and Nigeria**

## Seagrass

- **More seagrass studies are needed in all regions for all services**

2) Are there any trends in this data in regard to methodologies, data types, geographies, origin of publication etc?

There are a few notable trends for the coral reef and mangrove ecosystems. Unfortunately there are too few seagrass studies for a thorough analysis of trends. An interesting trend that applies to both the coral reef and mangrove studies is the predominance of gray literature in the database. Only 36% of the coral reef studies and 52% of the mangrove studies were from peer-reviewed journals. Many of the values in the database originate from government, NGO, or consultant reports. The MESP is currently overhauling its database to present data in a clearer way with further details regarding each study. As of April 2012 a category for “Type of Publication” was planned. Although this information could be discerned from the bibliographic data published, highlighting the origins of the studies could be helpful to visitors. The MESP should go forward with presenting and highlighting where studies are published.

Another trend applying to both coral reef and mangrove studies is the large number of ESVD values which outnumber all other value types including willingness to pay, consumer surplus, and net present value. The MESP does offer a link to the ESVD database, but more information on the MESP website itself regarding the origins of these derived values may be useful.

In terms of the coral reef studies the majority of values were for recreation and tourism services followed by fisheries. The majority of values were estimated using stated preference methods followed by price dependent methodologies. Most coral reef studies were conducted at the MPA level rather than country wide or regionally.

The majority of mangrove values were for fish, other raw materials, and coastal protection. The main methods used were price dependent methods. Geographic scopes ranged from local forests and bays to countries and coastlines.

Further, currently the MESP does not offer information on methodologies, nor if values are from primary or secondary data. Such information may be useful to visitors as they decide whether to pursue reading the original studies. Several of the values in the database are from studies quoting work done by previous authors such as in case studies or guides on how to use valuation.

An interesting typology the MESP may want to look into is that of Seppelt et al in their paper "Form follows function? Proposing a blueprint for ecosystem service assessments based on reviews and case studies" [20]. This paper emphasizes the difference between primary and secondary data, theory driven and application driven studies, as well as other useful information such as whether the study considered uncertainty or included stakeholders.

Understanding trends in its database is certainly knowledge that the MESP can bring to its future discussions. In terms of actions items, the MESP should consider:



### Action Items for MESP

- **Keep and highlight the “Type of Publication” category**
- **Offer a methodology category**
- **Note whether a study offers values based on primary or secondary data**
- **Offer more information on ESVD values**

3) How do economists feel about standardization and do they have recommendations for standards?

This section of the project offers the MESP a first look at the opinions of economists and policy makers; and offers a launching point for future discussions or studies. Due to the lack of random sampling, biases may exist. However, opinions were obtained from economists in a variety of organizations and geographical locations. The sample was small at only 15 interviews, so the MESP may want to gather further opinions going forward.

The interviews gathered here do offer insights the MESP may want to consider in its future discussions. Perhaps the most important is the use of the word ‘standardization’. This word can be interpreted in a variety of ways including: normalizing values, bringing about Green GDP, setting methodological recommendations, or improving reporting. Further, the MESP can promote standardization through the use of its database (only accepting studies that meet its own requirements) or by fostering discussion through its partnership.

A few economists seemed overwhelmed when first considering the word ‘standardization’. However, the majority (thirteen out of fifteen) seemed to support the idea of ‘reporting guidelines’. Various recommendations were made about items that ought to be reported. Particular emphasis was given to reporting on sampling and survey methodologies as well as offering datasets online. It is likely that sampling and survey techniques were emphasized given the widespread use of stated preference methods in coral reef valuation. Other items that could use increased reporting included socioeconomic variables and ecosystem characteristics. Several interviewees also thought a better definition for “ecosystem services” was needed.

As previously mentioned, the MESP could promote reporting standards through its database. The MESP could require new submissions to outline the methods used, sampling techniques used, and policy question addressed. The MESP is currently working on uploading PDFs to link the values in its database to their original studies. It is likely that offering datasets online is still far down the road, but worthy of discussion with partners.

### Recommendations for MESP

- **Consider various meanings of ‘standardization’**
- **Promote increased ‘reporting guidelines’ through database submissions and dialogue with partners**
- **Require new submissions to database to report on methods, sampling techniques, and policy question when possible**
- **Continue to solicit opinions from economists, policy makers, and data users**

- 4) How was the Coastal Capital project data used and do these data users have recommendations on what they would like to see in the future?

Results from the Coastal Capital interviews were delivered to the World Resources Institute. Together with WRI, conclusions regarding the success and future areas of interest were developed. Using this information, WRI has developed a separate report for their own use.

Overall, the Coastal Capital data users were happy with the development and output of the Coastal Capital project. However, some countries used the report to a greater extent than others. Belize offered the clearest “success story” having used the report in a variety of contexts with wide-spread dissemination of the report. Jamaica data users also seem to be very interested in this kind of information and would welcome future valuation studies. One of the interviewees working in Jamaica even suggested a possible follow up project that WRI could participate in to further leverage results.

The Coastal Capital series met with less apparent success in the Dominican Republic, Tobago, and St. Lucia. Although the data users were happy with the project itself, there seemed to be issues with dissemination and acceptance from government officials. Issues cited included corruption among government officials and resource managers, as well as a rapid turnover rate within the government. One interviewee noted that Tobago was less likely to respond to coastal valuations of reefs as most of their income comes from the gas and oil industry. Future valuation studies may want to have an initial look at a country’s reliance on reef resources and the level of interest for valuation among government officials.

Key factors that contributed to the success of the project included stakeholder engagement, a strong network of local partners, and well developed communication strategies. One of the interviewees in Jamaica mentioned that he would like to see further engagement with local scientists during the development of the project. The Coastal Capital’s success in Belize worked in large part due to dissemination of the project’s reports by the Health Reefs Initiative. Belize is also highly dependent on coastal resources and has active conservation actors.

Overall the respondents seem to be interested in updates to the values at a scale of every 5 years or so. The respondents differed in the geographical scale they would prefer to see information. High accuracy levels would be preferred although the respondents often kept time and cost restrictions in mind. Several of the interviewees also mentioned packaging the information in ways that government officials would find interesting. Ideas included offering numbers as a percentage of GDG, expressing values through video or social media, and disseminating shorter policy briefs.

WRI can use this information to guide its future valuation projects and future work with partners in the Caribbean. The MESP, of which WRI is a partner, can also use this information to foster a dialogue on data needs and presentation. Accuracy was important to the data users but almost equally important was the actual presentation and dissemination of values. Updated values also seemed to be of high importance as several interviewees wished for the values to be updated every 5 years. Future work by the MESP may want to further explore how values on paper are translated into actual policy use.

## Recommendations for MESP

- **Keep the database updated as more recent values tend to be more useful**
- **Foster a dialogue on the data needs and presentation preferences of data users**

As the MESP moves forward to expand its database and promote a discussion of standards, it is hoped they will keep all of the above recommendations in mind. The database itself can be used to promote standards; hopefully its usage will grow as the database is updated and gaps are filled. As the MESP fosters a dialogue on standards it may want to emphasize reporting guidelines as a feasible first step. Finally, although many of the economists interviewed were interested in improved reporting for methodologies and data sets; most of the data users interviewed seemed more concerned with obtaining and disseminating values. The MESP should also keep in mind the varying needs of its different users.

## **6. Acknowledgements**

I'd like to thank my advisors Dr. Linwood Pendleton and Dr. Xavier Basurto for their support and guidance. I'd also like to thank the World Resources Institute for inviting me to work on their Coastal Capital project. Finally, I thank all my interviewees for offering their time and thoughts to this Master's Project.

## **7. Literature Cited**

1. Brown, T.C.B., John C.; Loomis, John B, *Defining, Valuing, and Providing Ecosystem Goods and Services*. Natural Resources Journal, 2007. **47**: p. 329-376.
2. Fisher, B., R.K. Turner, and P. Morling, *Defining and classifying ecosystem services for decision making*. Ecological Economics, 2009. **68**(3): p. 643-653.
3. Haines-Young, R. and M.B. Potschin, *Methodologies for defining and assessing ecosystem services*, 2009, JNCC. p. 69.
4. Angulo-Valdes, J.A. and B.G. Hatcher, *A new typology of benefits derived from marine protected areas*. Marine Policy, 2010. **34**(3): p. 635-644.
5. de Groot, R.S., M.A. Wilson, and R.M.J. Boumans, *A typology for the classification, description and valuation of ecosystem functions, goods and services*. Ecological Economics, 2002. **41**(3): p. 393-408.
6. Ken J, W., *Classification of ecosystem services: Problems and solutions*. Biological Conservation, 2007. **139**(3-4): p. 235-246.
7. Millennium Ecosystem Assessment, *Ecosystems and Human Well-Being: Synthesis*, 2005: Washington, D.C.
8. Carson, R. and J. Louviere, *A Common Nomenclature for Stated Preference Elicitation Approaches*. Environmental and Resource Economics, 2011. **49**(4): p. 539-559.
9. Johnston, R.J. and R.S. Rosenberger, *Methods, Trends and Controversies in Contemporary Benefit Transfer*. Journal of Economic Surveys, 2010. **24**(3): p. 479-510.
10. Naber, H., G.-M. Lange, and M. Hatziolos, *Valuation of Marine Ecosystem Services: A Gap Analysis*, 2008, The World Bank: Washington, DC.
11. World Resources Institute , *Value of Coral Reefs & Mangroves in the Caribbean - Economic Valuation Methodology*, 2009.
12. Brander, L.M., P. Van Beukering, and H.S.J. Cesar, *The recreational value of coral reefs: A meta-analysis*. Ecological Economics, 2007. **63**(1): p. 209-218.
13. Boyd, J. and S. Banzhaf, *What are ecosystem services? The need for standardized environmental accounting units*. Ecological Economics, 2007. **63**(2-3): p. 616-626.
14. TEEB, *The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A synthesis of the approach, conclusions and recommendations of TEEB*, 2010.
15. Assessment, U.N.E., *The UK National Ecosystem Assessment: Synthesis of the Key Findings*, 2011: Cambridge.
16. Fisher, B. and R. Kerry Turner, *Ecosystem services: Classification for valuation*. Biological Conservation, 2008. **141**(5): p. 1167-1169.
17. World Resources Institute, ICRI Secretariat. *Report of the Ad Hoc Committee on Economic Valuation*, 2010.
18. Pendleton, L., P. Atiyah, and A. Moorthy, *Is the non-market literature adequate to support coastal and marine management?* Ocean & Coastal Management, 2007. **50**(5-6): p. 363-378.
19. Valiela, I., J.L. Bowen, and J.K. York, *Mangrove forests: One of the world's threatened major tropical environments*. Bioscience, 2001. **51**(10): p. 807-815.
20. Seppelt, R., et al., *Form follows function? Proposing a blueprint for ecosystem service assessments based on reviews and case studies*. Ecological Indicators, (0).

## 8. Appendix

### Executive Summary

This project worked with the Marine Ecosystem Services Partnership (MESP) and the World Resources Institute (WRI) to assess the current state of ecosystem services valuation, and the feasibility of bringing further standards to the field. Recommendations were developed for the MESP concerning ways the partnership could improve its database of coastal and marine ecosystem values; as well as ways the MESP could better facilitate discussions on standardization.

The study was guided by the following four questions, with recommendations tailored to their answers:

1. Are there gaps in the MESP's coral reef, mangrove, and seagrass data that hinder the MESP in providing a comprehensive view of the valuation of these ecosystems?
2. Are there any trends in this data in regard to methodologies, data types, geographies, origin of publication etc?
3. How do economists feel about standardization and do they have recommendations for standards?
4. How was the Coastal Capital project data used and do these data users have recommendations on what they would like to see in the future?

### Gaps and Trends in the MESP Database

The MESP database plays a central role in the partnership's mission not only as a repository of information but also as a gathering place for data users and producers. Improving the database could position the MESP as an authority to better facilitate discussions on standardization. The database itself could also be used as a tool to foster standardization by only accepting quality studies.

In order to answer questions regarding gaps and trends in the MESP database an analysis was performed for the coral reef, mangrove, and seagrass data. The analysis looked at the goods and services evaluated, types of values derived, methodology used, geographic location and scope of the studies, as well as the author and type of publications used. Currently the MESP database has 124 studies tagged for coral reefs, 58 studies for mangroves, and 17 for seagrass.

It is difficult to know whether existing gaps are due to gaps within the field as a whole or whether the MESP itself is missing studies. However, the MESP has a similar number of values as compared to Naber et al's 2008 study, *Valuation of Marine Ecosystem Services: A Gap Analysis*, the only gap analysis on marine and coastal values found to date. As such it seems the MESP is already in a good position as a gateway of data. The MESP may, however, want to keep the following in mind:

## Coral Reefs

**There are currently fewer than 10 coral reef studies in the database for:**

- **Pacific Island Countries**
- **Africa**
- **Central/South America**
- **South Asia**

## Mangroves

**There are fewer than 10 mangrove studies in the database for:**

- **Caribbean, USA, Australia, Pacific Island Countries, Africa, South Asia, Central and South America**

## Seagrass

- **Currently there are 17 seagrass studies covering the entire globe. More seagrass studies are needed in all regions for all services**

The MESP may also want to look into its reporting of value types and publication types. Only 36% of the coral reef studies and 52% of the mangrove studies are from peer-reviewed journals. Many of the values in the database originate from government, NGO, or consultant reports. Highlighting this information may be useful to visitors. Also, 67% of mangrove values and 20% of coral reef values are from the ESVD database which is comprised of a derived dataset. The MESP may want to offer more information regarding the origins of these derived values.

Other trends noted include the dominance of recreation and tourism values for coral reefs, which were primarily obtained using stated preference or price dependent methods. Mangrove studies were dominated by values for fish, other raw materials, and coastal protection using price dependent methods.

## **Economist's Opinions on Standardization**

Fifteen interviews were conducted with economists from around the world in order to gauge opinions on standards for the field. Interviews were sought out via snowball sampling and were in general semi-structured. The overall questions guiding the interviews were:

- 1) Do economists think it would be worthwhile to create basic standards?
- 2) What basic kinds of information should a valuation study collect?

The interviews offer insights the MESP may want to consider in its future discussions. Perhaps the most important is the use of the word 'standardization'. This word can be interpreted in a variety of ways, something the MESP will want to consider as it promotes dialogue. The majority of economists interviewed here (thirteen out of fifteen) did seem to support the idea of 'reporting guidelines' with an emphasis on sampling techniques, survey

methods, and offering of datasets. Many economists were also concerned that standards could be 'restrictive' to an evolving field.

### **Interviewing Data Users**

This project also sought out the opinions of data users via the World Resource Institute's Coastal Capital project. Launched in 2005, the Coastal Capital series aimed to provide decision-makers in the Caribbean with information and tools linking the health of coastal ecosystems to development goals. WRI developed reports for the following countries: Belize, the Dominican Republic, Jamaica, Trinidad and Tobago, and St. Lucia.

Twelve users of the Coastal Capital project were interviewed to answer the following two questions:

- 1) How have the WRI Coastal Capital studies been useful or influential?
- 2) What kinds of marine/coastal valuations would be most useful/influential in the future?

Overall the Coastal Capital project met with the most success in Belize, a country highly dependent on its coastal resources and open to valuation information. The project was not as widely used in Tobago which is less reliant on its reefs or the Dominican Republic where government officials are also motivated by other interests.

These data users also emphasized the need to make valuation information accessible to government officials and the general public via shorter reports, video, and social media. Data users were also interested in seeing more studies and more up-to-date information at various geographical scales. Answers to these questions can be used by WRI to guide future valuation projects and its future work with partners in the Caribbean. The MESP can also use such information to foster a dialogue on data needs and presentation.

## WRI Coastal Capital Interview Schedule

[Introduced self and explained project]

My first set of questions examines the usefulness and influence of the WRI's coral reef valuation in [country].

1. How has the WRI Coastal Capital valuation (and possibly other marine valuations in the Caribbean) been useful/influential?
  - a. Did you find it useful?
  - b. How has it been used?
    - i. Who is using it?
    - ii. How are they using it?
    - iii. For advocacy / raising awareness? For policy/management/decision making?
  - c. What would have made it more useful?
    - i. Would some other type of valuation or use of another valuation method been more useful?
    - ii. Were the numbers large enough to achieve impact? etc
  - d. What would have made the valuation more used?
    - i. Was there adequate dissemination, communication and outreach?
    - ii. Were the right people reached?

I am also interested in your thoughts on how future coastal and marine economic valuations—whether led by WRI or anyone else—could be most useful, beneficial and influential.

2. What kinds of valuations would be most useful/influential in the future?
  - a. What geographical scale(s) are most useful? Are overall values for a country or site-specific (such as MPA) numbers more useful?
  - b. What types of values are of most use (i.e., do you want to examine the overall value of the coral resource or the marginal changes in value due to management or policies)?
  - c. What level of accuracy is necessary? (More precise valuations require much more data collection, so are more expensive – is it enough to just have ballpark values?)
  - d. Is it enough to measure values during a given year, or are time-series data (or predictions of future value) more useful?

Are there other people you think would be useful to contact?

Thank you very much!



# Coral Reef Valuation Studies

Studies Labeled as “Coral Reef”	Related Studies Labeled as “Multiple”	Studies Accessible Online	Values in Database
120	17	115	722

## Analyzing the Data

### *Goods and Services Evaluated*

The MESP is currently not happy with how the “goods and services” portion of their database is organized and this information is not offered on their website at this time. There are currently 44 different categories of goods and services in the database some of which are quite similar to each other (i.e. fish, fishery, fisheries). This overlap is due in large part to the collaborative nature of the MESP – the MESP database was built from partner databases each using their own typology. Perhaps notable is that the field as a whole has not decided on a common typology for categorizing ecosystem goods and services.

Still, such information can be useful to have. Although the typology offered by the Millennium Ecosystem Assessment is not universally accepted, it can offer a good stepping stone for categorization. The MESP’s coral reef values are reorganized here in Table 1. The majority of the values are for recreation and tourism (422 values) followed by fisheries and fish (72 values). Unfortunately not all of the MESP categories fit well into the MEA typology. These are included in the “Other” category below. Going forward the MESP may want to give more specific descriptions for values such as “multiple”, “TEV”, and “NPV”.

**Table 1: The MESP’s Coral Reef Values by Goods and Services**

Good or Service Valued	# of values
<b>Cultural and Amenity</b>	
Recreation and tourism	422
Science / Research	8
Attractive landscapes and Artistic Inspiration	7
Education, Research, Photography	2
Total	439
<b>Provisioning</b>	
Fish and Fisheries	72
Other Raw / Sand, rock, gravel, coral / raw materials [unspecified]	7
Pets and captive animals	6
Plants / vegetable food // Food [unspecified]	4
Provisioning values [unspecified]	2
Solar Energy	1

Total	92
<b>Regulating</b>	
Coastal protection / disturbance regulation / flood control Storm protection Erosion prevention/ erosion control	23
Prevention of extreme events [unspecified]	8
Waste treatment [unspecified]	2
Nursery service	1
Climate regulation [unspecified]	1
Total	49
<b>Supporting</b>	
C-sequestration	3
Nutrient cycling	1
Biological Control [unspecified]	1
Total	5
<b>Other</b>	
“multiple”	61
“degradation / loss of ecosystem service (multiple)”	23
biodiversity	26
enhanced ecosystem service (conservation / restoration / management)	13
TEV	12
NPV	2
Total	137

### ***Types of Values Derived***

The MESP database holds a “value detail” column offering a brief description of what the value is measuring and in what terms. Understanding what value types are currently being offered is useful, especially when researchers know what values are in demand by data users. This information could be useful to the MESP as it continues to position itself as a gateway for data.

Further, it is interesting to see that many of the values currently offered are from the Ecosystem Services Valuation Database (ESVD) and are thus derived values. This may be something the MESP would like to explain in greater detail to its users.

**Table 2: The MESP’s Coral Reef Value Types**

<b>Type of Value</b>	<b># of Values</b>
ESVD values	145
Consumer Surplus	126

WTP	86
NPV	78
"Economic impact of visitors" due to sales/ income/ expenditures (no time frame given)	59
"Annual value"	55
Loss in expenditures/values due to (policy, pollution, coral bleaching etc)...	32
Estimated revenues from fees (i.e. MPA fees, diver fees)	20
Annual revenues, income, expenditures, benefit	17
Revenues, non-annual	17
TEV	14
Income per month or year	14
Other	59

## ***Methodology***

This category is not currently offered by the MESP. The analysis went back to the original studies, when possible, to collect this information. Unfortunately, not all studies were easily accessible, so methods are not included for all studies. Some studies used more than one method. The most used methods for coral reef studies were stated preference methods such as contingent valuation and price based methods such as financial analysis.

**Table 3. Coral Reef Valuation Methodologies**

<b>Method</b>	<b>Studies</b>	<b>Notes</b>
Stated Preference: Contingent Valuation, Contingent Behaviour, Choice Experiment/ Choice Model	45	Stated Preference only (23), Stated Preference and another method (22)
Financial Analysis (Price dependent including effect on production, avoided damages)	40	Financial analysis only (24), Financial analysis with other method (17)
Travel Cost	14	
Reports (Quotes other studies, case studies)	17*	
Benefits Transfer	13	
Literature Review (only)	4	
Meta-analysis	3	
Economic model	3	

## ***Location and Geographic Scope***

The MESP database includes information on the country a study was conducted in but not geographical scope. The analysis returned to the original studies to find information on geographical scope. Most studies seem to be conducted at an MPA level and the USA is the most represented

country in the database. This information is useful for analyzing geographic gaps in the MESP database. At a more site specific level, the most popular places to study were Montego Bay (10 studies), Great Barrier Reef (7), and Bonaire (5).

**Table 4. Top Ten Geographical Locations for Coral Reef Studies**

Country	Number of Studies	Number of Values
United States	20	269
Jamaica	15	65
Australia	11	37
Indonesia	9	54
Philippines	8	61
Thailand	6	21
Netherlands Antilles	5	18
Global	4	11
Malaysia	3	8
Caribbean	3	11

Does not include studies unavailable online, but does include 'Multiple' studies

**Table 5. Geographical Scope of Coral Reef Studies**

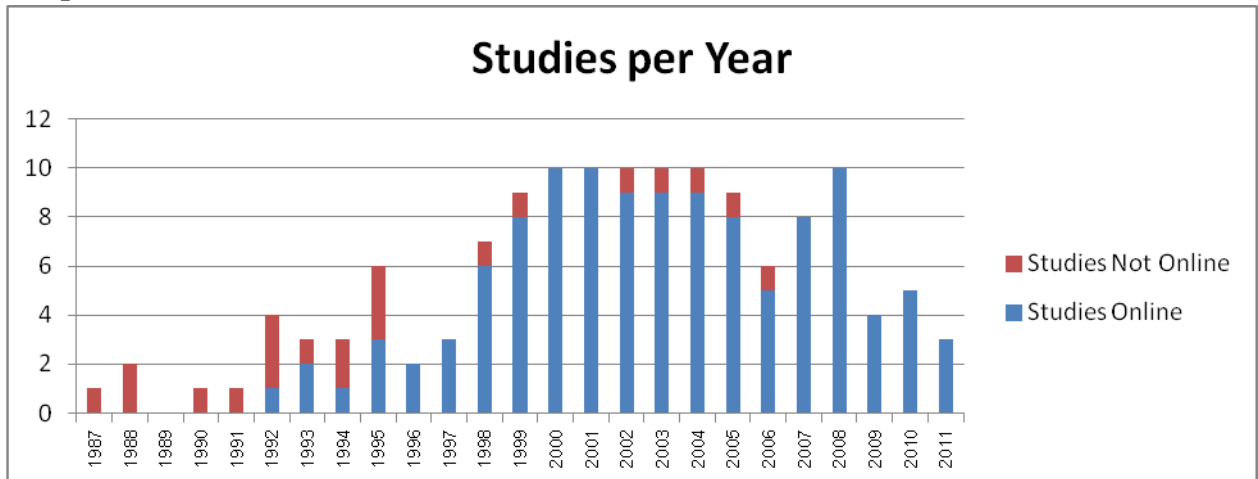
Note: does not include studies that are Reports, Case Studies, or Literature Review

Scope	Study Count
MPA	41
Island	15
Island, multiple	13
Country (non-Island)	5
Region (NE Florida, SE Florida, Bohol Marine Triangle, Straits of Malacca, Offshore TX, Mayan Peninsula)	6
Site Specific – Beach, Town, etc.	5
Global	3
County/Municipality	3
Coastline	3
Caribbean	3
Beaches	2

### ***Timeliness***

The MESP database notes when a study was published. Coral reef studies range from 1987 up to 2011, however not all of these studies are easily accessible online. Having this information will ensure the MESP remains up to date while also offering historical information to inform trends and analyses.

**Graph 1: Publication Year of Coral Reef Studies**

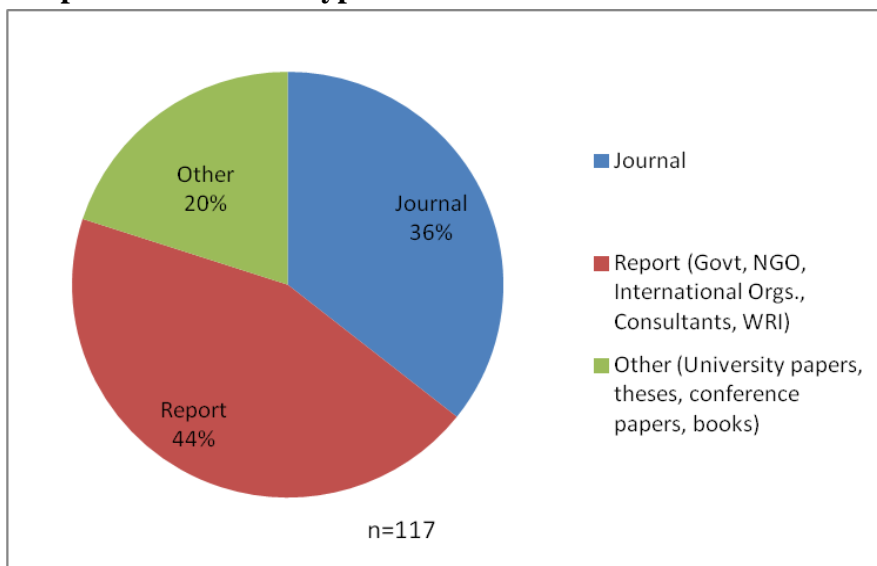


***Type of Publication/Authors/Journals***

The MESP can ensure a diverse representation of authors and journals by keeping track of which publications are currently held in the database. Currently 197 coral reef authors are represented with almost 80% of these authors appearing only once. The most published authors over the past 10 years are Cesar, H. (10), Burke, L. (7), van Beukering, P. (6). It thus appears no one author is dominating the database. It also appears no one journal is dominating the database; journals with most studies published are Ambio (4), Ocean & Coastal Management (4), Ecological Economics (3).

The type of publication is a new entry the MESP is planning on including in the next iteration of its database. This could be useful information for data users concerned with where studies originate. Currently less than half of the studies represented in the database are from peer-reviewed journals. However reports from governments, NGOs, and consulting firms often offer valuable and scientifically rigorous information as well.

**Graph 2. Publication Type for Coral Reef Studies**



# Mangrove Studies

Studies Labeled as “Mangrove”	Related Studies Labeled as “Multiple”	Studies Accessible Online	Values in Database
58	4	48	210*

\*Labeled as “mangrove”, 16 further values labeled as “multiple”

## Analyzing the Data

### *Goods and Services Evaluated*

There are currently 42 different ecosystem goods or service types for mangroves in the MESP database. This category is currently not represented on the web but can still be useful information for data users to have. The ecosystem goods and services for mangroves are reorganized below according to the MEA’s categories of cultural, provisioning, regulating, and supporting services. An ‘other’ category is included for services that do not neatly fit into the above four. The most represented good/service type for mangroves is fish/fisheries (39 values) followed by other raw materials (26 values) and coastal protection/erosion prevention (26 values).

**Table 6. Mangrove Studies Goods and Services**

Good or service	Number of values
<b>Cultural and Amenity</b>	
Recreation/tourism	13
Total	13
<b>Provisioning</b>	
Fish/ fisheries	39
Other raw/ “raw materials/food/medicine”/ Raw materials [unspecified]	26
Timber	17
Fuel wood and charcoal	11
Biochemicals	3
Total	96
<b>Regulating</b>	
Coastal protection / disturbance regulation / flood control	26
Storm protection	
Erosion prevention/ erosion control	
Nursery service	14
Waste regulation/ water purification	3
Gas regulation	2
Total	45

<b>Supporting</b>	
C-sequestration	6
habitat / biodiversity support	4
Total	10
<b>Other</b>	
“multiple”	20
TEV	13
Biodiversity protection	7
Other/various	5
enhanced ecosystem service (conservation / restoration / management)	1
Total	46

### ***Types of Values Derived***

In the MESP database there are currently 210 values labeled as ‘mangrove’ with an additional 16 mangrove related values labeled ‘multiple’. Of these values, 141 were obtained from 42 studies out of the ESVD database. The ESVD database is comprised of a derived dataset. The next most common value type for mangroves were “annual” values at varying geographic scopes.

**Table 7. Mangrove Study Value Types**

<b>Value Type</b>	<b>Number of values</b>
ESVD derived values	141
"Annual Value"	50
▪ per hectare*	22
▪ per bay/forest/lagoon/wetland	9
▪ per country	6
▪ per km <sup>2</sup>	3
▪ per island	3
▪ South Asian countries	2
▪ Other Annual Value	5
NPV	8
"TEV"	7
WTP	7
Consumer surplus	6
Other	7

\*11 of the per hectare values are for Surat Thani, a province in Thailand

## ***Methodology***

This category is not currently included in the MESP database. The analysis went back to the original studies to collect this information. Not all studies were accessible and so not all MESP studies are included here. Some studies used more than one method.

**Table 8. Methodology Used in MESP Mangrove Studies**

<b>Method</b>	<b>Number of Studies</b>
Price dependent	29
Including "production function" or "effect on production"	8
Including "Avoided damages" or "replacement costs"	4
CVM	9
Benefits Transfer	9
Report	9
Travel Cost	2

## ***Location and Geographic Scope***

There are currently 26 countries represented in the MESP database for mangrove studies plus a category for "global" values. The most represented region is Southeast Asia with 31 mangrove studies.

Geographic scope is not currently a category within the MESP database. However, this information can be useful to data users hoping to work with particular numbers. Most mangrove studies seemed to be conducted at local levels such as local forests, bays, or lagoons.

**Table 9. Top Ten Countries with Mangrove Studies**

<b>Country</b>	<b>Number of Studies</b>	<b>Number of Values</b>
Thailand	7	29
Sri Lanka	2	19
Indonesia	6	16
Malaysia	7	13
Philippines	4	13
Vietnam	3	13
China	1	10
Cambodia	2	9
Mozambique	1	9
Fiji	5	8



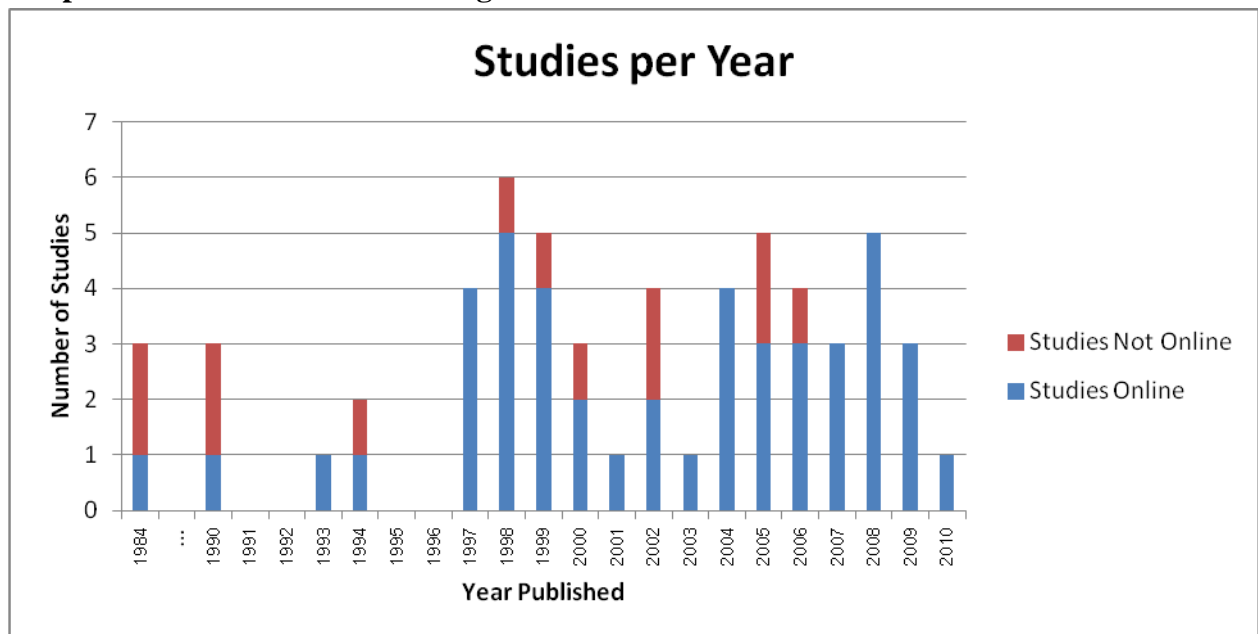
**Table 10. Geographic Scope of Mangrove Studies**

Geographic Scope	Number of Studies
Forest/Bay/Lagoon	10
Country/ Country's coastline	6
MPA/Reserve	6
Island	5
Literature review/ non-primary case study	5
Village(s)	3
City	1
Global	1
South Asia	1
Other	7

### ***Timeliness***

Mangrove studies within the MESP database ranged from 1984 to 2010. Not all studies are accessible online.

**Graph 3. Publication Year of Mangrove Studies**

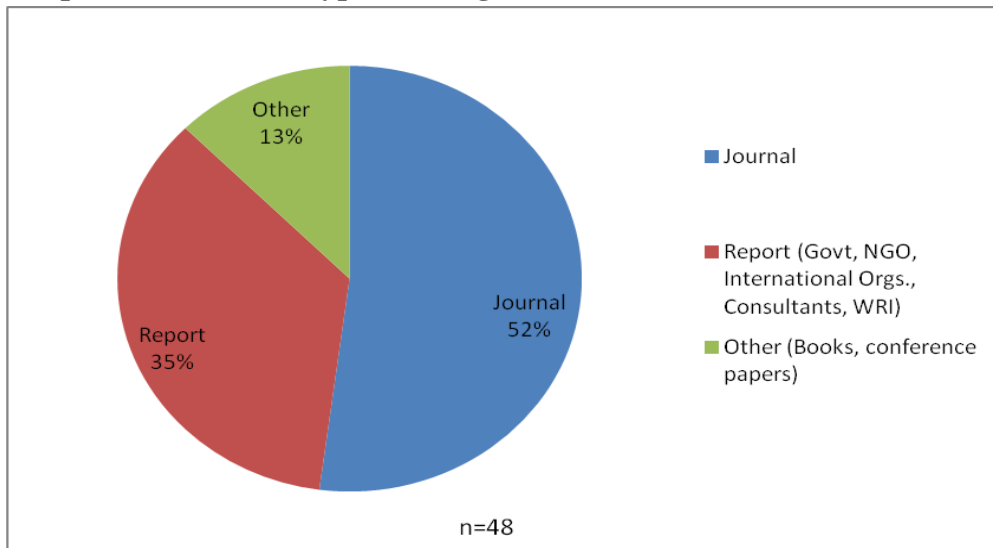


### ***Type of Publication/Authors/Journals***

Currently the studies of 117 mangrove authors are held in the database. The most published authors are Barbier, E. (4) and Sathirathai, S. (4) followed by Bann, C. (3) and Emerton, L. (3). No one journal

or author seems to be dominating. About 52% of the studies are from journals with the remainder coming from reports, books, and conference papers.

**Graph 4. Publication Type of Mangrove Studies**



# Seagrass Studies

Studies Labeled as “Seagrass”	Related Studies Labeled as “Multiple”	Studies Not Online	Studies Analyzed	Values in Database
17	4	0	21	42

## *Goods and Services Evaluated*

There are currently 16 different categories of goods and services represented for seagrass studies in the MESP database. This category is currently not published online however can still be useful to know. The goods and services are reorganized below. The most reported good/service type is fish and fisheries (7 values) followed by raw materials/food/medicine (6 values).

**Table 11. Seagrass Goods and Services**

Good/ Service	Number of Values
<b>Cultural and Amenity</b>	
Total	0
<b>Provisioning</b>	
Fish and Fisheries	7
Raw materials/ food/ medicine	6
Energy other	1
Provisioning values [unspecified]	1
Total	15
<b>Regulating</b>	
Nursery service	1
Waste treatment	1
Total	2
<b>Supporting</b>	
Habitat/biodiversity support	2
Nutrient cycling	2
Biological Control	1
Gross/net primary/ secondary production	1
Total	6
<b>Other</b>	
“multiple”	3
TEV	3
Enhanced ecosystem service (conservation/ restoration/ management)	1
Total	7

## ***Types of Values Derived***

Similar to coral reefs and mangroves the most reported value type in the database for seagrass is ESVD values. The second most reported type are “annual values”.

**Table 12. Types of Seagrass Values**

<b>Type of Value</b>	<b>Number of Values</b>
ESVD Value	14
"Annual value"/"Value of"	15
Consumer surplus	6
Other: (replacement cost)	1
Value of management	3
NPV	2
"Market value"	1
Total	42

## ***Methodology***

The most used methodology was some form of benefits transfer. This may mean more seagrass studies are available for the MESP to add to their database.

**Table 13. Seagrass Methodologies Used**

<b>Method</b>	<b>Study Count</b>
Benefits Transfer	8
Financial Analysis/Market Price	6
Report with Case Study or Citations	3
Literature Review (only)	2
Models: Economic/ Simulation	2
Travel Cost	2
Contingent Valuation	1

## ***Location and Geographic Scope***

Given the low number of seagrass studies overall the MESP would do well to find further seagrass studies for all countries and regions. The most common area in the database for seagrass studies was Australia (4) studies, Jamaica (3) and the Philippines (3).

The geographic scope for studies also seemed evenly split between local areas such as MPAs, longer stretches of coastline and island wide values.

**Table 14: Geographic Location of Seagrass Studies**

Country	Number of Studies
Australia	4
Jamaica	3
Philippines	3
Global	2
Indonesia	2
Spain	2
United States	2
Bahamas	1
Japan	1
United Kingdom	1

**Table 15: Geographic Scope of Seagrass Studies**

Geographic Scope	Number of Studies
Coastal zone 500km<x<1000km long	3
National Park/MMA/ MPA	3
Multiple Islands	3
Country	2
Island, single	2
Other (case studies in multiple places/multiple scales)	2
Global	2
US State Fishery	1
Harbour	1
Resort town	1
Enclosed sea	1

### ***Timeliness***

The first study the MESP database has is a 1989 study, then no more studies until 1993. One to two studies were published every year from 1993-2010 with a gap from 1995-1997 and 2003/2004.

### ***Type of Publication/Authors/Journals***

No author or journal dominated the seagrass studies. Some studies had multiple authors and so a total of 48 authors are represented in the database. Each author shows up once. The majority of studies came from journals with no one journal dominating. The most represented journals include *Marine Pollution Bulletin* (3 studies) and *Coastal Management* (2 studies).

**Table 16: Publication Type for Seagrass Studies**

<b>Publication</b>	<b># of Studies</b>
Journal	12
Final Report	3
School thesis/paper	2
Other (Book, Conference Paper, Working Paper, Educational Booklet/Material for Managers):	4