Compilation of an ecosystem services assessment toolkit: Deliverable 4

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Contents

Case studies

A selection of case studies from the Panorama Solutions database[1] were selected to illustrate concrete use of the ecosystem service valuation methods and approaches of the toolkit in the context of blue forest ecosystems. Where no suitable case study was found in this database, case studies from the Valuing Ecosystem Services in the Western Channel (VALMER) project[2] and the Marine Ecosystem Services (MES) Partnership database[3] were used.

Table 1: Selection of blue forest ecosystem services valuation case studies from the Panorama Solutions database and the VALMER database

Assessed ecosystem service	Ecosystem service valuation methodology	Country	Case study description	Link
Fisheries including aquaculture, Coastal protection, Recreation	Choice modelling, natural capital mapping	Belize	Ecosystem services were mapped and valued in a participatory process that included designing spatially-explicit scenarios of future human uses throughout Belize's coastal zone. To understand the implications of different development scenarios, InVEST models were used to map future value of coastal protection, recreation, and fisheries services. The resulting Plan can help the people of Belize plot an improved course for managing the valuable resources their ocean and coast provide.	http://www.panorama.solutions/en/solutions/mapping-and-valuing-ecosystem-services-for-integrated-management
Coastal protection, Fisheries including aquaculture, Recreation, Tourism	Place-based valuation	St. Maarten	An ecosystem valuation analysis of St Maarten's coral reefs quantified the value of these ecosystems. The results were used to support the establishment of St Maarten's first Marine Protected Area (MPA) and to implement further management actions connected to the MPA. Moreover, the results were incorporated in climate change response strategies. The communication of the valuation's outcome supports awareness rising among coastal communities and a growing understanding of the importance of coral reefs.	http://www.panorama.solutions/en/solution/coral-reef-valuation-mpa-management-and-implementation

[1] http://www.panorama.solutions/en/portal/
[2] http://www.valmer.eu/
[3] http://www.marineecosystemservices.org/

Assessed ecosystem service	Ecosystem service valuation methodology	Country	Case study description	Link
Coastal protection, Fuel (firewood, charcoal) and raw material (timber)	Replacement/ substitute cost	Philippines	The local population of Silonay actively addressed the degradation of coastal greenbelts and rehabilitate degraded mangrove areas. By diversifying incomes and providing capacity building for communities the sustainability of mangrove restoration and coastal protection was enhanced.	http://www.panorama.solutions/en/solutions/mangrove-rehabilitation-and-income-diversification
Coastal protection, Fuel (firewood, charcoal) and raw material (timber)	Payment for Ecosystem Services	Costa Rica	Mollusc farming was becoming unsustainable in Area de Conservación Tempisque – Sinac. To address this, an innovative finance mechanism, managed by the NGO FUNDECOES, has been established that works as a private sector based system of payments for ecosystem services. Local communities, such as the Jicaral and Lepanto benefit from being able to receive Conservation Credit Units (CCUs) from their existing private forests. Revenue from the CCU is split between managing existing forest (40%), establishing buffer zones (40%) and the forest owner (20%).	http://www.panorama.solutions/en/solutions/financial-mechanism-for-coastal-forest-restoration
Coastal protection, Fisheries including aquaculture	Cost Benefit Analysis	Belize	Ecosystem system services such as coastal protection, fishing and climate change mitigation were all incorporated into a cost-benefit analysis in the Placencia Peninsula, Belize. The outcome helped provide strong evidence to local communities to place more emphasis on conserving their natural ecosystems.	http://www.panorama.solutions/en/solutions/valuating-climate-adaptation-options-on-placencia-peninsula
Fisheries including aquaculture, Coastal protection, Recreation	Natural capital mapping, Choice modelling	United Kingdom	The focus of the study was the area's extensive seabed muds, sands and gravels, and the role they play in storing carbon, processing waste, and providing nursery grounds for commercial fish and shellfish. Working closely with stakeholders, plausible, relevant management options were constructed. These explored how delivery of ecosystem services may change with alternative management and use on a 15 year time horizon.	http://www.valmer.eu/case-studies-overview/north-devon/

Assessed ecosystem service	Ecosystem service valuation methodology	Country	Case study description	Link
Recreation, Tourism, Coastal protection, Fisheries including aquaculture	Damage coast avoided, Market value/market price	Belize	Using ecosystem valuations undertaken by WRI, the Belize Government was able to seek compensation when a cargo ship damaged a large section of the Belize Barrier Reef. The economic value was calculated for tourism, fisheries and shoreline protection.	http://www.panorama.solutions/en/solutions/coastal-capital-economic-valuation-of-belize-s-reefs-and-mangroves
Tourism, Water purification, Recreation	Choice modelling	Bonaire	The focus of the study was to value nature (mainly marine tourism and recreation and recreational fishing) through the perspective of various stakeholders such as local residents, visitors, tourist industry and residents of the islands of the Caribbean Netherlands' mainland. Insights in willingness of Dutch mainland citizen to pay for nature conservation was used to secure 7.5 million Euros for nature conservation.	http://www.panorama.solutions/en/solutions/nature-s-contribution-to-the-economy
Recreation, Tourism	Travel cost method, Q-methodology, Market value/market price	United Kingdom	This study focused on valuing a range of activities including kitesurfing, windsurfing, kayaking, waterskiing, jetskiing and birdwatching. This was done using questionnaires and the Travel Cost Method. As well as gaining monetary value information, a profile of the people undertaking these activities was also built, which improved understanding of the attributes of their experience in Poole Harbour that were most important.	http://www.valmer.eu/case-studies-overview/poole/
Cultural Heritage, Recreation, Water purification	Natural capital mapping, Choice modelling, Place-based valuation	United Kingdom	Through discussions with stakeholders it was agreed that a broadscale Ecosystem Service Assessment (ESA) would be undertaken, entailing valuation and mapping of all marine and coastal ecosystem services within the site, wherever possible. The project added considerable value through its Data Discovery exercise, processing, analysis and presentation/visualisation for a baseline assessment. Stakeholders also explicitly voiced a desire for cultural ecosystem services to be researched. This interest stemmed from the need to better understand the links between the marine environment and human well-being and the importance of tourism and recreation in the area.	http://www.valmer.eu/case-studies-overview/plymouth/

Assessed ecosystem service	Ecosystem service valuation methodology	Country	Case study description	Link
Fisheries including aquaculture, Coastal protection, Cultural heritage, Recreation, Tourism, Water purification	Natural Capital Mapping, Choice modelling, Place-based valuation	France	At the beginning of the project, the VALMER Golfe du Morbihan team chose to develop a multi-criteria assessment of seagrass beds based on social, economic and environmental criteria rather than a monetarised assessment. The VALMER team collected scientific and local knowledge to identify all the ecosystem services provided by seagrass beds in the Golfe du Morbihan (e.g. shelter for many species; food resource for birds feeding on their leaves (e.g. geese); improvement of sedimentation, etc.); and to better understand the natural and human factors that could affect the level of the ecosystem services provided by seagrass beds.	http://www.valmer.eu/case-studies-overview/morbihan/
Fuel (firewood, charcoal) and raw material (timber), Coastal protection, Fisheries including aquaculture	Contingent valuation	India	This study analysed factors that influence households' willingness to contribute toward mangrove restoration among three subsistence user groups in west coast of India: fishermen, fisherwomen and rice farmers. A contingent valuation technique was utilised to measure the economic value of perceived benefits of mangroves. Results indicated that although the different user groups were willing to make contributions of labour and/or money to mangrove restoration, their motivations for doing so varied considerably.	http://www.sciencedirect.com/science/article/pii/S0964569108000276
Fuel (firewood, charcoal) and raw material (timber), Coastal protection	Payment for Ecosystem Services	Kenya	Mikoko Pamoja is realizing mangrove conservation and community benefits as a community marine managed area (CMMA) through a carbon offset payment scheme. Mikoko Pamoja is validated by Plan Vivo Standards to sell carbon credits over a period of 20 years. Through Mikoko Pamoja, the community has realized increased income and improved mangrove management at Gazi Bay. Money generated is benefiting community projects in health, education and marine conservation.	http://www.panorama.solutions/en/solutions/community-based-mangrove-carbon-offset-project-in-kenya

Assessed ecosystem service	Ecosystem service valuation methodology	Country	Case study description	Link
Coastal protection, Tourism	Benefits transfer	Portugal	The central Portuguese coast is recognized as the region most vulnerable to coastal erosion in Portugal. The objective of this study was to assess likely ecosystem service value losses resulting from coastal erosion patterns, thereby using a benefits transfer approach in combination with coastal erosion projections. For a case study of the central Portuguese coast it was shown that the total value of coastal ecosystem services is about €193 million per year, while expected ecosystem service value losses from coastal erosion will amount to over €45 million per year by 2058 (i.e. 25% of the concerned coastal ecosystem service values).	http://esanalysis.colmex.mx/Sorted%20Papers/2009/2009%20PRT%20-CS%20PRT,%203F%20Econ.pdf
Water purification	Averting behaviour method	United States of America	The impact of poor water quality on avoidance behaviour was assessed by estimating the change in bottled water purchases in response to drinking water violations. Using data from a national grocery chain matched with water quality violations, an increase in bottled water sales of 22 percent from violations due to microorganisms and 17 percent from violations due to elements and chemicals was found. Costs of avoidance behaviour were estimated at roughly $60 million for all nationwide violations in 2005.	http://www.nber.org/papers/w16695.pdf
Tourism, Recreation	Travel cost method, Contingent Valuation	Turkey	This paper surveyed tourist users primarily on Olu Deniz beach, Turkey. The majority (70%) were British who used the beach for both recreation activities and to enjoy open space and scenery. Major dislikes were found to be litter (41%), water quality (31%), and dogs' faeces (24%). A positive willingness to pay (WTP) was expressed by 87% of British respondents. British tourists expressing a WTP were prepared to pay £1.03 per adult per visit. Nearly all (99%) the respondents thought that children should not pay any contribution. The consumer surplus for enjoying the beach was £1.11 per adult per visit.	http://www.jcronline.org/doi/abs/10.2112/06-0813.1?code=cerf-site

Data sources

This part of the analysis lists and provides web links to data sources for the selected priority blue forest ecosystem services. While global databases provide the best overview of ecosystem services' states and trends from a global perspective, local or regional databases may provide more accurate data which can inform local decision-making. Therefore, the following table lists both global and local data sources, as well as suggestions for the kind of data that might be more generally relevant for blue forest ecosystem service valuations. Please note that this is not an exhaustive review of data sources.

Table 2: Possible data sources for priority blue forest ecosystem services

Blue forest ecosystem service	Relevant data source name and link	Description
Fisheries including aquaculture	Sea Around Us, available at http://www.seaaroundus.org/	Contains information on fisheries' catch time series starting in 1950, and related series (e.g., landed value and catch by flag state, fishing sector and catch type), and fisheries-related information.
Fisheries including aquaculture	FishBase, available at http://www.fishbase.org/search.php	FishBase is a global biodiversity information system on finfishes. It contains information on over 33,000 fish species including their taxonomy, biology, trophic ecology, life history, and uses, as well as historical data reaching back to 250 years. FishBase is compiled from over 52,000 references.
Fisheries including aquaculture	The Food and Agriculture Organisation of the United Nations (FAO) Fisheries and Aquaculture Department Statistics http://www.fao.org/fishery/statistics/collections/en	The FAO Fisheries and Aquaculture Department compiles, analyses and disseminates fishery data, structured within data collections. The collections among others contain data on aquaculture production, tuna catches, fishery commodities fish and fishery product consumption, and regional captures.
Fisheries including aquaculture	The Organisation for Economic Co-operation and Development (OECD) Review of Fisheries: Country Statistics, available at:	The Organisation for Economic Co-operation and Development (OECD) produces annual statistical reports on fisheries and aquaculture in OECD countries and a few non-member countries. Information is provided on fishing fleet, employment in fisheries, government financial transfers, total allowable catches, landings, aquaculture production, recreational fisheries, and imports and exports.

Blue forest ecosystem service	Relevant data source name and link	Description
	http://www.oecd-ilibrary.org/agriculture-and-food/oecd-review-of-fisheries-country-statistics_rev_fish_stat	
Coastal protection, Fisheries including aquaculture	ReefBase, available at: http://www.reefbase.org/	ReefBase gathers available knowledge about coral reefs into one information repository. It is intended to facilitate analyses and monitoring of coral reef health and the quality of life of reef-dependent people, and to support informed decisions about coral reef use and management.
Coastal protection, Water purification	Global Distribution of Saltmarshes, available at: http://data.unep-wcmc.org/datasets/43	This dataset displays current knowledge regarding the distribution of saltmarshes globally, drawing from occurrence data (surveyed and/or remotely sensed). The dataset was developed to provide a baseline inventory of the extent of knowledge regarding the global distribution of saltmarshes, which are ecosystems located in the intertidal zone of sheltered marine and estuarine coastlines.
Coastal protection, Fisheries including aquaculture	Global Distribution of Seagrasses, available at: http://data.unep-wcmc.org/datasets/7	This dataset shows the global distribution of seagrasses, and is composed of two subsets of point and polygon occurrence data. The data were compiled by UNEP World Conservation Monitoring Centre in collaboration with many collaborators (e.g. Frederick Short of the University of New Hampshire), organisations (e.g. OSPAR), and projects (e.g. the European project Mediterranean Sensitive Habitats "Mediseh"), across the globe.
Fuel (firewood, charcoal) and raw material (timber)	Mangrove Reference Database and Herbarium, available at: http://www.vliz.be/vmdcdata/mangroves/	This source provides a relational database for all true mangrove plant species (ca.75 species) by providing a fact sheet for each mangrove plant species including basic information with photographs, herbarium specimen scans and distribution data. It also includes a searchable online map showing the distribution map for each species and an automated determination key to identify mangroves worldwide.
Fuel (firewood, charcoal) and raw material (timber), Coastal protection, Fisheries including aquaculture	Global Distribution of Modelled Mangrove Biomass, available at: http://data.unep-wcmc.org/datasets/39	This dataset shows the modelled global patterns of above-ground biomass of mangrove forests. The dataset was developed by the Department of Zoology, University of Cambridge, with support from The Nature Conservancy. The work is based on a review of 95 field studies on carbon storage and fluxes in mangroves world-wide. A climate-based model for potential mangrove above-ground biomass was developed to produce this dataset.

Blue forest ecosystem service	Relevant data source name and link	Description
Water purification	AQUASTAT, available at: http://www.fao.org/nr/water/aquastat/main/index.stm	AQUASTAT is the FAO's global water information system, developed by the Land and Water Division. It is the most quoted source on global water statistics. AQUASTAT offers data, metadata, reports, country profiles, river basin profiles, regional analyses, maps, tables, spatial data, guidelines, and other tools on: Water resources, water use, irrigation, dams and water-related institutions, policies and legislation.
Recreation, Cultural Heritage, Tourism	A Global Map of Coastal Recreation Values, available at: http://www.sciencedirect.com/science/article/pii/S0921800912004284	This is a global database of primary valuation studies that focus on recreational benefits of coastal ecosystems. The database takes into account characteristics of the built coastal environment (accessibility, anthropogenic pressure, human development level), natural coastal environment (presence of protected area, ecosystem type, marine biodiversity), geo-climatic factors (temperature, precipitation), and sociopolitical context.
Cultural Heritage, Tourism	UNESCO underwater cultural heritage site database list, available at: http://www.unesco.org/new/en/culture/themes/underwater-cultural-heritage/underwater-cultural-heritage/databases/	This page contains information on databases and maps of underwater cultural heritage sites elaborated by external institution, including shipwreck sites and archaeological preserves. Yet, their accuracy has not been controlled and is not guaranteed by UNESCO.
Tourism, Recreation, Fisheries including aquaculture	Ocean Health Index, available at: http://www.oceanhealthindex.org	The Ocean Health Index is a tool for the ongoing assessment of ocean health. The Ocean Health Index looks at status and trends for marine revenue in the six sectors for which there were global data. Those six marine sectors are 1) Aquarium Trade Fishing 2) Marine Commercial Fishing 3) Mariculture 4) Marine Mammal Watching 5) Tidal Energy and 6) Tourism.

Table 3: Global resources which provide access to information on many ecosystems or services

Resource	Description
The World Factbook, available at https://www.cia.gov/library/publications/the-world-factbook/	The World Factbook provides information on the history, people, government, economy, geography, communications, transportation, military, and transnational issues for 267 world entities.
The Organisation for Economic Co-operation and Development (OECD) Databases https://data.oecd.org/searchresults/?r=+f/type/datasets	The OECD databases Include data and metadata for OECD countries and selected non-member economies on a variety of economically relevant data and indicators, including agricultural production, employment statistics, Human Development Index and health.
Ocean Data Viewer, available at: http://wcmc.io/ODV	The Ocean Data Viewer includes spatial data on the distribution of corals, mangroves, seagrasses, and other important marine and coastal habitats.
Atlas of Ocean Wealth (The Nature Conservancy), available at: http://maps.oceanwealth.org/	The Atlas of Ocean Wealth is a collection of information about the economic, social and cultural values of coastal and marine habitats from all over the world. It is a synthesis of innovative science, led by The Nature Conservancy (TNC), with many partners around the world. The work includes more than 35 critically important maps that quantify the value of marine resources.
A global map of natural capital, available at: http://wcmc.io/towards_a_global_map_of_natural_capital	This report builds on a considerable body of work in the fields of natural capital accounting and the mapping of ecosystem services. It also contains a composite map of ecosystem assets, produced by combining a number of existing global spatial datasets to produce a map for both terrestrial and marine realms. The individual datasets represent fresh water resources, soil quality for plant growth, terrestrial carbon, terrestrial and marine biodiversity, and marine fish stocks.
The manual on marine and coastal datasets of biodiversity importance (2015 Edition), available at: http://wcmc.io/MarineDataManual	This document provides an overview of global marine and coastal datasets of biodiversity importance, and also includes some datasets of regional interest. This non-exhaustive review has resulted in the identification of 128 datasets, databases, and data portals. Detailed standardised metadata are presented for 69 of these reviewed datasets. A set of four annexes provides a wealth of information, including background factsheets on topic areas (Annex 1), a preliminary inventory of 128 global and regional datasets (Annex 2) and dataset-specific metadata on 69 of these (Annex 3).

Data scarcity

Data scarcity is an important challenge for ecosystem service assessments and valuations. This is particularly true for the marine environment, which is often less accessible than terrestrial ecosystems. For example, uncertainties can exist regarding the geographical extent and status of marine and coastal habitats, their ecological functions and dynamics, their economic value and the beneficiaries of their ecosystem services. Additionally, data can be inaccurate or incomplete. Nevertheless, data scarcity can be overcome through various approaches. Where data are scarce, methodologies that allow the use of proxies to estimate a given ecosystem service, such as the benefits transfer method, can be used. Creation of new data through undertaking research in the area of interest can also supply information. Furthermore, data scarcity can be overcome by using a combination of different valuation methodologies and data sources that complement each-other. Expert workshops can also be organised to gather information about a given blue forest ecosystem.

Nevertheless, even if an ecosystem valuation project does not produce accurate results, the process of engaging with local communities itself can be more important for raising awareness of blue forests and their services than the final valuation results. Even so, it is crucial that data uncertainties are communicated to stakeholders in a clear way. For example, the VALMER project concluded that simple qualitative information was enough to start discussions with stakeholders about ecosystem service trade-offs. Where data are hard to collect, one option can be to use ecosystem service valuation methods that allow the use of existing data, such as the market value method or the replacement cost method. Involving citizens in data collection (a process known as 'citizen science') can also prove very useful where resources for data collection are lacking.

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