GULBENKIAN

oceans

INITIATIVE

valuing oceans for tomorrow

CALOUSTE
GULBENKIAN
FOUNDATION

The Calouste Gulbenkian Foundation

The Calouste Gulbenkian Foundation is a Portuguese private institution of public utility, created in 1956 in accordance with the last will and testament of Calouste Sarkis Gulbenkian. Its statutory aims are in the fields of the Arts, Charity, Education and Science.

The Foundation actively pursues its statutory aims in Portugal and abroad through a wide range of direct activities and grants supporting projects and programmes.

The Calouste Gulbenkian Foundation has its headquarters in Lisbon. The large premises comprise the head-office itself, the Calouste Gulbenkian Museum, the Modern Art Centre, and the Art Library. The premises, which are set in the Gulbenkian Park, also include a large auditorium, a space for temporary exhibitions, and a congress area with auditoriums and other rooms. The Instituto Gulbenkian de Ciência, a leading international biomedical research centre located inside a multi-building complex in Oeiras, was created and is supported by the Foundation.

The Calouste Gulbenkian Foundation also has delegations in the United Kingdom (UK Branch) and in Paris (France Branch).

GULBENKIAN

oceans

INITIATIVE

valuing oceans for tomorrow

CALOUSTE
GULBENKIAN
FOUNDATION

Executive Summary

The oceans cover approximately three quarters of our planet and approximately 80% of our fauna and flora live on the oceans. They play a crucial role in supporting society's well being and in sustainable economic growth due to the fundamental benefits they provide.

Oceans provide a wide range of benefits – or ecosystem services – to our societies, including: food, raw materials, water, medicinal resources and renewable energy (provision services); climate and water cycle regulation and moderation of extreme events (regulating services); nutrient cycling, maintenance of genetic diversity and habitat for the different species (supporting services); recreation, tourism, spiritual and visual experiences (cultural services).

However, the importance of all these services is frequently neglected in decision-making because we ignore their total economic value. Usually, decision-makers only have an understanding of the private net benefits of an economic activity or project. They often ignore its actual external costs – the reduction and/or degradation in ecosystem services caused by that same activity or project – and the external benefits originated by natural capital. For this reason, decision-makers can be confronted with the negative environmental impacts of an oil spill generating a positive, rather than negative, impact on a country's

GDP, as cleaning-up pollution generates jobs while the economic value of reduced or lost ecosystem services remains unaccounted for.

In other words, we generally ignore the tremendous economic losses from the deterioration of our oceans that is already happening. Even where this knowledge is available, it is usually in a piecemeal fashion, in a format or at a level that is not adequate for consideration by decision-makers.

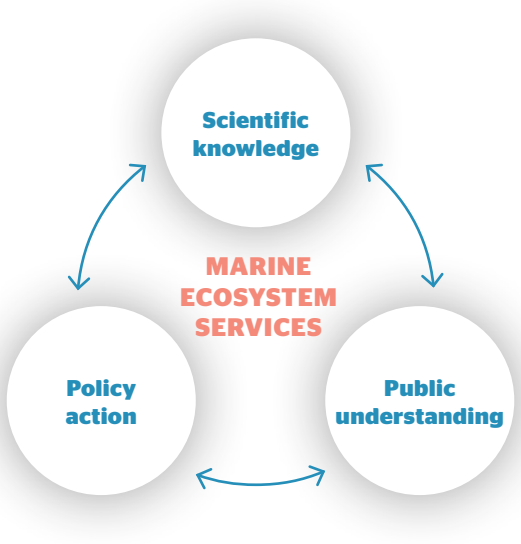
There is a need to know more about the economic value of marine ecosystem services, and to integrate, where possible, this value into decision-making processes of governmental institutions, private companies, non-governmental organizations and individual citizens, at the local, national and European level. This critical gap in our collective knowledge needs to be addressed urgently so that our oceans can be protected and adequately managed for the long-term benefit of us all.

The Gulbenkian Oceans Initiative is working towards protection, conservation and good management of the oceans and of marine ecosystems. It supports scientific research on the economic valuation of marine ecosystem services. It is raising awareness to increase public understanding of the value of oceans for human well-being and economic development. And it promotes policy action by mobilizing policy-makers and decision-makers at the local, national and EU levels to integrate the economic value of marine ecosystem services into their regular activities and decision-making processes.

1. The Gulbenkian Oceans Initiative

The Gulbenkian Oceans Initiative (GOI) is a five-year program of the Calouste Gulbenkian Foundation that will work towards protection, conservation and good management of the oceans and of marine ecosystems.

The Gulbenkian Oceans Initiative will promote activities in three domains – research, public understanding, and policy action – with the overall goal of increasing public and political understanding of marine ecosystem services as strategic assets for sustainable economic development and for human well-being.



Gulbenkian Oceans Initiative

SUPPORT SCIENTIFIC RESEARCH

The GOI will sponsor an interdisciplinary study combining different areas of knowledge with the purpose of determining the economic value of marine ecosystem services in Portugal. This research will produce policy-relevant scientific findings, and will be carried out by leading research institutions that integrate natural sciences (e.g., marine biology, environmental sciences) and social sciences (e.g., economics, political science). Their interdisciplinary approach will involve having postdoctoral researchers with different backgrounds (social sciences vs. natural sciences) working in pairs, thus meaningfully bridging the divide between social and natural sciences.

Research efforts will include, but will not be limited to, a study focused on a pilot area in Portugal with the purpose of producing a textbook example of economic valuation of marine ecosystem services, and of how these contribute to improve decision-making processes and raise marine environmental awareness.

Expected research results include the following:

1. The monetary value (as well as other values) of the services produced by marine ecosystems within the pilot area;
2. The monetary value (as well as other values) of a single marine ecosystem service at the national level;
3. The economic benefits that a single economic activity enjoys from marine ecosystems.

These lines of research will contribute to improve current valuation methodologies, but will also look into intangible benefits produced by marine ecosystems. Clear mutual links between marine ecosystems and well-being will also be investigated, including the impacts that economic activities have on the provision of marine ecosystem services.

INCREASE PUBLIC UNDERSTANDING

Improving scientific knowledge of marine ecosystem services will not be sufficient to achieve a real change in how the public perceives them. As citizens, we only demand protection and better management of what we know to be valuable for our well-being.

The Gulbenkian Oceans Initiative will promote a varied range of activities targeting diverse audiences – children and youth, researchers, local communities, policy-makers, decision-makers, environmental NGOs, accountants of major maritime companies – with the overall aim of increasing their understanding of the importance of marine ecosystem services for well-being and economic development.

For some specific audiences, capacity-building activities will have the additional purpose of showing how such knowledge can be integrated into regular institutional practices.

PROMOTE POLICY ACTION

Increased scientific knowledge and public perception about the importance of marine ecosystem services do not necessarily lead to meaningful change in practices by public and private organizations.

To overcome this, the Gulbenkian Oceans Initiative will promote within various institutions and organizations the integration of the economic value of marine ecosystem services into their regular activities and decision-making processes, as well as the adoption of monetary valuation methods to support them. It will advance the knowledge and interest of Portuguese institutions in natural capital accounting, and the adaptation of marine governance systems to such input.

In order to contribute to meaningful and lasting change, the GOI will partner with other initiatives so as not to duplicate efforts and to fill existing gaps.

This initiative will also promote the marine ecosystem service approach in public consultations at the local, national and EU levels where it finds it can contribute decisively to improve the knowledge base upon which decisions are made. This includes the definition of research priorities, marine spatial planning, environmental impact assessment, and the revision of coastal management plans and of marine protected area management plans.

2. Background to the GOI

For at least 40 years, since the early seventies, we have been aware of the importance of biodiversity as a natural capital and part of the life support system of the planet. Still, action to halt biodiversity loss has not been successful at any level of decision-making, i.e. at the global, international level, despite the Rio and Johannesburg summits; at the regional level, for instance within the EU; or at the national, or state level. Hence, the EU has failed to make good its commitment to stop biodiversity loss in Europe by 2012 and has now postponed this goal to 2020.

In spite of such failure to act effectively, we are today more aware than ever of the severe problems threatening biodiversity, as well as of our great contribution – with pollution, deforestation, etc. – to increase the degree of those threats. Also, our understanding of how ecosystems are critical to the planet's functioning and of how directly important they are to our own well-being, has been increasing in parallel with the fast deterioration of those natural ecosystems. Thus, healthy ecosystems are not only needed to preserve the planet's fauna and flora, but they are indeed the base-resource of many of our human activities and economic processes of wealth's production.

A deeper understanding of ecosystem services reveals that they generate economic value, and indicates that ecosystems and biodiversity should be perceived as key strategic assets for sustainable development and economic growth.

3. The importance of marine ecosystems for human well-being

With more than 70% of the Earth's surface covered by oceans, it is not surprising that these gigantic ecosystems determine such a significant part of our planet's climate and ecology. The oceans are critical to the functioning of the Earth's life support system: they are a reservoir of fresh water, which is evaporated by solar energy from the sea and deposited as rain on land, in this way contributing to the regulation of the planet's hydrologic cycle; and they are home to millions of species that we enjoy watching because of their beauty, that we enjoy eating because of their excellent taste and essential nutrients, and from where we extract active compounds to cure some of our illnesses.

Well-being is defined as the material needs for a good life, health, good social relations, security and freedom of choice and action.

TEEB (2010)

Marine ecosystem services are the benefits that people obtain from marine ecosystems.

TEEB (2010)

But there are many more ways in which the oceans and their ecosystems contribute to our well-being as a society. Marine ecosystems, and their associated biodiversity, provide us with a wide range of services that, despite being critical for our individual and collective well-being, are generally not recognized as such in policy-making and decision-making. In practical terms, this means that when a government needs to

decide between, for example, protecting one area of the ocean or drilling for oil and natural gas, it usually considers protection as a cost and oil production as a benefit, thus neglecting the fact that that same area provides tremendous benefits to us all and sometimes even overlooking the environmental costs of oil production.

One of the reasons for this is that often we all – citizens and institutions – fail to realize how we benefit from ocean services in our daily lives, even when we live close to the sea.

The multiple benefits provided by coastal and marine ecosystem services.

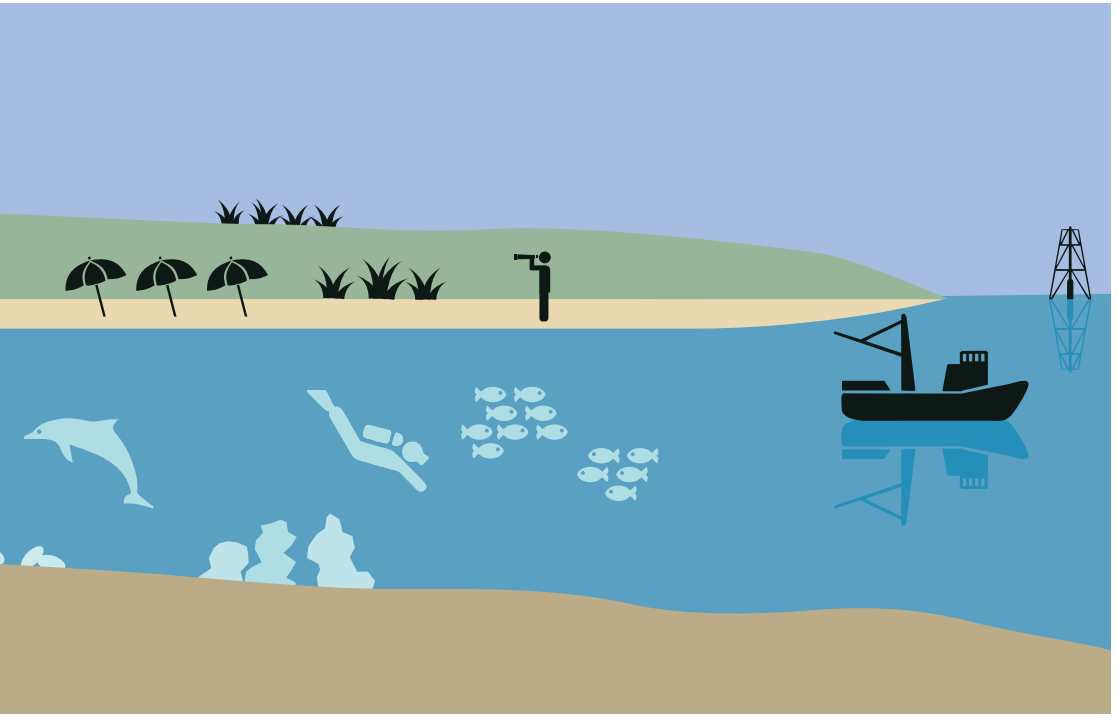
PROVISION SERVICES

The oceans provide us with a variety of goods that we find in our daily lives. Most of the fish that we eat comes from the oceans, and we need increasingly more fish to feed a growing world population. In 2011, 154 million tons of fish were removed from the world's oceans – 4% more than in 2010 – and about 85% of those were destined for food.[1]

The oceans are also the means through which much of the EU's production is exported, and

Provision services are ecosystem services that describe the material outputs from ecosystems. They include food, raw materials, water and medicinal resources.

TEEB (2010)



through which consumer goods reach us from other parts of the world: close to 90% of the EU's freight exchanges (in volume) with the rest of the world are seaborne, and more than 90% of global trade is also carried by sea.[2] The oceans and seas are therefore a natural infrastructure for transportation of people and goods. Nevertheless, and contrary to road or rail infrastructures which have a market price and cost, seaborne transportation does not reflect in its cost the economic value of this natural infrastructure: the sea space.

The oceans also give us other material goods that are essential to global, EU and national economies and well-being. Oil and natural gas are increasingly extracted from the sea floor, as reserves on land

become less profitable to explore; emerging technology for renewable energies may take only a few more years to generate electricity from waves, tides, and offshore winds at a commercial scale, thus contributing to the EU's goal of having 20% of electricity consumption from renewable energy sources by 2020[3]; and pharmaceutical companies are already extracting a growing number of bioactive compounds for medicines and cosmetics from sea life.

Some of these provision services, such as wind energy, are abundant in the EU and increasingly contribute to its GDP. In 2010, wind energy's contribution to the EU's GDP was twice as high as the growth in the EU's GDP itself.[4] Offshore wind energy in particular is expected to constitute 26% of the installed wind energy capacity in the EU by 2020.[4]

REGULATING SERVICES

The oceans give us much more than material goods. They play a key role in regulating ecological, physical and chemical processes upon which life and human well-being depend.

The oceans are a natural sink for land-based nutrients and waste. They are able to process the dangerous pollutants we produce on land, but do not process all pollutants and do not process them entirely. In other words, we can no longer believe that "the solution for pollution is dilution". The amount of pollutants reaching the oceans is in many places already above its capacity to process them. Many coastal areas are now considered to be "dead zones" due to an overload

Regulating services are the services that ecosystems provide by acting as regulators, e.g. by regulating the quality of air and soil or by providing flood and disease control.

TEEB (2010)

of nutrients that promote phytoplankton blooms, quickly exhausting oxygen in the water and leaving other marine creatures to die.[5]

The oceans also regulate global climate by storing heat and absorbing CO_2. It is the water's ability to store heat that enables a milder climate on the Atlantic coast of Europe than on the Atlantic coast of North America. Part of the warm Gulf Stream that originates in the Gulf of Mexico runs southward along the European coast, but does not come close enough to the Atlantic coast of North America.

The capacity of oceans to absorb CO_2 makes them the largest carbon sink on our planet. CO_2 can be dissolved in sea water, or it can be incorporated by phytoplankton through photosynthesis. Either way, oceans definitely contribute to eliminating this greenhouse gas from the atmosphere.

Oceans play therefore a critical role in atmospheric gas and climate regulation and are essential for water, nutrient and waste recycling.

Other regulating marine and coastal ecosystem services we enjoy include: shoreline stabilization by coastal dunes, allowing regular human activities to take place; protection from storm surges by dunes and salt marshes, preventing damage to people and estate; and the processing of pollutants (e.g. through accumulation in the roots of marine plants), reducing human contact with these compounds.

CULTURAL SERVICES

Oceans are a venue for recreation, hosting a variety of tourism, leisure and sport activities. These are dependent not only on the physical space of the ocean (e.g. boating, surfing, diving and swimming), but also on the marine life and biodiversity it hosts (e.g. whale-watching and other wild life observation, and angling).

Such activities often provide the foundation for local, sustainable economies. For example, in the south of Portugal, as much as 18% of the workforce is employed in restaurants and hotels[6] that service millions of tourists visiting the beaches of Algarve yearly. In the Azores, whale-watching has become a thriving industry, strongly dependent on the more than twenty species of marine mammals that cross its waters on a regular basis.

Cultural services include the non-material benefits people obtain from contact with ecosystems. Those include aesthetic, spiritual and psychological benefits.

TEEB (2010)

Coastal tourism employs more than 2 million people in the EU, making it the EU's largest maritime economic activity. The coastal cruise segment is expected to grow strongly, even though more traditional segments have stabilized.[7] In Portugal, the excellent natural conditions of its coastline have turned it in the last few years into an attractive destination for surfers and windsurfers from all over Europe and beyond.

Unfortunately, the value of the oceans as a venue for these activities is still an extra-market value that needs to be more thoroughly researched and appraised.

SUPPORTING SERVICES

Besides those already mentioned, the oceans provide a variety of services that are less obvious because they are not directly used by people. Nevertheless, these supporting services are essential for the production of all the other ecosystem services.

Supporting services underpin almost all other services, as ecosystems provide living spaces for plants or animals and also maintain a diversity of different breeds of plants and animals.

TEEB (2010)

One such service is photosynthesis, the biochemical process through which marine phytoplankton produces half of the oxygen we breathe, while removing CO_2 from the atmosphere (the other half comes from terrestrial plants, such as trees and grasses).[8]

The oceans also play an irreplaceable role in nutrient cycling and water cycling. They store more than 95% of the planet's water, and are the source of 90% of the evaporated water that enters the water cycle. Oceans are also essential for the cycles of nutrients such as carbon, phosphorus and nitrogen.

This varied and extremely complex web of marine ecosystems services reminds us all that they cannot be fully substituted,[9] and need to be properly protected and managed.

4. The economic value of marine ecosystem services

The role of all marine ecosystem services – provisioning, regulating, cultural and supporting – in economic development and human well-being is not completely understood. In part, this is because we do not fully appreciate their contribution to our economies.

If we were able to understand, even if not completely, the total economic value of marine ecosystem services, it would be much easier to make a case for marine conservation. In Australia, €23.4 million[10] were spent in 2006-7 on managing the Great Barrier Reef Marine Park, but its marine ecosystems had a direct and indirect contribution to the economy estimated at €3558 million for that same period.[11]

Knowing the economic value of marine ecosystem services would also allow us to compare alternative scenarios in environmental impact assessment using

Total economic value of an ecosystem is a framework for considering various constituents of value, including direct use value (e.g., from raw materials), indirect use value, option value, quasi-option value, and existence value.

TEEB (2010)

the same unit of measure: monetary value. We could then assess if the economic cost of destroying, for example, a mangrove area outweighs the economic benefit of aquaculture production in the same area.

Currently, most of these comparisons lack a solid scientific base. This makes the job of decision-makers less robust and more error-prone. Environmental NGOs lobbying for environmental conservation also face difficulties in their work as often they are unable to make their case based on concrete economic evidence.

In a time of financial crisis such as the one we are living in, job creation is a fundamental variable to measure the impact of all economic activities. If we were able to determine the economic value of marine ecosystem services, job creation associated with these services would give us an additional unit of measure for comparing both public and private costs and benefits of certain economic activities.

Direct use value is the benefits derived from the services provided by an ecosystem that are used directly by an economic agent. These include consumptive uses (e.g. harvesting goods) and non-consumptive uses (e.g. enjoyment of scenic beauty).

TEEB (2010)

If such information – economic value and job creation potential of marine ecosystem services – were to be integrated into decision-making processes, policy-makers and decision-makers would have a better knowledge of the environmental and economical implications of their decisions. But as we stand now, there are very few studies on the economic value of a limited number of geographically scattered ecosystems.

Moreover, this information is presented in a scientific format that is not helpful for policy-makers and decision-makers.

Indirect use value is the benefits derived from the goods and services provided by an ecosystem that are used indirectly by an economic agent. For example, the purification of drinking water filtered by soils.

TEEB (2010)

In summary, we need to understand better the economic value of marine ecosystem services because what is not monetary valued is often not accounted for. In fact, because we currently do not know the market value of marine ecosystem services, their commercial value is considered to be zero. This is a huge information gap in decision-making processes that undermines the case for marine conservation as an economically viable alternative. It is also a gap that the Gulbenkian Oceans Initiative wants to help reduce in collaboration with other initiatives.

5. Other initiatives

Though our collective knowledge on the economic value of marine ecosystem services is currently limited, there are efforts underway to overcome this.

THE ECONOMICS OF ECOSYSTEMS AND BIODIVERSITY (TEEB)

The growing importance of the issue of economics and ecosystems and biodiversity was underlined by TEEB, the UNEP-sponsored initiative presented in 2010, the International Year of Biodiversity. TEEB developed an approach that can help decision-makers recognize, demonstrate and, where appropriate, capture the values of ecosystems and biodiversity. Despite being regarded as a landmark, TEEB was mostly focused on terrestrial ecosystem services rather than on marine ones. More recently, TEEB established a working group to address the economics of coastal and marine ecosystems and biodiversity (http://www.teeboceans.org) and a multi-stakeholder platform to support the development of methods for natural and social capital valuation in business (http://www.teebforbusiness.org).

NATURAL CAPITAL PROJECT (NCP)

This project is developing tools for quantifying the values of natural capital in clear, credible, and practical ways. In particular, it developed INVEST, a family of software-based tools for Integrated Valuation of Environmental Services and Tradeoffs.

InVEST enables decision-makers to quantify the importance of natural capital, to visualize the benefits delivered today and in the future, to assess the tradeoffs associated with alternative choices, and to integrate conservation and human development. InVEST already includes a few models for the marine environment, focused for example on sedimentation, coastal protection, marine water quality and wave energy (http://www.naturalcapitalproject.org/).
The Natural Capital Project is a partnership between Stanford University, The Nature Conservancy, the World Wildlife Fund, and the University of Minnesota.

WEALTH ACCOUNTING AND THE VALUATION OF ECOSYSTEM SERVICES (WAVES)

WAVES is a global partnership working to ensure that the national accounts used to measure and plan for national economic growth include the value of natural resources. For this, it strives to implement environmental accounting where there are internationally agreed standards, and develops standard approaches for other ecosystem service accounts (http://www.wavespartnership.org/). Some of the countries implementing natural capital accounting, such as Australia and the Philippines, are particularly concerned with their marine ecosystems. The WAVES partnership is promoted by the World Bank and consists of a broad coalition of UN agencies, governments, international institutes, non-governmental organisations and academics.

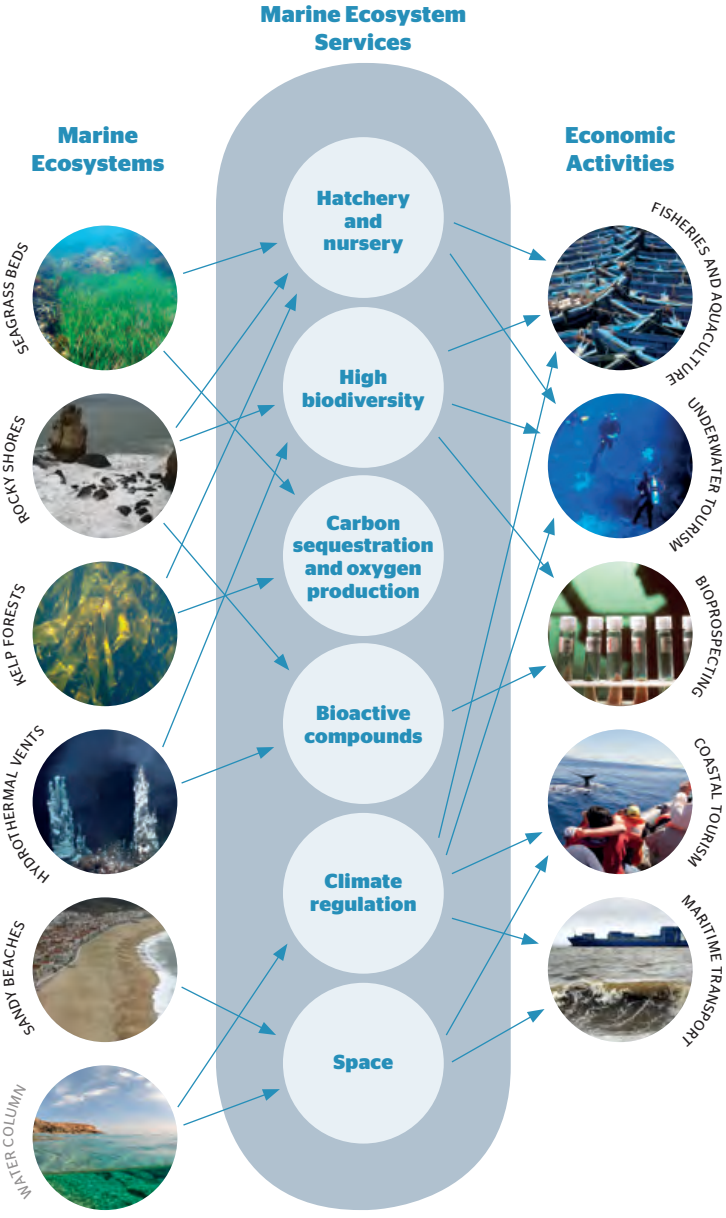
GOI will seek to create strong links with TEEB, NCP and WAVES, and develop synergies with these and other projects that can be mutually beneficial.

6. The contribution of the GOI

The work being done by TEEB, NPC and WAVES is highly valuable, and will definitely have a significant impact on our understanding of the economic value of ecosystems and natural capital, and in ensuring the comprehensiveness of national accounts.

However, we are still lacking a specific focus on marine ecosystems and the services they generate, as most initiatives have focused essentially on terrestrial ecosystems. There are three key reasons why ecosystem services valuation is mostly focused in terrestrial systems. Firstly, there is a lack of understanding of marine ecosystem functions and the wider role they may play, chiefly because what happens in the sea is naturally less visible to us than what happens on land. Secondly, there is lack of data concerning marine ecosystems and their value, especially in offshore and deep water environments. And thirdly, such studies and the necessary data collection are much more expensive to do in the ocean than on land.

Assessing the economic value of ecosystem services in the oceans is also more complicated than on land. Oceans are open access, making it difficult to limit access and use of its resources, and to identify the people and activities that benefit from marine ecosystem services. Consequently, measuring the contribution of ecosystem services at sea to different economic activities is trickier than on land. Also,



Note: the water column is not really an ecosystem, but it is here considered so for illustrative purposes.

From marine ecosystems, to marine ecosystem services and economic activities

as oceans are interconnected, it is more difficult to measure the services provided by a single marine ecosystem than to measure the services provided by a terrestrial ecosystem, as different marine ecosystems contribute to the same service.

To overcome this, we need more data on marine ecosystem services and their economic value. We also need to increase public and political awareness of the role of marine ecosystem services in economic development and human well-being. And we need to integrate this knowledge into decision-making processes.

This can all be done in a more meaningful way if we combine the efforts of existing projects and produce a single example that has the consistency and robustness to showcase internationally how the economic valuation of marine ecosystem services can change how they are taken into account in decision-making processes.

To achieve this we need excellent, interdisciplinary scientific research that truly combines the fields of marine biology and economics and that increases our understanding of marine biodiversity, marine ecosystem functioning, marine ecosystem services and their economic contribution to human well-being and economic prosperity.

The Gulbenkian Oceans Initiative is contributing to fill this gap by supporting scientific research on the economic valuation of marine ecosystem services. Such a study does not need to cover entire countries or even very large areas.[12] It will begin instead by focusing on a

restricted geographical area and on a country-wide marine ecosystem or marine ecosystem service. In this way, collecting data can be more manageable, research efforts may be geographically concentrated and results thus generated may contribute to making it a critical case-study with national impact and international projection that is able to shape political action by showing how marine ecosystems contribute to economic activities.

This approach will help the Gulbenkian Oceans Initiative raise awareness among the general public, policy-makers, decision-makers and other stakeholders about the importance of marine ecosystem services to our general well-being.

Particularly, it is expected to show how the integration of the economic value of marine ecosystem services into decision-making improves the effectiveness of our environmental and economic policies related to the ocean space. This will be accompanied by introducing changes in national satellite accounts so that these integrate monetary and non-monetary information of marine ecosystem services.

To sum up, the Gulbenkian Oceans Initiative will produce knowledge on the economic value of marine ecosystem services that will feed appropriately into awareness-raising activities and into decision-making processes at all levels, hopefully promoting profound and long-lasting changes in how the contribution of marine ecosystem services to human well-being is acknowledged.

NOTES

1 FAO (2012). *The State Of World Fisheries and Aquaculture 2012*. Rome. 209 pp.

2 UNCTAD (2013). *Review of Maritime Transport 2012*. UNCTAD/ RMT/2012.

3 Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

4 EWEA (2012). *Green Growth: The Impact of Wind Energy on Jobs and the Economy*. European Wind Energy Association.

5 R. J. Diaz & R. Rosenberg (2008). Spreading Dead Zones and Consequences for Marine Ecosystems. *Science* 321(5891): 926-929.

6 European Parliament (2008). *The Impact of Tourism on Coastal Areas: Regional Development Aspects*. Directorate General for Internal Policies of the Union, Policy Department B: Structural and Cohesion Policies.

7 European Commission & DG MARE (2012). *Blue Growth - Scenarios and drivers for Sustainable Growth from the Oceans, Seas and Coasts*. Final Report.

8 M. Bollmann and others (2010). *World Ocean Review 2010 – Living With the Oceans*. Maribus, Hamburg.

9 P. Dasgupta (2012). "Natural capital as economic assets: a review". In *Inclusive Wealth Report 2012: Measuring progress toward sustainability*. UNU-IHDP and UNEP. Cambridge: Cambridge University Press.

10 GBRMPA (2007). *Annual Report 2006-2007*. Great Barrier Reef Marine Park Authority.

11 GBRMPA (2007). *Economic Contribution of the Great Barrier Reef Marine Park, 2006-07*. Research Publication No. 98. Great Barrier Reef Marine Park Authority.

12 See for example: K. Noone, R. Sumaila, R. J. Díaz, editors (*In press*). *Valuing the Ocean*, Stockholm Environment Institute. R. Naidoo, A. Balmford, R. Costanza, B. Fisher, R. E. Green, B. Lehner, T. R. Malcolm, T. H. Ricketts (2008). Global mapping of ecosystem services and conservation priorities, *Proceedings of the National Academy of Sciences* 105(28): 9495-9500. R. Costanza (1999). The ecological, economic, and social importance of the oceans, *Ecological Economics* 31(2): 199–213.

Gulbenkian Oceans Initiative

Francisca Moura
Catarina Grilo
Filipa Saldanha
Gonçalo Calado

Contacts

Fundação Calouste Gulbenkian
Av. de Berna, 45A - 1067-001 Lisboa
Telephone: (+351) 217 823 000
http://oceanos.gulbenkian.pt
oceanos@gulbenkian.pt

Production

Text: Catarina Grilo
Graphic design: TVM Designers

September 2013

Credits

Page	Credit
2	*Underwater photo of Anacapa arch, kelp and birds, Channel Islands National Park, California, United States of America, North America*. Antonio Busiello © Getty Images Portugal.
4	*Three female surfers sitting on beach, rear view*. Betsie Van Der Meer © Getty Images Portugal.
12	*Southwest coast of Alentejo*. © Helder Gonçalves.
14-15	TVM Designers, Catarina Grilo.
16	*Wind turbines in sea*. Michael Dunning © Getty Images Portugal.
24	*France, Gironde, Bassin d'Arcachon, Cap Ferret, oyster farm and dune of Pilat*. Christophe Boisvieux / hemis.fr © Getty Images Portugal
28	**Seagrass beds** – untitled – © Centro de Ciências do Mar da Universidade do Algarve **Rocky shores** – *Peniche* – © Catarina Grilo **Kelp forests** – *Kelp forest, Adrtoe* – © David Baird / CC BY-SA 2.0 **Hydrothermal vents** – *East Scotia Ridge* – © Rogers AD, Tyler PA, Connelly DP, Copley JT, James R, *et al.* (2012) PLoS Biol 10 (1). DOI:10.1371/journal.pbio.1001234 **Sandy beaches** – *Nazaré* – © Catarina Grilo **Water column** – *Mediterranean sea* – © http://www.enpi-info.eu **Fisheries and aquaculture** – *Moroccan fishing boats* – © Helder Gonçalves **Underwater tourism** – *Scuba diving* – © Civertan Grafikai Stúdió **Bioprospecting** – *Test tubes* – © Bill Branson **Coastal tourism** – *Faial - whales watching* – © Luca Nebuloni **Maritime transport** – *Shipping* – © Ben Salter.