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**Marine Ecosystem Service Valuation
– A proposal for action**

A report for Calouste Gulbenkian Foundation

By

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1. Introduction

Natural ecosystems play an essential role in the regulation and maintenance of life support systems on Earth. The global reserves of natural capital and their development as ecosystem goods and services provide the platform for continuing economic trade, development and the maintenance of human wellbeing. Marine biodiversity, in particular, is a fundamental bio-network that delivers ecosystem services, such as the provision of food and climate regulation, which underpin life on Earth. Widespread and intensive human activity in the world's oceans and the subsequent loss of key marine species will impair the long-term ability of these ecosystems to provide the essential services that contribute to human well-being. These services from the marine environment include provisioning (e.g. providing food, raw materials), regulatory (e.g. gas and climate regulation), supporting (e.g. nutrient cycling) and cultural (e.g. leisure, spiritual) roles.

Currently these marine goods and services are not all valued equally. While it is relatively straightforward to value goods such as fish by reflecting our 'willingness to pay' the market price, it is far more difficult to place a value on non-instrumental services such as climate regulation or natural environmental beauty. However if the environment is not monetized it is automatically excluded from economic calculations and in many cases the impact it can have on human well-being is ignored. A range of methods have been developed to value ecosystem goods and services including market pricing, hedonic pricing, travel cost and contingent value or preference methods but their application, especially in the marine environment, is problematic. A World Bank study undertaken in 2008 estimated that the total annual figure of all Marine Ecosystem Services for which a market already existed amounted to over \$20 trillion. The World Bank stated that 'non market values such as biodiversity and climate regulation were incalculable. And the spiritual worth of an intact seascape and the wonder of a coral reef are impossible to quantify' (World Bank, 2008).

The Calouste Gulbenkian Foundation (CGF) has recognised that there is scope to develop and implement greatly improved valuation of marine ecosystems and the services they provide within decision-making processes. The Centre for Marine and Coastal Policy Research, of the Marine Institute in Plymouth University, was charged with exploring opportunities whereby the Foundation could support the incorporation of valuation of marine biodiversity and ecosystem services into an ecosystem approach to decision making. This was undertaken through a comprehensive literature review, a series of expert interviews and two expert workshops. This report outlines the findings from this study and proposes actions which could be undertaken by the CGF in order to improve management of the marine environment and hence human well-being.

2. Threats to Marine Ecosystems

There is consensus amongst scientists that at a global scale, human induced changes in marine ecosystems are the main cause of biodiversity loss. As part of this study, 18 experts in the fields of marine biodiversity, economic valuation and marine environmental protection were asked what they considered to be the key threats to marine ecosystems and the top 3 responses were;

- Poorly managed fisheries
- Coastal systems undergoing development and land use change
- Climate change.

Other tangible threats mentioned included pollution, ocean acidification, invasive species and overpopulation. Perhaps unexpectedly, also among the top 12 challenges were management measures including perverse incentives encouraging over-exploitation of marine species and excessive focus on conservation of rare species. The inclusion of such management measures in the list of key threats sends a very strong signal that action must be taken to improve the approaches taken to the management of marine ecosystems.

The associated ecosystem services provided by the marine environment are also undoubtedly in decline as a direct result of human demands (Covey and Laffoley 2002; Laffoley, Maltby *et al.* 2004). Human well-being is inextricably linked to the health and diversity of ecosystems through the essential services they provide such as food and water (MEA, 2005). The Living Planet Index which measures trends in the earth's biological diversity found that between 1970 and 2007, there has been a 25% decline in marine species (WWF, 2010a). Additionally, there is a wide body of research which has identified significant and important processes of the marine environment that are under threat of irreversible damage, including those services that assimilate waste, regulate the climate and recycle nutrients and those ecosystem components that are subject to heavily commercial exploitation, for example, fish stocks (Laffoley, Maltby *et al.* 2004; University of Liverpool 2006).

Recently the Convention of Biological Diversity concluded that if action is not taken to stop the loss of biodiversity we risk compromising the future security of human well-being (CBD, 2010). It also highlights the lack of knowledge concerning the relationship between biodiversity and human well-being. However, the CBD warns that this should not be used as an excuse for inaction, rather the CBD suggest several specific measures of direct action to help tackle these underlying issues (CBD, 2010):

- The requirement of greater efficiency in the use of land, energy, fresh water and materials to meet growing demand.
- Use of market incentives, and avoidance of perverse subsidies to minimize unsustainable resource use and wasteful consumption

- Strategic planning in the use of land, inland waters and marine resources to reconcile development with conservation of biodiversity and the maintenance of multiple ecosystem services. While some actions may entail moderate costs or trade-offs, the gains for biodiversity can be large in comparison.
- Ensuring that the benefits arising from use of and access to genetic resources and associated traditional knowledge, for example through the development of drugs and cosmetics, are equitably shared with the countries and cultures from which they are obtained.
- Communication, education and awareness raising to ensure that as far as possible, everyone understands the value of biodiversity and what steps they can take to protect it, including through changes in personal consumption and behaviour.

Due to their vital importance to human societies and their economies, coastal ecosystems have become the most researched areas in connection with biodiversity (Leadley *et. al.* 2010, FIELD, 2010, Thiel, 2010, CBD, n.d). Coastal development has placed immense pressure on associated habitats, including impacts from housing, ports, tourism, infrastructure and dredging. Intertidal habitats which provide natural coastal defence systems such as mangroves, sea grass beds and salt marshes are under considerable threat. Mangroves are harvested for their resources, such as wood, act as nursery areas for many fish species and protect low lying coastal communities from storm events. Sea grass beds are also a nursery habitat for many fish species and are also provide a rich source of food. Salt marshes are particularly valuable for removing atmospheric CO₂, provide habitats for shore birds and act as storm barriers. Shellfish reefs may be the most threatened coastal habitat and play an important role in providing food and shelter for fish, crabs and seabirds. It is estimated that up to 85% of shell fish reefs have been lost globally (CBD, 2010).

Major destructive implications to biodiversity are emphasised in the Stern Review (2006) a report for the UK Government which explores the economic implications of the threats posed by climate change. Stern notes that in relation to current and increasing climate changes with a large percentage of ecosystems will be unable to maintain their current form and between 15-40% of species may face extinction with a rise of just 2°C (Wigley and Raper, 2001). Additionally the Stern Review states that 'ocean acidification, as a direct result of rising CO₂ levels will have major effects on marine ecosystems' (Stern, 2006). Climate-induced change in water temperature has led to a massive decline in tropical coral cover associated with bleaching effects (Salm and Coles, 2001, Lesser, 2007). Coral reefs play an important role for tourism, recreation and aesthetic beauty and also support fish species, provide food resources and act as a natural barrier to coastal regions against storms and large waves. Deteriorating conditions of slow growing deep water habitats are also causing concern, although information is still scarce in this. Cold water corals are also considered to be particularly susceptible to ocean acidification, although there is still very limited knowledge of the chemical processes involved and data on the

global status of coral reefs does not yet exist. Awareness regarding the impacts from deep water fishing techniques suggests that vulnerable habitats such as deep cold water corals and sea mounds are under threat. Bottom trawling techniques have now been developed which allow fishing to depths not previously achieved and result in damage to previously unfished areas (CBD, 2010).

It is estimated that 80% of global marine fish stocks are completely exploited or over exploited (CBD, 2010). These statistics include an 11% decline in global biomass since 1977 (with regional variations) and a reduction in size of catch of 22% since 1959 and an increase in stock collapse over time. Some top predator species have been caught in such numbers that they cannot recover, therefore catches include much smaller fish and invertebrates, a situation referred to as 'fishing down the food web'. Ultimately this has worrying implications for the marine ecosystems that provide for many coastal communities.

Protection of marine and coastal areas lags behind the terrestrial protected areas and this is particularly the case in the high seas (CBD, 2010). However the issue of High Seas protection is an area of current interest, with countries such as Portugal leading the way in the establishment of open ocean MPAs (WWF, 2010b). The high seas represent approximately 64% of the world's sea and ocean surface, and yet are the least protected region of our planet. The high seas are also facing increasing threats from development and intensification of human activities, which have damaging effects on the marine environment. IDDR (2011) identify some of these influences as the 'exploitation of natural and mineral resources of the high seas, fisheries, navigation, scientific marine research and also the consequences of climate change, acidification and pollution from the land' (IDDR, 2011). Research in the high seas area includes a case-study conducted in 2008 on the conservation and sustainable use of the marine biodiversity in areas beyond national jurisdiction. Leading parties in this research included IUCN, The German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and the Dutch Ministry of Agriculture, Nature and Food Quality (Dotinga and Molenaar, 2008).

3. Marine ecosystem services

Ecosystems services and the reserves of natural capital provide the platform for continuing economic trade, development and the maintenance of human wellbeing. Therefore, we place a 'value', albeit a monetary, social, emotional, environmental or cultural value, on these services in recognition of their fundamental role. The decline in ecosystem services that we are currently witnessing may be a direct result of the fact that many of these values are not quantifiable in a common currency, as they fall outside the traditional sphere of the market economy. To 'the man in the street' they have no assigned or market value and the services they provide are invisible or essentially 'free'. In terms of traditional economics the 'elementary theory of supply and demand implies that if something is provided at zero price [free], more of it will

be demanded than if there was a positive price' (Pearce, Markandya et al. 1991). This can lead in the long-term to a level of demand for a natural resource which outstrips the capacity of the environment and a lack of weighting afforded to the ecosystem services in policy decisions (Chee, 2004).

Much debate surrounds the definition of the term 'ecosystem service' and revisions have been made since the 1990s (Boyd and Banzhaf, 2006, Dailey et al, 1997, Mooney and Ehrlich, 1999). A broadly accepted definition is provided by the Millennium Ecosystem Assessment which states that 'ecosystem services are the benefits people obtain from ecosystems' (MEA, 2005). Ecosystem services, as a term, has been adopted by scientists and economists to translate the complexity of ecological functions into a series of roles or goods and services which directly relate to, and have benefits for, human well-being (De Groot, Wilson et al. 2002; Daly and Farley 2004). Barbier (2007) considers these 'goods and services' in terms of economics and places them into three categories. Firstly, he identifies 'goods' that relate to a resource that is derived from an ecosystem, such as timber or water. Secondly, 'services' which could be the benefits from habitat functions such coastal protection or the potential for tourism and recreation. Thirdly, he identifies the cultural benefits, such as the spiritual, religious beliefs and heritage values (Barbier, 2007). The use of a goods and services approach has been cited as having the capacity to play a fundamental role in delivering the ecosystem approach, by enabling the competing pressures and demands of society, the environment and the economy to be incorporated into an environmental management framework (Beaumont, Austen et al. 2007).

Although there has always been much discussion surrounding the services that ecosystems provide, the Millennium Ecosystem Assessment (MEA), 2004 was significant in the wider establishment of the term and grouped these services into four over-arching roles:

1. Provisioning roles including food, water, minerals and energy
2. Regulating roles such as carbon sequestration and climate regulation, waste detoxification and crop pollination
3. Supporting roles including nutrient cycling and seed dispersal
4. Cultural roles such as intellectual and spiritual inspiration and recreational activities

Ecosystem services provided specifically by the marine environment were described by Beaumont, Townsend et al. (2006) in a study for the UK Government. These definitions are provided in Table 1 with the roles they provide as defined by the MEA (2005). Defining these characteristics is an essential step to the determination of the values which can be ascribed to them. More recently the TEEB report (2010) revised

the MEA definition to be more specific, changing one of the over-arching roles i.e. 'supporting roles' to 'habitat services' (TEEB, 2010).

Table 1. A summary of the ecosystem services provided by marine biodiversity, the MEA role they represent and the current definition.

Goods or Service	Millennium Ecosystem Assessment role	Definition
Food provision	Provisioning	Plants and animals taken from the marine environment
Raw materials	Provisioning	The extraction of marine organisms for all purposes, except human consumption
Leisure and Recreation	Cultural/ Provisioning	The refreshment and stimulation of the human body and mind through the perusal and engagement with living marine organisms in their natural environment
Resilience and resistance	Regulatory	The extent to which ecosystems can absorb recurrent natural and human perturbations and continue to regenerate without slowly degrading or unexpectedly flipping to alternate states.
Nutrient cycling	Supporting	The storage, cycling and maintenance of availability of nutrients mediated by living marine organisms
Gas and Climate regulation	Regulatory	The balance and maintenance of the chemical composition of the atmosphere and oceans by living marine organisms
Bioremediation of waste	Supporting	Removal of pollutants through storage, dilution transformation and burial.
Biologically mediated habitat	Supporting	Habitat which is provided by living marine organisms
Disturbance prevention and alleviation	Regulatory	The dampening of environmental disturbances by biogenic structures
Cultural heritage and identity	Cultural	The cultural value associated with the marine environment e.g for religion, folk lore, painting cultural and spiritual traditions.
Cognitive values	Cultural	Cognitive development, including education and research, resulting from marine organisms.
Option use values	Cultural	Currently unknown potential future uses of the marine environment.
Non-use values –bequest and existence	Cultural	Value which we derive for marine organisms without using them

Adapted from (Beaumont, Townsend et al. 2006)

4. Valuation of ecosystem services

Understanding of the term 'value' varies according to different disciplines. For example, in economics, value and utility are firmly associated with human kind. Therefore, when considering marketed goods and services, humans can identify the instrumental value (or usefulness) of an object by a 'willingness to pay' for them (e.g. the market price of fish). Ecosystem services can also have a non-instrumental (intrinsic) value (e.g. a cultural or spiritual value) (Hinchcliffe and Belshaw, 2003). These values can be combined, for example, some people value whales for non-instrumental reasons, perhaps for their beauty, whilst others value them instrumentally for their medicinal uses, or their blubber for food or fuel. Whilst people can assign value instrumentally and non-instrumentally, the two values can also exist together. For example, a desire to protect an area may arise from a wish to enjoy the surroundings (non-instrumental) as well as to maintain the property value of an area (instrumental). Values can be termed as subjective, which relates to those that are considered a matter of preference, and objective value, which can claim that something more than preference is at stake and wider principles are involved when valuing ecosystem services.

Decision making, especially where the natural environment is concerned, is inherently exposed to serious conflict potential necessitating a methodology for capturing the complex context of ecosystem function and service provision within a framework for analysis of options for decision making (Salafski, Margoluis et al. 2001). The field of economics, in its broadest sense, provides a framework for valuing the environment which equates instrumental value with money. Indeed the development of both environmental and ecological economics can be seen as a 'commitment among natural and social sciences and practitioners to develop a new, pluralistic understanding of the way in which different living systems interact with one another, and to draw lessons from this for both analysis and policy' (Costanza, Andrade et al. 1999).

Monetizing the environment is not without its critics and many of our interviewees, while working in this area, expressed the need for extreme caution in its application. It can be argued that the value of ecosystem services is infinite as 'the economies of the Earth would grind to a halt without the services of ecological life support systems' (Costanza, d'Arge et al. 1997). Characterisation of the wide range of goods and services provided from the environment in economic terms can lead to comparisons which may sometimes be seen as rather meaningless (e.g. recreational use versus patrimonial stake of environment) (Plottu and Plottu 2007). However, difficult as it may be (both practically and theoretically) to place a value on ecosystem goods and services there is a bottom line which justifies the cause for monetization (Plottu and Plottu 2007), 'if the environment is not monetized, it is automatically excluded from any kind of economic calculation and can therefore have no impact on the determining of rational choice.' Policy makers are increasingly taking note of the role that economic valuation methodologies can have in influencing and justifying the

development of environmental policies. Figure 1 below illustrates the division between use and non-use values and some of the methods which may be employed to value ecosystem services.

In summary the methods available include;

- Market price method – estimates the economic prices for ecosystem goods or services that are bought and sold in commercial markets
- Productivity method – estimates the economic prices for ecosystem goods or services which contribute to products that are bought and sold in commercial markets
- Hedonic pricing - estimates economic values for ecosystem goods or services that directly affect market prices of some other good (e.g. house prices)
- Travel cost method – estimates travel costs for recreation on the assumption that the value of the site is reflected in how much people are willing to pay to travel there
- Damage avoidance costs – estimates economic values based on the costs of avoided damage to ecosystems
- Contingent valuation methods – generally estimates the non- use value of an ecosystem based on willingness to pay for specific ecosystem services
- Contingent choice methods – estimates the value of an ecosystem based on asking people to make tradeoffs between different ecosystem characteristics.

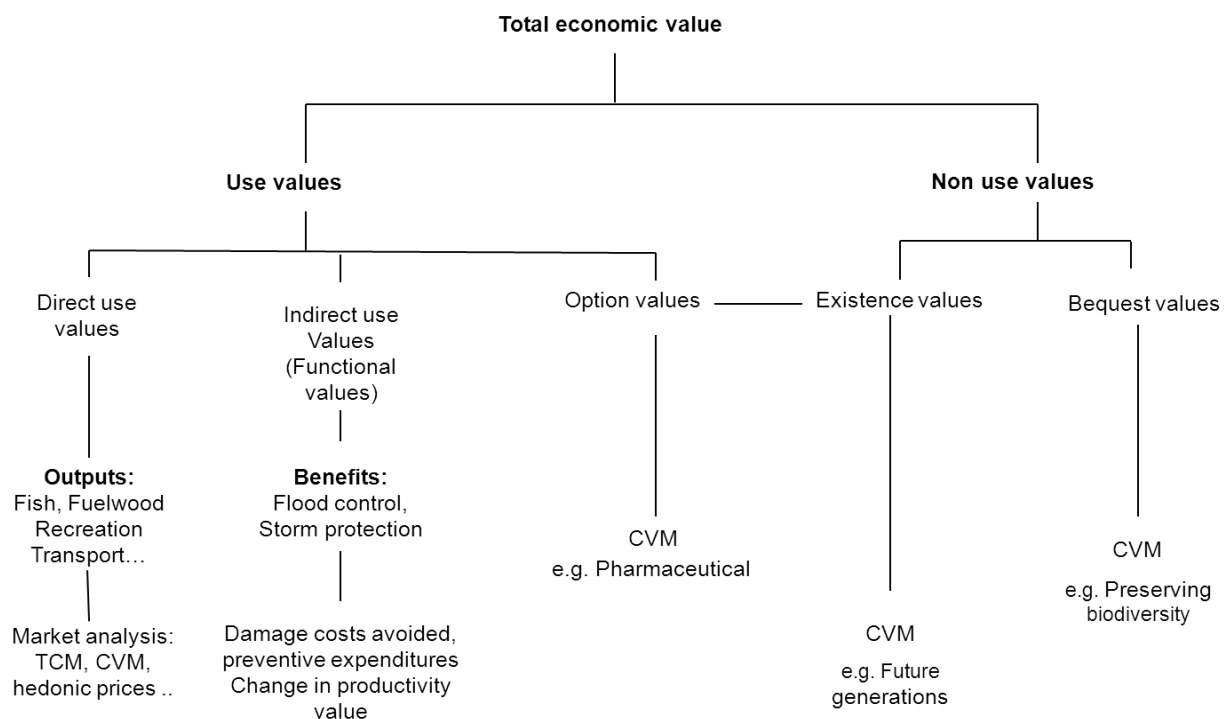


Figure 1. Examples of use and non-use values, in this case for wetlands, and the methods which may be used to derive these. TCM – Travel cost method; CVM – Contingent valuation methods. (Adapted from Barbier and Sathirathai, 1989)

Thus while a range of different pricing tools are available, there will be significant differences in their ease of use and the applicability of the outputs. Where there is a poor understanding of ecosystems and their function, as may be the case especially in the high seas, there is a danger that these techniques may be misleading.

4.1. Valuation of Ecosystem Services - Marine

A World Bank study undertaken in 2008 estimated that the total annual figure of all Marine Ecosystem Services amounted to over \$20 trillion. This figure only considered those ecosystem services for which a market already existed (World Bank, 2008). The World Bank stated that 'Non market values such as biodiversity and climate regulation were incalculable. And the spiritual worth of an intact seascape and the wonder of a coral reef are impossible to quantify' (World Bank, 2008).

Evaluation of marine and coastal ecosystems presents greater difficulties than terrestrial counterparts often as a result of the distance between the use of the ecosystem service and the ecosystem which provided it. Luke, 2010 states that 'The property rights situation is also more complex [when considering the marine environment]' (Luke, 2010). Pagiola, 2008 suggests that marine and coastal ecosystems can be subject to what economists refer to as the 'tragedy of the commons'. Outside of defined EEZs, marine resources are considered essentially free and without ownership, meaning there is no incentive to reduce consumption even when the consumption is having clearly damaging effects. Fishing is a prime example of this situation, where fishermen are all competing for diminishing resources, despite experiencing the effects of this first hand, because only fish that have been caught and landed have a value (Pagiola, 2008).

MARES, The Marine Ecosystems Services Program was established in 2009, launched by 'Forest Trends', and is designed to help incorporate the value of these services into the economy through the provision of information on prices, science and other factors that effect the markets for ecosystem services (Katoomba group, 2010). The Ecosystem Market Place is a web based information service that has been designed to assist the development of global environmental markets¹. Payments for Ecosystems Services (PES), advocated by Ecosystem Market Place, considers the methods available to measure the economic value of services provided by living ecosystems, and then proposes that those who will benefit from these services, pay for their upkeep. This technique is already in operation with the Water Quality Trading scheme (WQT) with examples in operation in the USA, Latin America, Europe and Africa (Luke, 2010). The promotion of healthy water systems including streams, rivers and lakes through these schemes by creating financial incentives for best practice stewardship of the surrounding watershed to these

¹ www.ecosystemmarketplace.com

systems, provides a useful example and it may also be applied to the oceans (Luke, 2010).

Considering coastal environments, Craig (2007) suggested that a 'user pays' initiative may be applied to tourism providing a way to support payments for ecosystem services. For example, divers could be charged a fee to dive a particular sea grass bed, or in a marine park, as is the case in some of the Marine National Parks in the Seychelles. The revenue generated would then provide funds for future protection of the area. Craig states that this would create a new market based on 'competition between commodities and amenities users – to translate the new economic demands into a political will to better protect the marine ecosystems and the services that they provide' (Craig, 2007).

Thus it can be seen that there is a need to incorporate the value of marine and coastal ecosystem services into our current economy so that its value can be understood and protected. However, the application of these techniques is limited at this time. There are lessons which can be learnt based on terrestrial schemes, such as wetland mitigation banking and the global carbon markets, to 'create new financing mechanisms that identify the economic value of the ocean's services' (Katoomba group, 2010). Environmental markets can offer new tools to help protect the ocean's resources. These tools are still evolving and being developed in the terrestrial environment, and are more challenging to apply in the marine environment, but nonetheless they offer an interesting and potentially significant area for further research.

5. Development of the proposals for action

Figure 2 depicts the processes which were followed to develop the proposals for action. Following the review of the relevant literature and the expert interviews an initial report was written which presented the findings and identified preliminary topic ideas for further consideration. These wide ranging ideas were narrowed down at the first workshop where the focus was on ensuring that any actions proposed matched closely with the Foundation's strengths (see Table 2).

Table 2. The relevant strengths the Calouste Gulbenkian Foundation would bring to such a programme of work.

Key strengths identified

-
- Having a long-term vision
- Being able to run risks
- Having global networks and an ability to influence at different scales (international, European, Portugal and local)
- Having an existing infrastructure including personnel and facilities
- Being able to call upon a broad pallet of tools including natural and social sciences, arts and education
- Having a brand with an excellent reputation and credibility

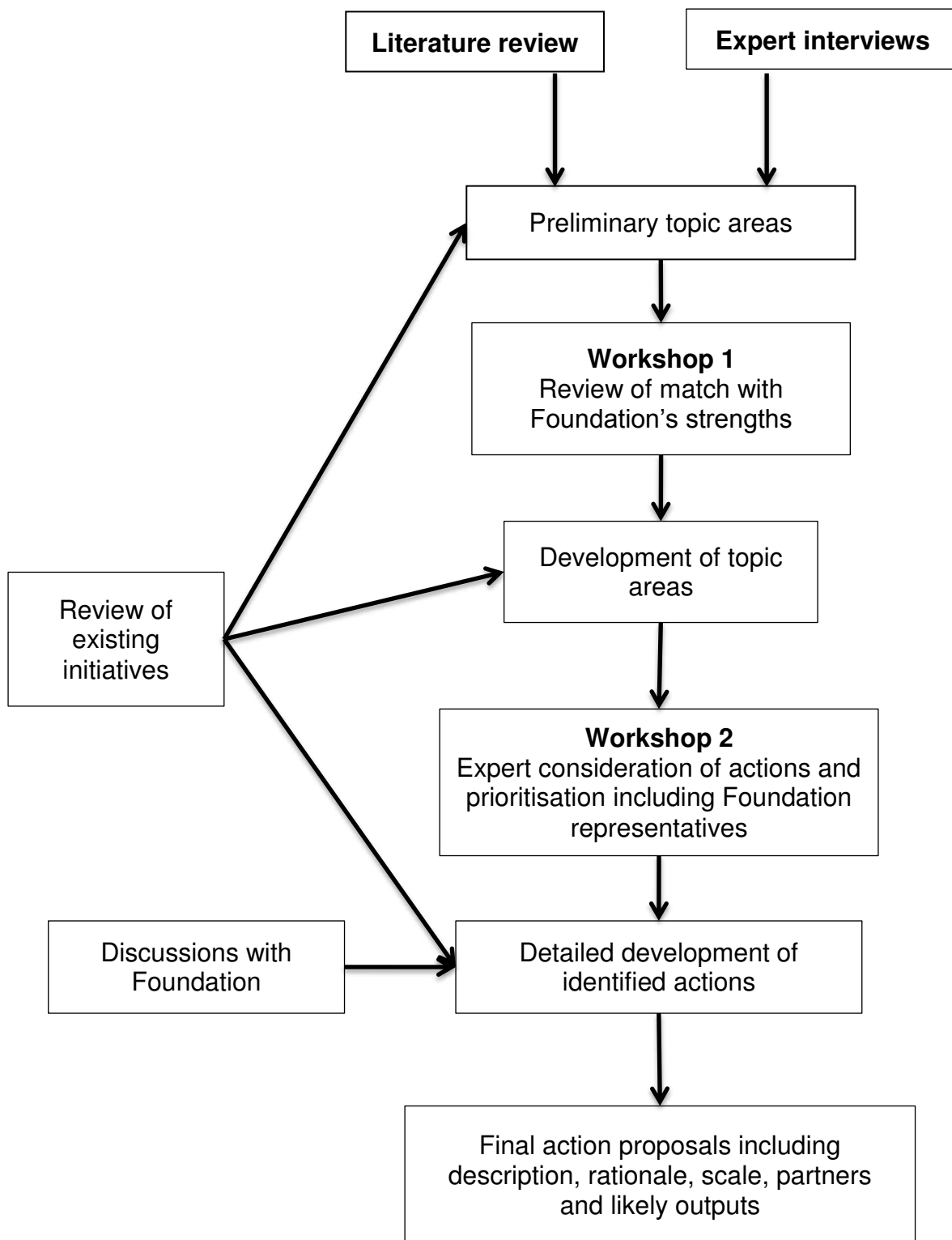


Figure 2. A process diagram for the activities undertaken in this project to reach the final actions described in this report.

Following this the key topics were identified as research, influencing and capacity building and proposals within these areas were developed. These proposals were then explored at the second workshop, to which a range of experts from academia, research, NGOs and foundations were invited. From these discussions specific ideas were identified for working up into the final proposals for action. Throughout it was considered essential to ensure that (a) whatever was proposed allied closely to the aims and ideals of the Foundation and (b) the actions proposed were not duplicating what was being done elsewhere in academia, the public sector or by other charitable foundations. Therefore, there was engagement with Foundation representatives at every stage of the process and also continual review of existing initiatives.

6. Rationale for selected actions

In summary this review has shown that there can be major benefits as a result of incorporating the value of marine and coastal ecosystem services into decision making processes. Recognising the importance of ecosystem services and their relevance to human well-being is essential if we are to enable a balanced and sustainable approach to the management of our environment. If these services are not documented then they cannot be incorporated into the assessment of the impact or implications of any particular course of action.

It is clear that valuation of ecosystem services has an important role to play in supporting conservation of marine biodiversity but that there are a number of challenges which limit the application of valuation techniques. Monetizing ecosystem services, if possible, enables them to be considered readily within the decision making processes whereas if they are not valued there is a concern that they may be automatically excluded from consideration. However, not all services lend themselves to such an economic approach and there is clearly a need to consider non-economic techniques as well in order to address the range of services obtained from marine ecosystems.

While such ecosystem service valuation is being increasingly used in terrestrial systems its application in the marine environment is really rather limited. Recent reports by organisations such as the Economics of Ecosystems and Biodiversity study (TEEB, 2010) and the Millennium Ecosystem Assessment (MEA, 2005) tend to focus on terrestrial environments in the first instance as does the UK Valuing Nature Network, an interdisciplinary network for valuing biodiversity, ecosystem services and natural resource use. Two key reasons for this were identified in this study. Firstly, there is a lack of understanding of marine ecosystem functions and the wider role they may play, and secondly, there is a lack of data concerning marine ecosystems and their value, especially, but not exclusively, in offshore and deep water environments.

From this review several key features, pertinent to the formulation of an environment programme incorporating ecosystem service valuation for the Foundation, were identified and these include;

- Valuation of marine biodiversity depends upon adequate understanding of ecological processes underpinned with evidence highlighting the need for quality validated research and good science.
- Valuation of marine biodiversity is constrained by poor understanding of marine ecosystem function, including the services marine ecosystems provide, and the interconnections between the ecosystem services and the functions of marine ecosystems. This in turn leads to a lack of understanding of the connections with human well-being.
- Any future approach to economic valuation of marine biodiversity should be inter-disciplinary, ensuring strong collaboration and partnerships between economists and natural scientists.
- Marine ecosystem services cannot all be valued purely in financial terms; therefore economic valuation cannot be used in isolation. Non-economic valuation methods therefore require consideration also.
- The role of the public in understanding marine ecosystems and the economic (and other) value of them to everyday life is important and can be a policy delivery channel to change public behaviour and attitudes to the marine environment.
- There is a limited professional skill and knowledge base to undertake economic and non-economic valuation of marine ecosystem services and biodiversity (particularly using an interdisciplinary approach).
- There is limited understanding of how economic and non-economic valuation techniques can be integrated into marine and coastal governance systems, such as Marine Spatial Planning.

This suggests a future Programme Ambiente focused on the economic valuation of marine biodiversity should support the following:

- the procurement and use of sound ecological evidence;
- interdisciplinary approaches to valuation;
- the development and application of reliable economic and non-economic valuation techniques for marine ecosystem services;
- the application of valuation in sound marine governance systems;
- the development of an enhanced professional skills;
- public awareness of marine biodiversity and its value (economic and other);
- public behavioural change as a policy channel.

The value of ecosystems services and their importance to human well-being have been under estimated for many years and this is especially the case in the marine environment, where an 'out of sight, out of mind' attitude can prevail. Advances in the research and understanding of terrestrial environments have led to the gradual increase in similar programmes being initiated for the marine environment (e.g. TEEB, 2012) although it still lags behind with many aspects unknown and unexplored. Other factors driving the development of understanding of the value of the marine environment include urgent challenges to ecosystems such as climate

change, ocean acidification, decline in fish stocks and pollution. In response, many initiatives and projects have been undertaken focussed on these immediate aspects of the problem rather than on the bigger picture. Thus, often working at European or National level, initiatives on similar topics may lack of standardisation resulting in un-coordinated responses dealing with single issues.

Despite the many initiatives undertaken, globally there are still only relatively small amounts of money dedicated to marine research as compared to the terrestrial environment. This study identified research, capacity building and influencing as areas in which there was a current deficiency which leads to poor application of marine ecosystem service assessment and valuation in the decision making process. If the Foundation is to fund projects in these areas successfully, augmenting existing work, they could support better implementation of marine ecosystem assessment and valuation and hence ensure the links between marine biodiversity, ecosystem services and human well-being are better understood and appreciated.

6.1. Rationale for Research Actions

There is considerable uncertainty surrounding the relationships between biodiversity, human well-being and the functioning of ecosystems (CBD, 2010). The worlds' oceans are incredibly diverse and sustain a huge variety of life forms and habitats about which our understanding is often limited. There have been recent ambitious attempts to catalogue marine life by the Census of Marine Life Project which was undertaken over a ten year period, ending in 2010, by a large, international network of scientists (Census of Marine Life, 2010). There is an obvious need to continue this good work and create a network of researchers with the expertise to maintain such work in the long term. However, while such a study may provide fascinating insights to marine life it is not immediately applicable in a management sphere and there is a need for the policy relevance of such knowledge to be made accessible.

There are a number of programmes focussed on marine ecology and biodiversity (e.g. the Diversitas programme an international programme of biodiversity science and IOBIS, the Census of Marine Life's database, which aims to document the ocean's diversity, distribution and abundance of life) that highlight the current state of our knowledge and provide support for improved understanding of marine biodiversity. The Living Planet Index measured trends in the earth's biological diversity (WWF, 2010a) and the Millennium Ecosystem Assessment (MEA) focused on the consequences of ecosystem change for human well-being and the scientific basis for action needed to enhance the conservation and sustainable use of those systems (MEA, 2010).

Where ecosystem service assessment and valuation research is undertaken this is often in specific geographic areas (e.g. the World Resources Institute's Reefs at Risk project to raise awareness of the threats to reefs and the tools for their management

and their Coastal Capital programme) and frequently coastal. The World Bank's WAVES programme (Wealth Accounting and Valuation of Ecosystem Services), launched in 2010, aims to apply natural capital accounting in 6-10 pilot countries and incorporate this within their policy analysis and planning. At the same time they aim to develop standardised guidelines for ecosystem accounting. Other projects concern specific services such as carbon sequestration (e.g. see the Blue Carbon portal which provides a focal point for information concerning carbon offsets in coastal vegetation) or fisheries (e.g. FAO statistics on the economics of fisheries) and provide information which can be used to develop a better understanding of the economics of particular issues.

Integrated research projects addressing social, economic and ecological aspects of marine and coastal issues can provide a great deal of new information but they are often relatively short term and may not be able to support the application of the outcomes into practical decision making. A number of large European research projects have been undertaken in recent years which address integrated marine and coastal systems (e.g. the FP6 project European Lifestyles and Marine Ecosystem (ELME), the FP6 Science Policy Integration for Coastal Systems Assessment (SPICOSA) and Vectors of Change in Oceans and Seas Marine Life, Impact on Economic Sectors (VECTORS)) and explore the links between society, ecology and economy. It also important to note that marine ecosystem research is significantly funded by several foundations. For example, the Oak and Pew Foundations have a very strong focus on fisheries while the Arcadia, Adessium and Mava Foundations focus more on conservation.

Despite all of the foregoing there are still many areas of knowledge that are missing, particularly that of the high seas, where data is very scarce. There is little year on year base-line data collection and monitoring but this is crucial to underpin the application of ecosystem service assessments to human well-being. Where such data is collected it may not be part of an integrated project and hence may not be readily comparable with other work. There is a fundamental need to assess the marine ecosystem services using comparable methodological tools. A standard methodological framework would ensure robust base-line data collection and enable the generation of comparable, verifiable datasets. Initial moves to do this are being undertaken by an American based organisation called the Natural Capital Project which has already successfully applied various standard models to the terrestrial environment over the last six years. Their InVEST project is developing a family of software based tools for the integrated valuation of ecosystem services and trade-offs. This would provide a timely opportunity for a partnership to take the marine element of this project forward through supporting a network of experts and their activities.

Likewise the TEEB initiative, has very recently produced a consultation document entitled 'Why value the Oceans' which may also present opportunities for collaboration and cooperation. This highlights a whole range of opportunities for new

research which it is not in a position to support but the Foundation may be able to. The best way to approach this could be by inviting applications via the proposed expert network for highly motivated, well trained young researchers to build careers in in this area. In conclusion, while there is considerable research and other work undertaken by various foundations and research organisations, this demonstrates there is scope for joint working with other foundations and organisations but there need be little fear of duplication. This research area is nowhere near saturated.

6.2. Rationale for Capacity Building Actions

Capacity building is essential to facilitate public involvement with, and support for, marine conservation, and in this case, recognition of the value of marine ecosystem services. Capacity building refers to the development of knowledge and skills that increase the ability of an individual to meaningfully engage with an issue, decision or debate. In this context, capacity relates to the ability of citizens to engage meaningfully with marine conservation and marine ecosystem service valuation decisions, debates and actions. Capacity building normally takes the form of education or training to fill a capacity gap. The research presented earlier in this report suggests strongly that citizens have a significant capacity gap related to the marine environment generally and the value of marine ecosystem services specifically. The capacity building actions outlined in this section are specifically focused on filling this capacity gap through building upon formal education channels.

Much capacity building is undertaken at the university level, where there are many global examples of degree courses from undergraduate to PhD levels. Some key examples of universities involved in this work include: CCMAR, University of Azores, University of Coimbra and the University of the Algarve in Portugal, Plymouth University in the UK, Griffith University, Australia, the University of Wyoming and the University of California in the USA, Dalhousie University and the University of British Columbia in Canada, and Wageningen University in the Netherlands.

For young adults there is also the option for vocational training as volunteers overseas to learn how to monitor reefs for example and improve their diving skill in return for helping communities protect their marine life. These initiatives include Global Vision International, Action Quest, Broad reach, Sea Camp and Earth Watch Institute but they are realistic options only for the wealthy few. Other projects to build capacity are funded by various foundations including, for example, the Packard Foundation, which has specific science communication projects and aims to develop a USA-wide network of citizen organisations supporting marine conservation; and the Waterloo Foundation, which works on a community basis to promote marine conservation.

Capacity building should arguably begin with younger children while at school but there is a distinct lack of coordinated efforts to support this. There are a few local or regional examples such as the marine education project in the Seychelles (Save Our

Seas Foundation, 2012), the National Maritime Museum in London and some national aquariums are also involved in such programmes. There is no widely available support for national or international educational resources focusing on the value of marine ecosystem services. A number of foundations do fund NGOs (such as WWF and the Marine Conservation Society (UK)) that are involved in specific educational projects, although not currently on marine ecosystem service assessment. Therefore there may be scope to work with these NGOs and other foundations providing their funding may be excellent partners for such work.

6.3. Rationale for Influencing Actions

There are a range of levels at which one can seek to influence behaviour towards the marine environment from an individual's lifestyle choices (e.g. shopping), through to politicians voting decisions, and the investments made by large insurance companies and other businesses. Influence of any sort must be based on sound science and then relies on appropriate, clear communication of relevant and engaging messages. Working with citizens, NGOs often provide the easiest and most direct route to changing behaviours. NGOs associated with influencing people about the marine environment currently include WWF, the Marine Conservation Society (in the UK), Greenpeace and IUCN among many others. These NGOs are actively involved in the practicalities of marine protection and also disseminating key messages to the media and policy makers. Many of these NGOs can come together to increase the value of certain projects as demonstrated, for example, in the case of the Common Fisheries Policy through the Ocean 2012 initiative which is funded by the Oak and Pew Foundations.

There is a continual need for politicians in particular to be informed about the latest research and the key messages resulting from this work. Although many channels for this communication exist such as print media, national television and lobby groups these are not necessarily as effective as might be hoped. For example, the news media may address the impact of an activity rather than the cause of the problem, hence the understanding of the issue may be incomplete and the resulting decision making poor. Initiatives such as the World Ocean's radio and the Green Alliance, which works to influence those in the UK parliament to make environmentally sustainable decisions, can provide information but not all would seek this out. There is a significant need for accurate, germane information on the value of marine ecosystem services and the cost of their loss to be made available in an accessible format.

Key players addressing the value of ecosystems and the services they provide at an international level include the World Bank, through their WAVES programme, the World Resources Institute, through their Main-streaming Ecosystem Services Initiative (MESI) project, and the IUCN through their Green Economy Programme. Part of the work at least of each of these organisations is aimed at policy makers and Governments but none of these projects focus on marine ecosystem services but

rather on terrestrial environments where data is much more readily available. Likewise, influential actors in business could make hugely significant decisions to the benefit of marine biodiversity and human well-being but often they do not have the basic knowledge to make appropriately informed decisions. However, there are many opportunities for this sort of work to be developed more widely particularly if linking marine ecosystem services to human well-being, as this is a topic that is likely to be attractive to this audience. There is a real opportunity to make progress in this area if the right information can be presented to those with the power to change the way marine ecosystems are viewed in key decision making processes.

7. Proposed actions for the Programma Ambiente

The final proposed actions for the Programma Ambiente were created through the step-by-step expert-informed developmental process outlined in this report. Eight substantial actions are proposed, some of which contain additional, optional actions. Three of the actions are classified as related to research, three are related to capacity building, and two are related to influencing. All of the proposed actions have a clear focus on the application of marine ecosystem service valuation to enhance marine biodiversity and human wellbeing; they also reflect the strengths and expertise of the Foundation and the results of the opinions we canvassed in the workshops and telephone interviews. A summary of the actions is presented in Table 3 while a detailed description of each action is presented in Appendix 1, in which each action is described according to the following criteria:

- Detailed description of the proposed action;
- Rationale for the selection of the proposed action;
- Links to other proposed actions and existing projects or initiatives
- Likely impact of the proposed action on marine biodiversity and human wellbeing;
- Risks
- Measures of success against which the proposed action should be assessed;
- Scale of initiative; geographic, temporal and economic
- Potential partners that could be engaged to deliver the proposed action.

Each of the proposed actions fit together to form a coherent and balanced programme focused on a range of topics, using a variety of techniques, over various spatial and temporal scales, and targeting different groups. The risk associated with the suite of proposed actions is therefore reduced by not placing all of the proposed actions in the same theme or using the same methods. The relationship between the proposed actions is presented in Figure 3, which shows that the proposed actions are inter-related and focused on the expertise and strengths of the CGF.

However, each action has also been developed to allow it to be implemented independently with no dependency on other actions listed.

In reality it is not expected that all actions would be carried forward and certainly not all at the same time. The main building blocks could be considered to be the Research Network and the Post-Doctoral Fellowship Programme as both of these would provide much of the skill and knowledge base to support the other initiatives. These two actions would undoubtedly augment one another if both introduced and likewise would be supported by and would support the research programme to develop standard methods. Combining these three initiatives would also build the credibility of the Foundation for work in this area which would be very beneficial for the influencing actions.

The two actions for young people could readily be developed sequentially perhaps working with younger children first, developing and using the educational materials, and then in future years following up and inviting those youngsters to participate in the Young Ambassadors project. Finally, the project to recognise and celebrate the non-market values of the oceans has a near perfect fit with the Foundation's strengths and could be developed as a standalone initiative. The development of this programme would support wider recognition of the inherent value of marine ecosystems (economic and non-economic) and this would facilitate wider appreciation of the importance of marine biodiversity and ecosystem services to human well-being. It is proposed that, with this recognition will come, in time, action to ensure marine managers adopt sustainable options.

Table 3. The actions proposed following this study are outlined briefly below and described in much greater detail follow.

Research
<p>Research Network An international and interdisciplinary network of experts hosted by the Foundation and with a common interest in marine ecosystem services assessment and human well-being. This network will promote the understanding and application of marine ecosystem service assessment and valuation to inform improved decision making.</p>
<p>Post Doctorate Programme A global, excellence orientated post-doctoral research fellowship programme coordinated by the Foundation. This would aim to fund the best and brightest postdoctoral researchers to work in the most relevant institutions, with expert supervisors and develop their career exploring the links between marine ecosystem assessment and human well-being. Thus, it would support the development of a future scientific community interested in and able to address and promote the incorporation of marine ecosystem service valuation into decision making.</p>
<p>Developing Standardised Marine Ecosystem Service Valuation Methodologies An initiative funding research projects to develop a standard methodological framework for the economic and non-economic valuation of marine ecosystem services. Without such a recognized standard approach the application of these techniques will be seriously restricted as results are incompatible. This framework</p>

could enable effective use of the results on a global basis.

Capacity Building

School's Marine Programme (Phase one)

A programme to educate young people about the true value of marine ecosystems and the services to human well-being they provide. This action would develop and deliver a teacher training programme, provide materials and support for schools based teaching and develop a network of specialist marine schools. The marine literate young people from this action may populate the Youth Ocean's Forum although this would not be exclusive.

Young Ambassadors for the Ocean (Phase Two)

Based on the school's marine teaching programme a national debate about marine issues would be facilitated at secondary level. This action would give young people a voice. School based Ocean Ambassadors would be members of a national Youth Ocean's Forum through which the debate could be taken to a national political level.

Recognition and Celebration of Non-Market Value

This action would inform and educate the public about the value of marine ecosystem services to human well-being and encourage their celebration. It would focus on non-monetary values for intangible elements of marine ecosystem services and would use arts and culture, so well represented by the Foundation, to disseminate the messages and develop a better understanding of the necessary scientific ideas. .

Influencing

Influence Decision Makers

This action would facilitate the delivery of the key messages concerning marine ecosystem services and their value to human well-being to policy and economic decision makers in the public and private sectors. The basis of these messages may have been identified through the research network, by the post-doctoral researchers or through the schools programme.

Cross-Sector Partnership Development

A project to develop cross sector partnerships through which the knowledge about marine ecosystem services and their value to human well-being could be disseminated with a view to altering behaviours or activities to minimise costs in terms of marine ecosystem services. Partners might include NGOs, other foundations and private enterprise such as supermarkets, insurance industries or shipping.

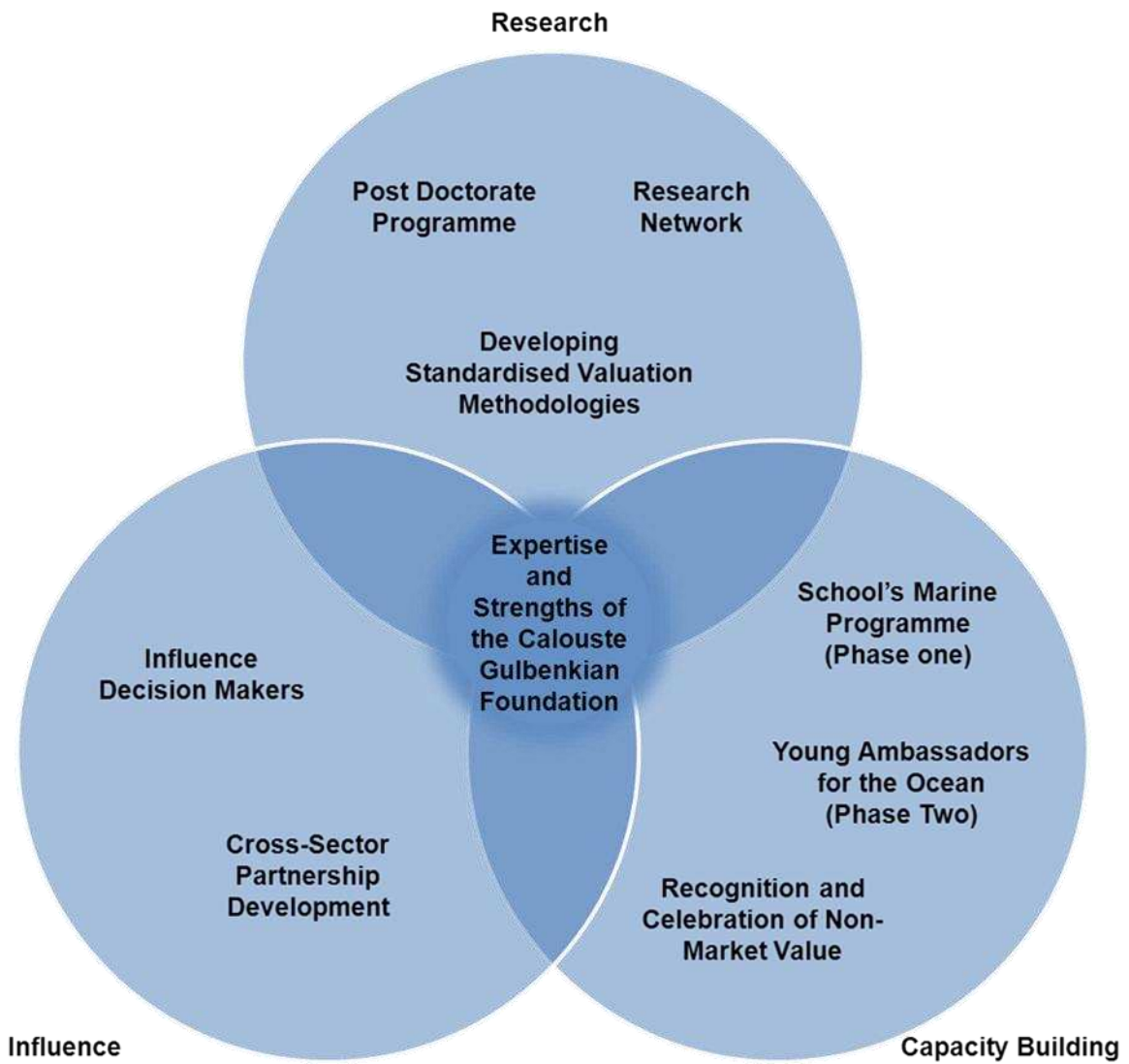


Figure 3. A depiction of the linkages between the actions and the strengths of the Foundation.

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Appendix 1. Detailed description of each of the proposed actions

Research Network

Action Description

The establishment of a research network hosted by the CGF to promote understanding and application of marine ecosystem service assessment and valuation.

The Research Network would provide an international platform for assessment and valuation of marine ecosystem services centred at the CGF. The network would bring together individuals working in different disciplines (including social, economic and ecological scientists) whose interests focus on enabling assessment of marine ecosystem services. It would consist of a group of connected, leading edge, interdisciplinary researchers who share ideas, 'future gaze' and, through collaboration, strengthen and make a more efficient use of the research being undertaken. Particular focus would be placed on research that would guide future Gulbenkian work in collaboration with other Trusts and Foundations. This engagement and potential partnership would have mutual benefits and would inform the Gulbenkian work programme. This action would focus research attention on the most significant gaps in the current understanding of ecosystem service valuation and its application. The outputs would include pioneering reports at the forefront of research that would have significant value in furthering work in this area.

The steps to establishing and running the Research Network include:

1. Identify leading edge researchers at varying career stages from around the world, who are focused on critical current issues related to marine ecosystem services valuation and human well-being.
2. Identified researchers would then be invited to create and/or join the network which would be supported by CGF.
3. The network members could frequently meet 'virtually' and would be invited to an annual (or more frequent) network forum hosted by the CGF.
4. Researchers could then work collaboratively on significant research outputs, new applications and informing and guiding the CGF's future work.

The network would provide the capacity for tackling large scale, high profile projects and, once established, appropriate links and connections would be made through it. The network could be broadened out over time to tackle other subjects in the future if appropriate. The work of the Network could be supplemented by commissioned research, in all likelihood, by members of the Network.

Rationale for selection

The Research Network would provide a platform for the development of research excellence which would strengthen the Foundation's reputation and capacity in this area and connect other experts in the field of marine biodiversity across the world. The network would inform the Foundation with the most recent and cutting edge

research findings, which would subsequently enhance its capacity to influence and inform decision makers, the media, and other Foundations.

This action is an amalgamation of three actions that were identified during the previous research and workshops which provides a strong rationale for its selection. Currently an international research forum of this type does not exist for policy driven marine ecosystem service valuation.

Impact

The potential impact of this project is wide reaching on many levels and could greatly strengthen this research agenda, help to build capacity and provide political influencing capability.

An international Research Network would potentially have a high impact and gain a world renowned reputation for its work in the area of valuation of marine ecosystems, biodiversity and human wellbeing, and would provide the very best evidence to guide the CGF with decisions over the direction of its future work. The area of research undertaken would influence the impact of this action, for example work within the high seas area has been so far very minimal and much base-line data collection is required to further understanding. Therefore activity in this area could have high impact.

Risks

The risks of this action would be associated with achieving an appropriate membership for the Network, with the best expertise available. Obtaining a critical mass for the network on an international scale is vital to the Network's success. These risks could be minimised by working with the potential partners and other key academic institutions to encourage their membership and recommend other potential members, whilst considering incentives such as a hosted forum, the Post-Doctoral programme and research funding opportunities.

Measure of Success

The success of this action could be measured through its outputs which would include cutting edge research reports, particularly ones that helped to influence policy making and decisions. Work undertaken for the first time through the collaborative nature of the forum would demonstrate the successful nature of the Network's work. Also, facilitation of EU based or international conferences would promote the topic and the Foundation's work.

Geographical Scale

International.

Time frame

Set up within 18 months; implementation long term and on-going.

Funding

This depends on the type of network developed. There would need to be a core budget available for a coordinator of the research forum, to convene meetings and run the administrative tasks. Around £50,000 would probably be adequate for such a task. Supporting an international conference may also require funding but this should not be high cost (£20,000). Other than that the costs for the research itself would be dependent on the work proposed and members would be encouraged to make formal applications for funding, perhaps to CGF, or to other foundations or funding bodies.

Links and potential partners

This action strongly links to all of the other actions in the programme as it will provide an evidence base underpinning the specific activities identified. The Network would specifically align with the post-doctorate programme where there would be many synergies, particularly with identifying the research to be undertaken. The network members could potentially help identify the best post-doctoral researchers and assist with their supervision.

Researchers and research areas for development maybe drawn from key international universities with a focus on valuation of marine biodiversity as part of their programme. These include in no particular order:

Plymouth University, UK
University of Wyoming, US
University of British Columbia, Canada
Dalhousie University, Canada
University of California, US
Duke University, US
GriffithUniversity, Australia
University of Azores, Portugal
University of Coimbra, Portugal
University of the Algarve, Portugal
Wageningen University, The Netherlands
University of Cape Verdi,

A wide range of research laboratories would also be of relevance to such a network including the Plymouth Marine Laboratory and CCMAR in Portugal. Organisations and initiatives that may usefully link with this network through a research forum or something similar may include:

The Marine Conservation Institute (MCI)
The Marine Life Census (with OBIS database)
Valuing Nature Network (UK)
Marine Biodiversity and Ecosystem Functioning (MarBEF) - an EUNetwork

Potential partners for the Foundation in initiating a network like this could include the following;

- The International Conservation Union for Nature (IUCN) has many specialist working groups that research different areas drawing on the expertise of their members. The groups produce reports that influence government decision making.
- The International Panel on the Science of the Oceans (IPSO) is a unique consortium of scientists and other ocean experts including those from the legal, communications and political arenas. The consortium identifies the current issues and projects the future outcomes of these problems to help develop pragmatic solutions to alter the trajectory of degradation. An influential and interesting report concerning the state of the oceans was produced in 2010 by this consortium (www.stateoftheocean.org).
- The Valuing Nature Network (www.valuing-nature.net) is principally UK based and largely terrestrial but the marine element could be adopted and developed internationally.

Other foundations who may be interested in this area include The Oak Foundation, The Pew Ocean's Commission, Synchronicity Earth (who have met with the CG Foundation already) www.synchronicityearth.org/index.php.

Conclusion

In conclusion the Research Network action would provide a great opportunity to extend the strengths of the CGF and provide the Foundation with the best information available. It would also work to progress the science in this area and its application for governance. The Network would engage and collaborate with other Trusts and Foundations to the best possible advantage. There would be scope to broaden the subject matter of the network in the future if considered appropriate.

Developing Standardised Ecosystem Service Valuation Methodologies

Action Description

Funding a research project or programme to develop a standard economic and non-economic methodological framework that can be replicated throughout different geographical regions and applied by different researchers.

The strength of this action is replicability. In order to apply ecosystem valuation consistently, the methods used must be compatible across different institutions, countries and regions so that the research outputs are standardised, reproducible and comparable. Only such a repeatable, robust dataset can be used to support governance and decisions making. The framework must provide an easy to use, scalable and transferable approach that would apply to economic and non-economic assessments. A method could be developed from funded research at PhD and post-doc level and then applied internationally to broaden the scope of the research, perhaps using the Research Network.

Initially a clear focus for the development of a standardised valuation framework could be directed towards a specific issue or ecosystem, focussed either spatially or on an ecosystem service (e.g. marine carbon storage), with a strong existing natural, social and economic evidence base. Once the standardised method had been developed, the widespread testing and application of the method in different ecosystem and socio-economic settings could be channelled through the Research Network. Once refined, the standard method could be rolled out on an international basis. There is the potential to achieve this through partnership and extension of existing work (eg with the Natural Capital Project). This research project would go through an entire life-cycle from development to implementation possibly spanning five years including testing and application to key projects until a broad take up is generated internationally.

Rationale for selection

Methodology standardisation or finding a common way to measure things is an issue that scientists have been dealing with for many years and it provides a great opportunity for change. An example can be found in the chemical analyses of pollutant concentrations in the North sea. Thirty years ago these were undertaken by each bordering country and project independently so that when an assessment of the entire North Sea was proposed comparisons were impossible because different sediment fractions and different digests had been used (for more information, see Glegg, G A (1994) What's the point of Monitoring? The Issues Surrounding the 1993 North Sea Quality Status Report. *North Sea Monitor*, 12(2), 16-18). Now consistent and comparable sediment monitoring methods are overseen across the Europe by international organizations, such as ICES and OSPAR, which enable whole sea-scale assessments to be made. A similar undertaking to develop a framework for the valuation of marine ecosystem services would be a really valuable contribution to the compilation of an evidence base for marine policy-making. Methodology standardisation is something that scientists support but by its nature, it is difficult to get funding to undertake. This action was popular at the London workshop and aligns closely with the CGF's aspirations.

Impact

The development of this action would not necessarily be high impact in the world of the media or public perception. However it could have a significant impact for scientists and researchers who would be able to equip themselves with the necessary tools to measure and value ecosystems in a coherent manner. This would ultimately save much time and money and importantly produce a robust system for data collection. Without a standard methodology it will be very difficult to promote the application of marine ecosystem valuation in marine management and decision making. Ultimately, the application of the standardised method may be very high impact through its subsequent strengthening of the policy-making evidence base.

Risks

The main risk for this action is ensuring credibility of the standard method(s) developed and encouraging researchers to undertake work using the method. These risks can be minimised by developing the action in line with the potential partners (see links and potential partners section) who have a track record of expertise and experience in this field. Once the method is developed it is envisaged that the international Research Network is used to undertake work using the methodology to extend its geographical scope and verify its credibility.

Measure of Success

Success measures include: the endorsement of the standardized method by policy-making organizations (e.g. OSPAR, EU); adoption of the standardised method by other universities/ institutes/ researchers as evidenced in the published literature (this may be very long term); and the establishment of a database of comparable ecosystem service valuation evidence sourced from the application of the standardised method. The MarBEF project provides a good example of success. The project has undertaken similar work to create a standard methodology for data collection of marine biodiversity and ecosystems and is populating the information into databases for availability to other researchers (www.marbef.org).

Geographical Scale

This action would be highly applicable at all scales but in the first instance adoption within European waters, including inshore and offshore areas, would seem appropriate. It could be developed and delivered within one university, or in a consortium based project, and then applied in others using the same methodology to examine various aspects of marine biodiversity.

Time frame

The initial development and testing of a standardized method would take up to 3 years although this may only address specific element of the issue; implementation would be seen over the long term.

Funding

The primary cost would be to commission and support the research project. This will carry a potentially high cost due to the inclusive nature of the project necessitated by the need to gain widespread support for the method. The cost of an individual research project in one institution may be around £80,000 per year or less.

Links and potential partners

This action links very closely with the establishment of a Research Network and the establishment of a Post-doctoral Programme. This action provides evidence to underpin strategic policy-making and influence international work in this area. There are also potential links between this action and the work of existing projects, including:

The Economics of Ecosystems Assessment and Biodiversity (TEEB)
The UN Millennium Ecosystem Assessment (MEA)
Biodiversity Information System for Europe (BISE)
OSPAR Convention's (see their Regional Economic and Social Assessment for the Marine Strategy Framework Directive).

A potential partner for this project could also be the Natural Capital Project which has grown from the Millennium Ecosystem Assessment and has developed tools for quantifying the values of natural capital initially for terrestrial ecosystems but latterly for the marine environment. In promising a return (of societal benefits) on investments in nature, the scientific community needs to deliver knowledge and tools to quantify and forecast this return. The Natural Capital Project is developing a suite of software-based tools for Integrated Valuation of Environmental Services and Tradeoffs (InVEST). InVEST enables decision-makers to quantify the importance of natural capital, to assess the tradeoffs associated with alternative choices, and to integrate conservation and human development. www.naturalcapitalproject.org

Conclusion

This action would provide a research project that would be conducted over a significant period of time to fully develop, test and implement a standard framework that could be used internationally for marine ecosystem service valuation. It is a potentially high-impact project with long-term significance to the quality of data collection in this field. It would therefore contribute to the quality and reliability of the evidence base to both inform future research directions and to underpin policy-making. This research project would associate the CGF with the very best tools for data collection in the field of ocean's biodiversity valuation and the research undertaken through its application.

Recognition and Celebration of Non-Market Values

Action Description:

The recognition and celebration of non-market valuation techniques that challenge traditional economic indicators of ocean biodiversity, potentially delivered through a series of small projects linked to the arts and culture.

This action is primarily a campaign to inform and educate the public about the full value of the marine environment and its links to human well-being. This action would be focused on the communication of the less tangible values of marine ecosystem services rather than their economic values. These values include the aesthetic beauty, the health benefits and the cultural and spiritual well-being that can be derived from the marine environment. These are incredibly valuable to humans, yet difficult to value. This action could highlight the strong heritage and cultural links people have with the sea and the 'price' of our failure to steward it well. For example, it could highlight the significance of cod or other fish to the culinary heritage of Portugal and demonstrate how this could be effected for future generations if the stocks are not managed well.

Project proposals would be invited and selection of appropriate projects would be based on the applications most closely aligned with the Foundation's strengths. This may be conducted through extending the CGF's links with art and other cultural projects to enable communication of the value of marine biodiversity at the community and national level to the wider population. Initially the Foundation's infrastructure in Portugal would support this project well, but it could also be applied in UK and France. This is an action that promotes creativity and could link well with recent art projects undertaken in Lisbon.

Examples of work that could be undertaken could include cultural competitions, such as photography and paintings and exhibitions. Particular topics could be identified such as celebrating the culinary culture associated with fish while raising awareness of the need for better stewardship of endangered fish species. The arts could represent an innovative way to communicate these messages to the wider public. This project would strengthen further the good reputation of the Foundation, particularly within Portugal, and its association with valuable and community based projects.

Rationale for selection

This action would allow for unique innovative ideas to be developed that show case new methods of communication the value of marine ecosystems. This action was discussed at the Lisbon workshop and is significant in the opportunities it provides the CGF to demonstrate its strengths in the arts and to draw upon the deep rooted marine culture and heritage of Portugal. Additionally it is an emerging area of study within the international arena and it offers much scope for new and ground breaking work which would align well with the CGF ethos.

Impact

The development and use of non-economic valuation methods to promote the health of marine biodiversity and ecosystems is likely to be a series of inter-connecting projects that can be implemented by communities, artists, and non-expert citizens. Therefore the

impact of this project in terms of media and profile may be limited, but the longer term value of non-economic valuation could have a far reaching impact and be of great importance to marine ecosystems. Given the scale of the Foundation, it could be possible to launch certain aspects of this project in a way which could attract considerable attention.

Risks

The key risks associated with this action relate to the possibility that the action becomes diffuse and has little or no national impact. The overall co-ordination of the various projects may be difficult and it could be hard to measure its impact. This could be partly mitigated by the employment of a skilled project manager with creative and innovative talent in order to get the most out of the programme.

Measure of Success

Success could be measured according to the funding granted to innovative bids to undertake this work. If the work is very specifically focused on a few areas it may be possible to develop a strong campaign but this would require the involvement of supporting NGOs or similar. Success could also be measured through outputs used by the Young Ambassadors for the Ocean Action.

Geographical Scale

This action could provide immense opportunity for Portugal at the national level as well as at regional and local levels through connecting communities to the sea and reinforcing the reach of the Foundation in delivering meaningful projects that speak to people.

Time frame

Primarily short term if delivering small arts and community based projects; but results may only become apparent over the longer term.

Funding

Low to medium (materials and set up costs) but community involvement is likely to be voluntary or incentive driven. Small grants would be made available.

Links and potential partners

The Post Doctoral Programme and the Research Network would be well positioned to support into this action, by providing the underpinning evidence base. The successful projects selected to under this action could help to generate ideas and provide material for the Young Ambassadors for the Ocean action and the Influencing Decision Makers action.

International and European organisations that could provide links and practical examples of non-material valuation techniques include:

- IUCN's task force on 'cultural and spiritual values of protected areas'
www.fsd.nl/csvpa
- Global Ocean Biodiversity Initiative (GOBI - <http://www.gobi.org/>)

Work undertaken for the Gulbenkian Foundation where useful examples and parallels maybe drawn include:

- The Gulbenkian Galapagos Artists' Residency Programme
- The Gulbenkian 'Rural Arts Funding Review'

As the application of this action is initially primarily targeted at Portugal, it may be that partners would be mainly national although links could be pursued with external NGOs.

Conclusion

This action could have a significant at the regional and local levels over a short time span. The action closely aligns with the Foundation's ethos to invest in communities, by providing support and recognising their maritime heritage, livelihoods and cultures. This action provides the opportunity to deliver a potentially high impact national project quite quickly for relatively low costs.

School's Marine Programme (Phase one)

Action Description:

This action is aimed at educating and empowering young people firstly through a school's marine teaching programme and later through facilitating debates about the oceans that would give young people a voice that could feed directly into marine policy-making. This action would be piloted in one region in Portugal with the opportunity to replicate it in other countries.

The School's Marine Programme would be the first phase of a two part initiative to help young people initially understand marine issues and later empower them to debate and share their views. This phase is aimed at the primary school level. Teaching staff would be trained to promote awareness of marine issues in relation to human well-being, culture and heritage. It could also identify and encourage specific everyday behaviours that benefit the marine environment. This is essentially a marine citizenship agenda which would be underpinned by research to develop educational materials, to identify the most effective mechanisms to teach marine citizenship, and that will identify the behavior changes that would lead to the most marine environmental benefit. This research could be undertaken in collaboration with the Research Network.

The programme could ultimately be delivered through alignment with the relevant national curriculum. A decision would be needed about which year(s) within the curriculum the programme would be best situated. Possible building of skills within schools for developing research ideas such as contributing towards data collection (examples can be seen with the Royal Protection for the Society of Birds (RSPB) where the public were asked to watch their gardens for 2 hours on a certain day and record all the species of bird they saw within that time).

On the strength of this action a 'school's twinning' programme could be established, to support and share information across regional boundaries. The Foundation could support marine visits between the twinned schools and potentially other activities that raise awareness of marine issues.

The steps to enable phase one of this action include:

1. A strong research evidence base to inform and help shape the teaching materials, teaching process, and desirable behavior change. This may be developed by the Research Network and the Post-doc programme.
2. Development and delivery of a teacher training programme.
3. Development of delivery mechanisms for the programme within schools using the latest technologies. This would also include teacher packs of relevant materials.
4. The development of a school's twinning programme to share information and ideas with other schools and allow pupils to undertake marine visits and other activities in different geographical areas.

Rationale

This action had a strong vote at the London workshop and was recognised as an important step in helping to 'shape young minds' with a view to a more sustainable use and outlook of the oceans amongst the next generation. The action would be extended through the teacher training to enable the programme to be delivered through the curriculum and would therefore widen the spread and impact of its key messages. The school's ocean certification and school's twinning programme are unique and will have potentially far reaching impacts. They would also be particularly media friendly.

Impact

This action is aimed at changing behaviour in the young that could potentially have a long lasting impact and influence throughout the child's life. Associated impacts would come from the teacher training and implementation of this action in multiple countries. This action has the potential to be high profile and is eminently media friendly.

Risks

A risk associated with this action is initially targeting a national roll-out. To overcome this, a regional or sub-regional trial is suggested from which lessons could be derived to deliver effective national roll-out.

Measure of Success

Success could be measured by the number of participating schools and the extent to which they engage with the programme. Other measures of success could include the number of teachers trained and the number of pupil's who have successfully undertaken the programme. Success could also be measured by the number of school's successfully participating in the 'School's Twinning' programme and marine visits made through that partnership. Long-term success would be difficult to quantify but nevertheless this action has a great potential to deliver sustainability of the marine environment through the influence and education of children and helping to change behaviour and attitude that will be carried with them for a life-time.

Geographical Scale

Initially this phase should be piloted in a region or sub-region of in Portugal to evaluate its success before being rolled out to other regions in the country. The project could then be widened to allow other coastal countries to participate.

Time frame: – short, medium or long term

Medium.

Funding

Funding would be necessary for the research that would inform and underpin the development of the teaching material, to identify the most effective teaching methods, and to establish behavior change priorities. However this could be linked in with the Post-doc programme and/or Research Network. Funds would also be required for teacher training, materials production and delivery, and project management.

Links and potential partners

The Research Network and the Post-doc Programme will provide the evidence base to inform the key messages in the School's Marine Programme. Good examples of teacher's packs include those developed by The World Wildlife Fund for Nature (WWF) and the Marine Conservation Society (MCS). The National Maritime Museum in London opened a gallery called 'Your Ocean' aimed at highlighting the key issues facing the marine environment in the 21st century and demonstrated how human life is dependent on the health and survival of the world's oceans. In conjunction with this initiative school education packs were developed for 11 – 16 year olds which supported the national curriculum (UK) in this area (www.rmg.co.uk/upload/doc/Consultation_Executive_Summary.doc). Save our Seas Foundation is committed to protecting the oceans by funding research, education, awareness and conservation projects focusing on the major threats to the marine environment. They operate various projects in schools to help bring these issues to light (<http://saveourseas.com>).

Conclusion

This would be a unique opportunity for the Foundation and Portugal to launch an innovative series of initiatives that would have a lasting impact on school children. It would closely involve the Post-doc action and the Research Network to inform the programme and would greatly enhance the good profile of the Foundation by working on community based projects and capacity building and raising awareness of the key messages of ocean's biodiversity. Science education would be built on with this programme and public participation and awareness would be integral to it. This phase of the programme is aimed at primary school level and would provide a strong platform for phase two, where older school children are facilitated in debate about the oceans with the opportunity to voice their opinions to policy makers in the public arena.

Young Ambassadors for the Ocean (Phase Two)

Action Description:

The Youth Ambassadors for the Ocean action would build on the School's Marine Programme and be channeled through schools, initially in Portugal to help give young people at secondary school level a voice in marine policy-making delivered through new media.

A team would be established with experts in facilitation of debate and discussion amongst school age students. The team would work within schools and initiate a debate with the children about the future of the oceans. The use of new-media is important to generate further interest and participation from children and allow them easier and more familiar ways to share their opinions. The output of the debate would ultimately be a contribution to the policy debate about the oceans from local to international scale.

In particular, a national debate could be instigated through a national-level Youth Ocean's Forum. Members of the Forum would be 'Ocean Ambassadors', selected by schools to represent the views of their school (or group of schools). The Youth Ocean Forum would hold virtual and actual meetings with marine scientists and policy makers. It is suggested that annually, one Youth Forum meeting would be chaired by the Environment Minister or Prime Minister and timed to coincide with a high profile marine event such as the annual Festival of the Sea (in Portugal) to generate media interest.

The output of the debate would ultimately be a contribution to the policy debate about the oceans. A national debate would be generated on the strength of the programme. Other mediums to maintain further generation of debate for the Youth Forum could include discussion on Facebook and U-Tube among others. The use of new-media engagement is important to generate further interest and participation from children and allow them easier, appropriate ways to share their opinions. There is the potential to film and televise the key messages and show them to the school children to initiate debate.

Rationale for selection

This is a modern and innovative action that would generate further interest and awareness in school children for the marine environment and allow them to contribute directly to the political debate surrounding the future of our oceans. It provides the unique opportunity for Portugal to show case an initiative that both raises awareness in pupils and allows them to feed their opinions directly to the national government level. This is potentially a high impact action that would confirm the CGF interests in productive community action and links to political leaders. This action lends itself well to being replicated in other countries and is likely to be popular with the political community.

Impact

This is a high-impact action. It would reach every school and school child in the country (Portugal). The selected Ocean Ambassadors would be able to exert influence on the government through the Youth Oceans Forum. Capacity would be developed in children about the marine environment and they would have the opportunity to make their opinions about the future of the oceans heard within the political arena. This initiative has the potential to be very media friendly and would greatly attract the national and local press. The action could have a celebratory launch which would attract the national and national press. With future implications for broadening the scope of the project to other countries, it would also be of interest to the international media.

Risks

Areas of risk would surround the scale and manageability of the programme and the identification of appropriate people to facilitate the national debate. This could be mitigated in part by looking to the Research Network for assistance or the Post-doc Programme for input. Additional risks maybe associated with the politicians, would they listen?

Measure of Success

Success would be measured in several ways. Firstly by the number of schools visited actively participating in the Young Ambassadors for the Ocean. Secondly by the debate generated through new media technologies such as U-Tube and Face Book. Finally by the selection of the Ocean Ambassadors and their meetings (virtual and face to face) with politicians. Ultimately, success would be direct influence being shown to be implemented on marine policy through the Youth Ocean Forum.

Geographical

Initially delivered in Portugal, piloted by region and then rolled out to the rest of the country. Increasing the geographical spread to schools in other countries at a later date.

Time frame

Initially medium to long term. Following the initial Youth Ocean's Forum this action could then be implemented much faster based on the experience and lessons learned from the original project, although this will have unique characteristics in each country.

Funding

Medium to high costs.

Links and potential partners

This action is closely linked to the School's Marine Programme by providing opportunities for older school children to develop their knowledge of the oceans and contribute to active and high level debate. Although closely connected, it is possible for this action to be developed independently from the Schools Marine Programme. This action would have links to the Research Network and the Post-doc Programme which would help to inform and feed into the programme topics of debate and evidence. The output from the debate and the annual ambassador's meetings would link to the Influence Policy and Economic Decision Makers Action. The Young Ambassadors for the Ocean could also look to the Recognition and Celebration of Non-Market Value projects for ideas and community projects to become involved with. Partners would include the national education body (of the country concerned), relevant marine education bodies (such as the National Maritime Museum and the National Marine Aquarium in the UK) and politicians with marine responsibility. The annual Youth Ocean Ambassador's meeting should be chaired by the President or Prime Minister of the relevant country (if possible).

Conclusion

This action would build on phase 1 of the school's programme and enable the debate concerning the assessment of marine ecosystem services to be conducted between disparate levels of society – schools and politicians. Through this the whole society can become involved, improving understanding of the links between marine biodiversity, ecosystem services and human well-being.

Post-Doctoral Research Fellowship Programme

Action Description

A global excellence-orientated Post-doctoral Research Fellowship Programme co-ordinated by the Gulbenkian Institute of Science in Lisbon.

This action would aim to fund the best post-doctoral researchers to help them to develop their career exploring the links between marine ecosystem service assessment and valuation and human well-being. The research fellows would be active participants in the Research Network. The Post-doctoral Research Programme would undertake research in marine ecosystem service assessment and valuation, providing a baseline understanding of marine ecosystems, exploring techniques and evaluating the links to human well-being. The research would fill specific priority research gaps in information in this area and aim to support and provide an evidence base for the other actions.

It is proposed that 5 year postdoctoral fellowships be offered to named researchers working within named research groups and institutions. They could be offered jointly between two institutions if appropriate for example between universities in Mozambique and Portugal, or the UK and Brazil. These longer fellowships should lead to a greater number of significant outputs than common 2 year projects and enable the researchers to develop a significant role within the institution. They also have time to obtain additional funding in support of their work and to develop a profile, and hence a career, in this area.

The research results would be transparent so that other parties could benefit and develop the information to the advantage and health of the oceans and human well-being. A research agenda would be developed that among other things would underpin the School's Marine Programme. This action would also be well positioned to undertake research using the standard methodology developed by Action 2 (the Standardised Valuation Methodology).

Rationale for selection

A programme of this nature would strengthen the CFG's reputation for research, and if hosted in Lisbon, Portugal would have additional credibility through the country's closely connected maritime culture. The Programme would be an important asset to the Gulbenkian Institute of Science in Lisbon where these topics are currently not investigated and would enable links to be developed with a range of key organisations around the world. This action was strongly promoted and widely discussed at the London workshop. The Institute is well positioned to lead a recruitment process for postdoctoral researchers in association with relevant partners. These post-doctoral researchers would form the bedrock of the Foundation's work and as part of their role could be asked to participate in the development of the Foundation's Programa Ambiente on an annual basis.

Impact

For the Foundation high profile outcomes can be expected from researchers at this stage of their career who are generally focused, enthusiastic and at the forefront of their chosen field. This action would provide a significant focus of activity for the global research community and would provide a centre of excellence in post-doc research in the areas described. The research undertaken would have the potential for far reaching impacts in the area of marine biodiversity valuation and development of media outputs could be one of the requirements of the awards.

Measure of Success

The measure of success would be the research outputs such publications in the refereed academic press, funding obtained for future research projects and wider dissemination via the media or through the Foundation's other projects.

Risks

Finding enough of the right people to undertake the Post-doc Programme would be the major risks associated with this action. However the research network would be an asset in reducing this risk through its international connections in the right subject area.

Geographical Scale

Global, but especially Europe and Portuguese and countries.

Time frame

Medium to long term

Funding

It is proposed that grants are for about 5 years and support the candidate but not necessarily the research for which funding may be sought separately. On average the costs might be about €50,000 per year per candidate with perhaps €10,000 start-up per scholarship.

Links and potential partners

This action would have strong links to the Research Network, the Developing Standardised Valuation Methodologies action and would also underpin the School's Marine Programme. The network might provide support in the process of identifying appropriate individuals and other relevant partners could include;

- Centro do Biologia, University of Lisbon. (Coordinated the Portugal Millennium Ecosystem Assessment in 2004 and work on many projects including GHRSSST – sea surface temperature). <http://co.fc.ul.pt>

- Centre of Marine and Environmental Research of the University of Porto – Is the associated laboratory (CIIMAR) created from CIIMAR and CCMAR
- Department of Oceanography and Fisheries of the University of Azores www.horta.uac.pt
- Algarve University, Faculty of Marine and Environmental Sciences – Research www.fct.ualg.pt
- The University of Brest, www.univ-brest.fr given the links of the Foundation to France
- There could also be links in countries such as Mozambique and Cape Verde
- Plymouth University, <http://www.plymouth.ac.uk/marine>

The Foundation would be central to the selection process but they would benefit input from these other institutions. The CGF could select 3 to 4 other research institutions through which they would be willing to support candidates could although this may be un-necessarily restrictive.

The following potential partners are proposed as appropriate institutions at which the Fellowships could be supported although this list is in no way meant to be exclusive:

- Plymouth University, UK
- University of Wyoming, US
- University of British Columbia, Canada
- Dalhousie University, Canada
- University of California, US
- Duke University, US
- Griffith University, Australia
- University of Azores, Portugal
- University of Coimbra, Portugal
- University of the Algarve, Portugal
- Wageningen University, The Netherlands
- University of Cape Verdi,

Conclusion

This action builds on the CGF strengths in research and their links to global experts. The action strengthens links to other actions in the recommended programme, particularly with the Research Network, the Standardised Valuation Methodologies and the School's Marine Programme. It has the potential to make a real difference to furthering research in this area with scope for significant global impacts resulting from published outputs.

Influencing decision makers

Action Description:

A campaign to influence policy and economic decision makers and the media through information sharing.

This action would aim to strengthen existing partnerships and create new ones where mutually beneficial between scientists and policy and economic decision-makers. It would develop key messages that have significant impact on politicians and economic decision makers. The underpinning research to identify appropriate messages and influence points would be conducted by the Research Network and/or through the Post-doc Programme. The messages would need to be clear and repeatable (potentially every 4 years for new governments). This action would be timed to coincide with key influence opportunities, such as new policy development, implementation of an international agreement or the revision of existing policy. This action would also provide ongoing, reliable marine information to politicians to ensure they were aware of marine environmental issues. Other areas would include science and policy projects and possibly inter-sessional workshops at UN meetings.

Steps to achieving this action include:

1. Developing key messages through a research evidence base drawing on work from the Research Network, the Post-doc Programme and the Youth Ocean's Forum.
2. Identify and strengthen links with the key channels of influence with the media, policy and economic decision makers.
3. Develop a programme for the delivery of the key messages working on a repeatable time-table (for politicians).

Rationale for selection

This is a unique action that would allow the CGF to channel key messages related to the conservation of ocean biodiversity towards economic and political decision makers. There is a compelling case that this group of people could greatly influence the public if they were informed with the right messages at the right time. It is essential that the good work of the Network and Post-docs are disseminated through these channels for maximum impact. The CGF could draw on its existing links and partnerships to create a network of influence and this action would strengthen their reputation in this area.

Impact

This action would have the potential to be high-impact (although this may be somewhat dependent on the outcomes of its underpinning research).

Measure of Success

The success of this action could be measured through dissemination of the key messages of marine biodiversity and ecosystems through various channels. This may be achieved through newspaper articles, TV reports, discussions in parliament and so on.

Risks

There would be minimal risk associated with this action on the basis that the Foundation is also supporting excellence in research and implementation of ecosystem service assessment and valuation simultaneously.

Geographical Scale

International.

Time frame

Long term and continual to develop a reputation for excellence.

Funding

Low to medium.

Links and potential partners

This action would link in with the Youth Ocean's Forum and their informed debate incorporating policy influence. It would also link to the Research Network and the Post-doctoral research programme where the research would help to develop the key messages.

Potential partners for this work could include the World Resources Institute MESI programme, IUCN's Green Economy programme and the Green Alliance, a UK based organization involved in providing political advice on environmental issues. The International Programme on the State of the Oceans (IPSO) brings together experts to work on key topical issues and as such may be keen to work in association with the Foundation. Also World Ocean Radio, a project of the World Ocean's Observatory (W2O), is a weekly series of five-minute audio essays available for syndicated use at no cost by community radio stations worldwide (<http://thew2o.net/world-ocean-radio>) and could be of value to this area of work.

Potential funding partners could include the Oak and Pew Foundations.

Conclusion

This influencing action has the potential to inform campaigns and spread key messages of marine biodiversity issues through channels such as the media and high level decision makers. It would have a far reaching impact internationally and be a way of constructively using current research to help

influence and inform top level decision makers and the media. By developing capacity of marine biodiversity issues with these groups of people, the messages can then be channeled out to the wider public.

Cross-Sector Partnership Development

Action Description:

Developing partnerships with NGOs, industry, researchers and other foundations, particularly those not traditionally associated with the value of marine ecosystem services.

This action would be unique in establishing and building on partnerships in sectors where the value of marine ecosystems services is not usually appreciated, such as amongst supermarkets and the finance sector, particularly insurance companies. These multi-national organisations may have a limited understanding of the impacts of their activities on the marine environment but through marine ecosystem services assessment and valuation a much improved understanding could be developed. Marine ecosystem experts would work with the new partners to inform them of the value (economic and non-economic) of the marine resources relating to their business. This work could be informed by the Post-doc Programme and the Research Network. Through working in partnership with these less traditional sectors mutual benefits can be realized through sharing information and encouraging behavioural change and revised attitudes towards marine resources. These partnerships may be important in delivering the Influencing Decision Makers action. The steps required to undertake this action are as follows:

1. Identify expert partners, who may be marine ecosystem experts, such as those who are members of the Research Network (See Potential Partners Section)
2. Identify individuals with indirect influence over marine ecosystems, but who may not be well informed about it. Examples may include the finance and shipping sectors and those involved in commodity supply chains (see Partner's section). This action could draw upon the influence of CGF with other foundations and partners.
3. Identify information gaps. Through collaboration within the partnerships, it will be possible to identify information gaps related to marine ecosystems and areas where application of this information would have the most beneficial impact to the marine environment and human wellbeing (tipping points).
4. Develop programme of collaboration targeting information gaps and areas where improved understanding of marine ecosystem services might have high impact within industry. The key is for less-informed partners to recognise the finite nature of marine resources and their economic and non-economic values.
5. Development of a focus on changing the behaviour and operational choices of business partners through assisting revised decision-making.

Rationale for selection

This action could greatly contribute to a change in the behaviour throughout certain industrial sectors, supply chains, and product life-cycles. For example, working with certain industrial sectors, previously unrecognized marine problems or concerns of resource wastage, could be identified and acted upon thus providing 'green' marketing opportunities for those involved. This is an action that if well executed could have high impact and lasting long-term effects on sectors who indirectly have a large impact on marine ecosystems services but may not have enough knowledge or understanding to prevent destructive behaviour or decisions. As yet this action has not been delivered for the oceans.

Impact

Potentially high impact due to the global nature of the partnerships and work focused on informing groups that are not usually involved with marine biodiversity considerations. For example, behavioural changes within the commodity market will have influencing power over the entire life-cycle of a supply chain. This would potentially influence policy and other decision makers.

Measure of Success

Success would be measured by the development of productive partnerships. Behavioural change within the commodity markets and other industries recognising and responding to the 'value' of marine ecosystems would be an additional measure of success.

Risks

The risks associated with this action are about the business cooperation for business take-up. It is important that this action does not just become a tick box exercise. This risk can be mitigated by developing genuine partnerships with companies which have already achieved work similar to this before.

Geographical Scale

Global.

Time frame

Long-term. Potentially an on-going project.

Funding

This action would need to involve a project coordinator and other experts to initially identify and bring partners together. The start-up costs are therefore likely to be high. The main costs thereafter would be related to a facilitation role and the convening of meetings and workshops to bring partners together to discuss and act upon the relevant topics. Although set up costs maybe high, the project could become self funding when companies/ partners understand the long term savings

and other benefits they are going to make. On this basis the action can be put in the category of a medium cost. The most appropriate mechanism may be to support an NGO involved in such activities.

Potential Partners

This action could have links to the Research Network and the Post-Doc Programme which would help to inform the action and partnerships and identify key players. There would also be a link to the action Influencing Decision Makers where new partnerships could help to communicate key messages to this group.

There are a number of organisations working on this topic but generally not specific to the marine environment.

WWF has identified 100 companies that most directly impact the vulnerable places and species that in their view are in need of protection. Their belief is that if companies commit to sustainability, global markets will shift to help reduce consumption. WWF's approach to working with the private sector is solutions-oriented. It works on collaboration by engaging with major companies and their supply chains to change the way global commodities are produced, processed, consumed, and financed worldwide. The approaches being used to promote positive change in these markets include better management practices, multi stake holder engagements and sustainable commodity investment with the finance sector. Specific contact:

- Jason Clay of WWF – USA. Senior Vice President of market transformation. http://wwf.panda.org/what_we_do/how_we_work/businesses/transforming_markets
[www.ted.com/talks/jason clay how big brands can save biodiversity.html](http://www.ted.com/talks/jason_clay_how_big_brands_can_save_biodiversity.html)

- Finance lab – WWF project supporting investigations between Institute for Chartered Accounts for England and Wales.

The Ellen MacArthur Foundation - this Foundation is an independent charity with the aim of inspiring people to re-think the future with what they refer to as the 'circular economy' approach or the 'closed loop' model, thus helping to achieve sustainable development <http://www.ellenmacarthurfoundation.org/about/circular-economy>

Conclusion

This action provides the chance to establish less traditional partnerships which would allow the opportunity to influence and work in different sectors and create benefits for them in relation to marine ecosystems services. This would be a high impact project operating on a global scale. This action has significant potential to broaden the reputation of the CGF as a strong international Foundation with a good research reputation and working in innovative cutting edge areas where their funding can make a real difference to a variety of business sectors.