Mangrove: Joe Bunni

Ocean Carbon – Changes in the open and coastal ocean

Geographical scope/benefitting country(ies):	Global
Duration (in months):	48 months
Name and unit of project officer	Luis Valdes, SC/IOC/OSS
Partner(s) institutions:	Republic of Korea, Germany, France, UAE SCOR, IOCCP, OA-ICC, CI, IUCN
Total estimated budget inclusive of Programme Support costs	1,200,000 USD

Rationale and background

What is the project aiming to achieve?

The core objective of this project is to catalyze and enhance the cooperation of ocean carbon monitoring and research activities in coastal areas and the open ocean. This will help to satisfy the need for improved understanding about the economic and social value of marine ecosystem services and how those will change under the impacts of higher levels of CO_2 in the atmosphere and ocean and direct destruction of marine habitats. It includes innovative actions to raise the awareness and the public interest for the emerging threat for human and marine health.

Why is this project needed?

Ecosystem services provided by the open ocean and the coastal areas are crucial for human well-being, e.g. climate and flood regulation, recreation and food provisioning. Nevertheless they are endangered by direct and indirect interventions caused by increasing populations, economies and urbanization, which change e.g. the ocean carbon stocks and fluxes. The project will focus on two areas of research the indirect human impact of ocean acidification and the direct influence of destruction of natural coastal blue carbon ecosystems.

The anthropogenic impact by carbon dioxide (CO_2) emissions since the industrialization has not only resulted in the warming of the planet but has also altered the chemistry of the ocean. The present anthropogenic caused acidification is a unique event in the geological history of our planet due to its rapid rate of change. An analysis of ocean acidification over the last 300 million years highlights the unprecedented rate of change of the current acidification. Though the capacity of the ocean to continue to absorb carbon (to act as a sink for carbon) at the same rate is questioned by scientists, the declined Revelle factor indicates that temperature rise and the recent increase of marine CO_2 already changed the chemical capability for that.

The increase in atmospheric CO_2 is occurring too quickly to be stabilized by natural feedbacks such as the dissolution of deep-sea carbonates, which acts on time-scales of thousands of years, or the weathering of terrestrial carbonate and silicate rocks, which operates on time-scales of tens to hundreds of thousands of years.

Global-scale projections of the changing chemistry of seawater can be made with high accuracy from scenarios of atmospheric CO_2 levels. Stopping anthropogenic CO_2 emissions immediately would not result in a recovery of the ocean's pH to its preindustrial level for centuries. Therefore the impact of increased CO_2 concentrations in the sea on ecosystem services has to be evaluated and valuated. Some areas already experience the alteration of the marine chemistry and stakeholders and policymakers are aware of this emerging threat for the ocean.

During the 20th century coastal zones have changed considerably with increasing populations, economies and urbanization. Effects of the destruction of coastal carbon ecosystems such as mangroves, sea grasses and tidal marshes influence the quality and quantity of several marine ecosystem services. While a global inventory exists for mangroves, reliable data for tidal marshes and seagrasses are still missing. Though it is needed with the strengthening of formal commitments under the United Nations Framework Convention on Climate Change (UNFCCC) and the Convention on Biological Diversity (CBD), and increased interest from the Ramsar and The World Heritage Conventions to more systematically and comprehensively address marine issues. GHG accounting guidelines for saltmarshes are available (IPCC), countries can expand national reporting of GHG emissions and reductions to include gains and losses of marsh extent and associated GHG fluxes. However, data – specifically aerial extent, management practices and consistent monitoring approaches – will be required to support national GHG accounting.

Therefore the IOC-UNESCO together with Conservation International (CI) and the International Union for Conservation of Nature (IUCN) have established the International Blue Carbon Initiative as an instrument to advance the scientific, management and policy actions and to develop management and conservation tools for marine coastal ecosystems. Within the framework of this initiative it is aimed to develop comprehensive and consistent global maps of blue carbon ecosystems, to build local capacity. This will finally gives the tools to answer the calls from international treaties and conventions for quantifying the ecosystem services and how they thrive under the anthropogenic influence, due to the altered ocean carbon conditions.

Why UNESCO ?

The project builds on the experience of IOC-UNESCO in coordinating and enforcing ocean carbon research. Now the IOC-UNESCO wants to enlarge its activities to answer the calls for a sustainable use of the ocean combining and facilitating current oceanographic research and socio-economic studies. This will be done in collaboration with other IOC and UNESCO programs in order to enlarge impact and visibility.

IOC-UNESCO listened to the call raised by international agreements, which effectively commit signatories to take action with respect to the ocean health. Efforts of IOC-UNESCO on Ocean Carbon include firstly advocacy and communication, and secondly the promotion of research and oriented actions towards capacity building.

One of IOC-UNESCO missions is to enhance the sensitivity for ocean carbon, and it changes in the open and coastal ocean not only among scientist but also to the public, the stakeholders and the decision makers. A few examples include: The Blueprint report for ocean and coastal sustainability, which aimed to provide a statement on sustainable development of the ocean, as well as analyze current challenges in ocean and coastal management. Further on the IOC has promoted and lead an Ocean Acidification Summary for Policy Makers. Besides that the IOC supports the Ocean Acidification International Coordination Centre, operated by the IAEA Marine Environmental Studies Laboratory in Monaco. The Centre is overseen, by an Advisory Board consisting of leading institutions, including the IOC. With regard to coastal areas, the involvement of IOC-UNESCO in the Blue Carbon Scientific Working Group formed in February 2011 is of special importance. It provides the scientific foundation for the Blue Carbon Initiative by synthesizing current and emerging science on blue carbon and by providing a robust scientific basis for coastal carbon conservation, management and assessment.

Activities within this initiative include actions at several intervention sites and publications, especially the Field Guide to assess Blue Carbon stocks in collaboration with CI.

Overall Goal/Objective

The objective of the project is to answer the call for improved understanding about the economic and social value of marine ecosystem services and how those will be altered by increased CO_2 levels and direct destruction.

Main expected results

Expected Result 1

Evaluation of ocean acidification trends and effects on marine ecosystem processes and services

Expected Result 2

Determination of the impact of human induced changes in Blue Carbon Ecosystems

Activities and outputs/deliverables relating to the achievement of expected results

What are the key activities to be carried out in order to produce the expected results?

The project will focus on two major subjects: (i) Evaluation of ocean acidification on marine ecosystem processes and services and (ii) Determination of the impact of human induced changes in Blue Carbon Ecosystems.

The key activities will concentrate on a strong participation in the Global Ocean Acidification Observing Network (GOA-ON) Executive Council, initiation of socioeconomic field studies, global and regional mapping efforts of tidal marshes and sea grasses, building local capacities to assess carbon stocks in Blue Carbon Ecosystems, which will be broadened to assess the human impact on ecosystem services and finally broadening the scope of blue carbon research to investigations conducted on kelp forests.

Activity 1 – expected result 1: Global Ocean Acidification Observing Network
Output/deliverable 1.1 N.1.1 Vision plan for the Global Ocean Acidification Observing Network
Activity 2 – expected result 1: How does OA alter ecosystem services ?
Output/deliverable 2.1 N.1.2 Compilation of existing socio-economic studies with regard to Ocean Acidification **Output/deliverable 2.2** N.1.3 Report on the economic impact of Ocean Acidification based on key species research
Activity 3 – expected result 2: Mapping of blue carbon ecosystem
Output/deliverable 3.1 N.2.1 Quantification of sea grasses and tidal marshes worldwide
Activity 4 - expected result 2: Evaluation of human induced changes on Blue Carbon Ecosystem
Output/deliverable 4.1 N.2.2 Application of the Field Guide to assess Carbon stocks and valuation of ecosystem services (quantitative & qualitative) at 3 intervention sites
Activity 5 - expected result 2: Kelp forest
Output deliverable 5.1 N.2.3 Report on the role of kelp forests on the marine carbon cycle

Beneficiaries and stakeholders

Climate scientists; local economies (e.g. oyster industries, aquaculture companies), scientists working on the role of coastal and open ocean ecosystems in global, regional and landscape biogeochemical cycles; political bodies involved in international marine, coastal, and climate agreements; intergovernmental funding and other related agencies (for example the World Bank, the Global Environment Facility, multi-lateral banks); regulatory agencies charged with protecting and managing coastal systems; non-governmental organizations; and local communities, UNESCO, UNEP, IAEA, UNFCCC, international banks (GEF,WB, ADB, IAB), and the Convention on Biological Diversity.

Implementation strategy

Enhanced and improved cooperation of ocean carbon monitoring and research activities in coastal areas and the open ocean will be the foundation for the implementation. In the process IOC-UNESCO will use workshops and meetings to enhance and encourage global and regional collaborations. One strong partner for the activities in light of Ocean Acidification will be the Ocean Acidification International Coordination Centre **(**OA-ICC). The IOC is involved in the Executive Council of the GOA-ON and will assist in the preparation and implementation of the GOA-ON action plan, using existing tools like the Global Ocean Observing System (GOOS) and the Surface Ocean CO2 Atlas (SOCAT).

In case of the Blue Carbon activities the established collaboration with CI and IUCN will continue and with the help of this project new application studies can be conducted. It is highly important to develop new local and regional capacities, which is possible with the use of the newly released field guide. Furthermore the support of NGO global organizations, ESA and NASA will be used to accomplish the mapping of ecosystem services. In addition the incorporation of kelp forests within this field of science opens up new possibilities to encourage private companies and local stakeholders to get involved in the protection of the coastal habitat.

In general one major component is maximizing the awareness for indirect and direct threats to the coastal and open ocean induced by unsustainable use of the marine resources. Innovative actions to raise the awareness and the public interest for the emerging threat for human and marine health will ensure that nations will have access to the necessary information to adapt national, regional and global plans.

Sustainability and exit strategy

Proposed activities are in partnership with (i) relevant national institutions and are anchored in these; and (ii) relevant regional bodies that link and anchor with national ministries of foreign affairs.