

IAEA activities currently undertaken related to the impacts of Ocean Acidification on the marine environment

The IAEA contributes to building Members States' technical capacity for applying nuclear and isotopic techniques to climate change study to enhance knowledge on ecosystem functions and climate change trends and impacts, including ocean acidification. Capacity building is carried out through Coordinated Research Projects and the IAEA Technical Cooperation Programme (TCP).

Recognizing that an interdisciplinary approach is necessary for climate change studies, the Agency has facilitated discussions and collaboration between experts in geochemistry, biology, fisheries and economics. The aim is to build connections between the different disciplines and to target priority support for Member States dependent upon marine resources in a time of rapid environmental change.

Ocean Acidification International Coordination Centre (OA-ICC)

The IAEA announced at Rio+20 UN Conference the establishment of the project "Ocean Acidification International Coordination Centre (OA-ICC)" at the IAEA Environment Laboratories in Monaco.

The goal of the OA-ICC is to serve the OA actors (scientific community, policymakers, media, and the general public) by facilitating, promoting and communicating a number of global actions on ocean acidification which are not currently funded at national or international levels. These include international observation, joint platforms and facilities, collaboration between natural, social and economic sciences, exchange of students and scientists, joint experiments, definition of best practices, bibliographic database, data management, capacity building and dissemination.

The Centre is supported by several IAEA Member States and through the IAEA Peaceful Uses Initiative (PUI). It will be advised by an Advisory Board consisting of leading institutions, including the Intergovernmental Oceanographic Commission of UNESCO, the U.S. National Oceanic and Atmospheric Administration, the U.N. Food and Agriculture Organization and the Foundation Prince Albert II of Monaco, as well as by leading scientists and economists in the field.

Coordinated Research Project of the economic impact of ocean acidification on coastal society

To address the current bias of North-North collaborations in ocean acidification research, the IAEA has begun in 2012 a four-year coordinated research project (CRP) focused on key ocean ecosystems south of 30°N latitude. The overall objective of the project is to evaluate potential biological and socio-economic impacts of ocean acidification, and the implications for sustainable food security for coastal society. The CRP targets productive coastal boundary currents, tropical coral reef habitat, and semi-enclosed seas. Currently six IAEA Member States, including Chile, Brazil, Ghana, Kenya, Kuwait, and the Philippines are participating in regional case studies of potential ocean acidification impacts on fisheries and fisher communities. Radiological techniques are being used to determine biological effects of acidification on valuable aquaculture species and habitats. Coastal monitoring of physical and biological data is being performed for baseline measures. Sociological and harvest

surveys of artisanal and industrial fisheries are being collected to determine fish catch to investigate human vulnerability to acidification. Technical training in bio-economic modelling (from the United States and Canada) with dynamic climate scenarios will scale impacts of global ocean acidification to regional coastal ecosystems in terms of economic gains and losses to direct users and supported communities (fishers, processors, jobs, and households). The CRP supports the transferral of new knowledge to a network of developing Member States, and will promote institutional capacity for research and training in ocean acidification regionally.

2nd International workshop on socio-economic impacts of ocean acidification

The IAEA has expanded its support for collaborations among international researchers on the effects of rising acidity of ocean water on marine organisms of high ecological and economic importance.

Through biennial international multi-disciplinary workshops, scientists meet to discuss the topic “Bridging the Gap between Ocean Acidification Impacts and Economic Valuation.” The goal is to generate interdisciplinary recommendations to policymakers on the emerging issue of ocean acidification. The 2012 workshop focused on regional scale scoping of potential impacts of ocean acidification on seafood security.

General conclusions emphasized the need to support seafood-dependent communities through capacity building and adaptive management of fisheries and aquaculture resources. Recommendations of options to respond to ocean acidification included: protecting coastal ecosystems and habitats for local mitigation, improving ecological resilience through well-managed Marine Protected Areas, and encouraging adoption and adaptation of aquaculture standards and practices to lessen exploitive stress on natural communities and aquatic food species. Several areas of research remain to be explored in the future. More research is needed on direct and indirect effects of ocean acidification on finfish and shellfish, and combined physical factors. Integrated mapping of multiple ecological stressors (acidification, warming, hypoxia, and pollution) continues to be a priority for climate-related ocean research. Multidisciplinary data collections are required for development of bio-economic models and vulnerability assessments of coastal zones and fisher communities to account for effects of ocean acidification.

The complete proceedings of the Workshop will be published in 2013 in cooperation with IUCN.

Nuclear and isotopic applications to assess the impact of ocean acidification on the marine environment and its resources

Nuclear and isotopic technologies are being successfully applied at IAEA-Environment Laboratories to investigate biological responses to contaminants and algal toxins of marine organisms under current and projected environmental conditions. Experiments are carried out to assess direct and indirect impacts of ocean acidification and warming on key species for fisheries and aquaculture, looking at the sensitivity and bioaccumulation of trace elements modulated by the ocean chemistry change. These high-resolution experiments, using key species such as shrimp, corals, cultivated oysters or pteropods, provide clear indication of physiological effects of high CO₂ concentrations in seawater, bioaccumulation of trace metals, and the process of bio-mineralization. Results of such experiments can help project what may happen to marine organisms and ecosystems under

conditions of altered carbonate availability and reduced pH in the oceans. Similar approaches are now being taken to study, in the context of climate change, the impacts of harmful algal bloom (HAB) toxins on marine organisms. This is especially useful in determining the vulnerability of high value oceanic resources such as coral reef habitats and important seafood species. The IAEA-Environment Laboratories is one of the few laboratories in the world that uses radiological techniques to provide answers to questions of environmental change relevant to society today.