2022 United Nations Ocean Conference Side Event

Ocean Negative Carbon Emission and Sustainable Development

Thursday, 30 June, 1:00pm – 2:15pm (UTC/GMT+1), Online

Organized by: Global ONCE, Future Earth, PICES, ICES, IMBeR, OCEANETs

Background on the event

With the 2030 Agenda for Sustainable Development and the Paris Climate Change Agreement adopted in 2015, the issue of securing mitigation and adaptation solutions to climate change became ever more central to both national and global agendas. The ocean has the potential to store globally significant amount of CO2, but approaches to enhance carbon sequestration require development and evaluation. In order to maintain global temperature rise to less than 1.5℃, we will have to use mechanisms that increase the uptake of carbon dioxide from the atmosphere to either the land or the sea – known as negative emission technologies or carbon dioxide removal.

Key Issues discussed

- Ocean-based actions cover both mitigation and adaptation and range across four clusters (Decisive, Low Regret, Unproven, Risky) and ocean-based climate actions should be scaled-up by: 1) prioritizing Decisive and Low Regret; 2) improving knowledge on the Unproven measures; 3) cautiously weighing the Risky ones.
- To conduct the ocean-based innovative research, we need research facilities like Aquatron Tower Tank Facility Seabed, Marine Ecosystem Chamber System (MECS), Mini-MECS, the floating platform sea, seabed scientific observation subnetwork as well as marine ranching facilities.
- The mechanism for carbon sequestration in the ocean includes 1) Biological Carbon Pump (BCP), 2) Carbonate Counter Pump (CCP) and 3) Microbial Carbon Pump (MCP). MCP is different from the other two, because it can take place to any depth in the water column. What we need to do is to study the synergies between these three pumps since they are taking place at the same time in the real world. If we cannot control the boundary conditions, we could reach the maximum outputs of all these three pumps in forms of inorganic and organic carbon simultaneously for barrier in the sediment.

- Microbes are relevant not only as key players in biogeochemical cycles and food webs but also as climate regulators.
- Knowledge of microbial processes is required for evaluating, implementing and monitoring progressive approaches for ocean negative carbon emission.
- Ocean iron fertilization as an approach for atmospheric carbon dioxide removal. Studies show that natural iron are productive to sequester more carbon, but there is still a lot of research and development needed. Harmful algal blooms and things that were not observed in experiments that need to be studied other greenhouse gases that we measured that would offset some of the carbon dioxide, greenhouse gas drawdown.
- Adding alkalinity to the ocean can contribute to achieving negative carbon emissions: 1) Wastewater and coastal waters provide low pH, high pCO2 and organic acid rich sites for effective ALK addition; 2) Export of ALK modified water to the ocean may create an effective, safe and low-cost pathway for OAE and ONCE.
- Multiple assessments underway to inform governance of mCDR. Assessment itself is an act of governance – the selection and weighting of criteria depends on who is in the room. Diversifying types of knowledge involved in mCDR assessment process will produce more politically and societally relevant outputs.

Key recommendations for action

- International collaborative and interdisciplinary efforts (such as ONCE) are urgent.
- More innovative tools, integrated climate models, statistical techniques to link data and correlate disciplines are needed.
- Efforts to inform policies and educate the public needed to increase awareness and gather support.
- Lab and field experiments and regional and global scale models are needed to study the implementation of the strategy and its environmental and biological impact.
- Assessment to inform governance of mCDR approaches must address more than technical and environmental aspects – political and societal feasibility is critical.
- The next steps for Global ONCE are to develop a coordinated network of coastal and ocean study sites and experimental infrastructure available for collaborative experimental research relevant to carbon sequestration. Global ONCE will continue to co-design model and observational experiments including developing evaluation metrics and governance frameworks and promote capacity development and public outreach. We hoped to stimulate discussions that could lead to future collaborations and joint research projects as well as stimulate further information exchange to a range of scientific and societal audiences.

Voluntary Commitments

Global ONCE will undertake and facilitate science required to evaluate and implement eco-technological interventions, including learning from paleo-oceanic carbon processes to predict the future, restoring impacted marine ecosystems, fostering nature-based systems of land-sea integrated management, upwelling manipulation, microbial-driven comprehensive carbon sequestration, adjustment of nutrients, DO and pH. Global ONCE will 1) develop an international network of field stations and research facilities, 2) co-design interdisciplinary collaborative research, 3) develop an evaluation framework for mitigation and adaptation approaches, 4) co-ordinate capacity building and 5) facilitate equitable policy, governance and societal understanding.