

## Information for CLIVAR SSG from IMBeR - March 2021

Thankyou for giving IMBeR the opportunity to present some ideas for continued and future collaboration between IMBeR, CLIVAR and other partners.

IMBeR's mission is *To promote integrated marine research and enable capabilities for developing and implementing ocean sustainability options within and across the natural and social sciences, and to communicate the relevant information and knowledge needed by society to secure sustainable, productive and healthy oceans*

Our aspiration is to undertake activities and produce outcomes which impact marine policy and governance, which will therefore likely lead to a change in behaviour, and an increase in societal ocean literacy and capacity in interdisciplinary marine science.

### Historical, current and potential future collaboration between CLIVAR & IMBeR

IMBeR has historical links with CLIVAR activities, such as the CLIVAR/CLiC/SCAR Southern Ocean Region Panel with the IMBeR Southern Ocean Regional programme ICED.

The Integrated Ocean Carbon Research program is an IOC working group formed in 2018 through a collaboration of several international programmes including SOLAS, IMBeR, and IOCCP to contribute to the science elements of the UN Decade Implementation Plan. The overarching questions to be addressed are: Will the ocean uptake of anthropogenic CO<sub>2</sub> continue primarily as an abiotic process, what is the changing role of biology in the ocean carbon cycle, what are the exchanges of carbon between the land-ocean-ice continuum and how are they evolving over time and how are humans altering the ocean carbon cycle and resulting feedbacks. The group have recently produced a white paper led by Rik Wannikhof and Chris Sabine which includes CLIVAR, SOLAS, the Global Carbon Project and IMBeR authors.

About 5-7 years ago, IMBeR had a working group on eastern boundary upwelling systems in collaboration with CLIVAR. In 2017, members of this working group together with SOLAS SSC members wrote a successful proposal for a SCOR WG on EBUS led by Ruben Escribano and Ivonne Montes. So SOLAS, CLIVAR and IMBeR currently collaborate on upwelling research within this WG. IMBeR took the decision to not do any additional work on upwelling regions over and above that undertaken within this SCOR WG #155, but to revisit this when the WG comes to an end. The SCOR WG is due to end in 2021/22 – so this might be an opportunity to discuss whether there are potential future collaborative opportunities between CLIVAR, SOLAS and IMBeR on EBUS.

IMBeR has a task team or so-called innovation challenge to advance understanding of ecological feedbacks in the Earth System led by Eugene Murphy, Laurent Bopp, Marion Gehlen and Emma Cavan. They are currently preparing a paper to address questions on the approaches needed to model and project interactions between the ocean ecosystem and other components of the Earth System and how these interactions affect and are affected by climate, and how to incorporate ocean-human systems into Earth System models. They are contributing to a workshop at our next conference (see below) and potentially organising a small discussion group alongside our SSC meeting in May / June 2021 which may be of interest to CLIVAR.

Our next IMBeR conference will be held virtually in October/November this year. This will consist of three parallel workshops and some integrating activities such as a debate/discussion and a poster session. The three topics arose from suggestions from participants at the IMBeR Open Science conference in France in 2019 and from topics relevant to the modelling and governance themes in our science plan. Some of these workshops are potentially of interest to CLIVAR and potentially link to the WCRP Safe Landing Climates Lighthouse Activity. The first session will be co-chaired by Phil Boyd and Ulf Riebesell on climate interventions, and links to ongoing collaboration between IMBeR and SOLAS. The workshop will integrate ecological, economic, societal and regulatory aspects of carbon dioxide removal strategies. The second workshop 'Lighting the Grey Zone' co-chaired by Marion Gehlen, Desiree Tommasi and Jess Melbourne-Thomas, will assess and progress strategies to develop and test the integration of the human dimension into decadal coupled physical-ecological prediction systems. The third workshop co-chaired by David VanderZwaag, Karen Evans, Ingrid van Putten and Samiya Salim reviews ocean governance and climate adaptation, comparing national, regional and local approaches. Each workshop will produce a position paper, journal special issue or book.

IMBeR has a regional programme centred on the Indian Ocean – SIBER – members of whom are strongly involved in the 2<sup>nd</sup> International Indian Ocean Expedition. The co-chairs are Raleigh Hood and Greg Cowie. SIBER has six science themes linking the physical forcing that occurs in the Indian Ocean in terms of seasonally reversing boundary currents with variability in biogeochemistry and ecology - topics that CLIVAR colleagues also contribute to.

IMBeR has two new innovation challenges starting this year; these provide a mechanism by which we can undertake short term task driven activities. The first links well with the SOLAS interventions theme, however rather than technological or biogeochemical interventions, this would focus on interventions that enable the ecosystem to adapt. The activities of the group would include a combination of modelling and pilot experiments. The proposal is being led by Alistair Hobday, with input from the social scientists in terms of governance aspects. It also links to an ICES / PICES WG on ocean negative carbon emissions co-chaired by Nianzhi Jiao, Louise Legendre, Carol Robinson and Doug Wallace. Discussions at the SOLAS SSG in November 2020 proposed a combined IMBeR / SOLAS (and others) initiative on ecological and technological approaches to climate intervention.

The second new innovation challenge relates to managing blue carbon resources, with particular focus on governance, management and the cultural value of this ecosystem service. Prateep Kumar Nayak, Ruth Parker, Carol Robinson, and Alice Newton are taking this forward. We have a EuroMarine Foresight workshop sometime this year looking at non-traditional blue carbon ecosystems such as sediments and water column organic carbon, and a session at the ASLO conference in June with co-chairs from Australia, Spain, Denmark and Brazil.

IMBeR have an early career researcher network IMECaN <http://imber.info/imecan-interdisciplinary-marine-early-career-network/> (including socio-ecological and economic expertise) and organise a biennial summer school ClimEco that WCRP-CLIVAR may wish to link to, perhaps through the WCRP Academy.