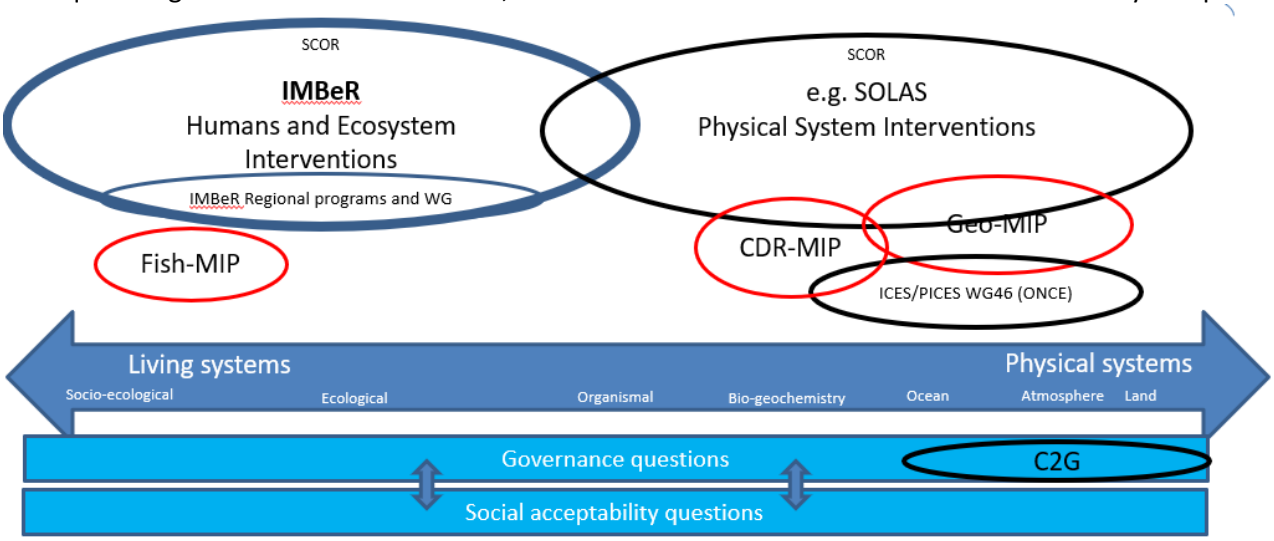
Innovation Challenge 5: Interventions to change the course of climate impacts

***The Challenge**: How can human intervention reduce the impacts of climate change on ocean life and human well-being?*

Climate effects on ocean systems are already occurring (e.g. coral bleaching, species range change, declining productivity), and a wide range of impacts will continue to occur with greater frequency, duration and intensity under climate change (e.g. marine heatwaves). Achieving the Paris Target will be difficult. Planned interventions will be required to preserve the benefits from oceans. To best select and prepare these, the implications and consequences of a range of perceivable interventions need to be assessed, and best practice approaches developed. Generic approaches and informed choices are needed since many regions will suffer the same problems and losses.

Adaptation-focused interventions (rather than mitigation focused) are defined here as local and regional interventions that seek to ameliorate the impacts resulting from accumulation of greenhouse gases into the atmosphere or ocean. Due to the residence time of gases in the atmosphere, climate change impacts will occur over the coming decades even with dramatic reduction in greenhouse gas emissions. Adaptation actions will be needed to avoid the worst outcomes for the environment and the people that depend on the ocean. Our focus will be on species, habitats and the people and communities that depend on the ocean, which are distinct from the interventions on the climate systems itself, which are the remit of other global initiatives. Across this continuum are common questions that must be resolved, including the appropriate and equitable governance of interventions, and which interventions will be considered as socially acceptable.



Objectives

The objectives for the IC are to

1. *Develop best practice guidelines for testing interventions in simulation models.*
    - This objective may be achieved by determining what models are appropriate for testing interventions such that a range of scenarios can be explored and in which unanticipated consequences can be detected.

2. *Development of methods to scale interventions from pilot experiments to "full scale" operational scale*
    - Interventions in pilot experiments may be low risk, but the risks in going to large scale implementation may be different.
3. *Development of decision rules for initiating interventions (e.g. defining thresholds)*
    - These decision rules may need to recognise political, societal, or environmental thresholds for action. Case studies may be helpful in illustration where decision thresholds were observed.
4. *Understanding and enhancing intervention governance frameworks (global, regional, national and local) for intervention.*
    - Interventions may be risky – governance may reduce those risks.

A rapidly changing ocean means intervention is necessary and will be interdisciplinary

The pace of climate change and increasing frequency of extreme events is already stressing living marine systems and the people that depend on the ocean. IMBeR recognises that intervention be help limit the negative outcomes of climate change and posits that successful intervention will require interdisciplinary approaches, as most interventions will influence more than just the focal species, habitat or community.

The Challenge cannot be addressed in isolation

This IC links to the current IMBeR Strategy and the three Grand Challenges in a range of ways.

- GCI: *Understanding and quantifying the state and variability of marine ecosystems*. The IC links to the GC, by assessing when intervention may become important in ecosystems, depending on the rate of change from the current state.
- GCII: *Improving scenarios, predictions and projections of future ocean-human systems at multiple scales.* Research as part of the IC will involve testing interventions in models and potentially in marine systems.
- GCIII: *Improving and achieving sustainable ocean governance*. The IC will seek to assess the social acceptability and potential governance arrangements that should accompany interventions.

This IC will also benefit from IC4 which seeks to *Advance and Improve the Use of Social Science Data for Ocean Management, Decision Making and Policy Development*. The IC will also be advanced by the activities of the IMBeR regional programs where intervention options are being investigated; for pelagic species (CLIOTOP), Antarctic systems (ICED), Arctic and sub-Arctic systems (ESSAS) and in the seas of the Indian Ocean (SIBER). Other activities such as SOLAS and those indicated in the figure also consider interventions in response to climate change, and we seek to engage with these efforts.

IMBeR is an international network that facilitates interdisciplinary marine research guided by three interconnected Grand Challenges to achieve sustainable ocean governance for the benefit of society. Sign up to IMBeR via http://www.imber.info/ to benefit from networking, mentoring and collaborative opportunities with world-class natural and social scientists, practitioners and researchers.

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