

## REPORTING FORM 2024

Please return completed form to [imber@ecnu.edu.cn](mailto:imber@ecnu.edu.cn) by **20<sup>th</sup> July**

**REPORTING PERIOD: WHAT YOU HAVE DONE** since the annual report submitted for the SSC meeting held in Paris in April 2023 ([Link to past annual reports](#))

and **PLANNED ACTIVITIES** over the next year (and beyond if details available)

**N.B.** The form focuses reporting on the research objectives (2022-2025) of the Grand Challenges (in order to align with how we are addressing IMBeR's commitments defined in the 5-year review process to SCOR and Future Earth).

**Thank you.**

*Insert name of Synthesis Activity*

*List authors*

---

### 1. Ongoing activities, in line with the IMBeR Grand and Innovation Challenges

*(Among other uses, information will be used to update the [IMBeR Annual Report to SCOR](#))*

#### 1.a. Grand Challenge I

*Understanding and quantifying the state and variability of marine ecosystems - with focus on Research Objectives 1 to 3:*

**Research Objective 1.** *Evaluate and predict the cumulative effect of multiple stressors*

**Research Objective 2.** *Integration of climate change and climate variability*

**Research Objective 3.** *Impacts on society – preparation for a changed future*

*Add text...*

#### 1.b. Grand Challenge II

*Improving scenarios, predictions and projections of future ocean-human systems at multiple scales - with focus on Research Objectives 4 to 6:*

**Research Objective 4.** *Development of integrated data systems and approaches for predictions and projections*

**Research Objective 5.** *Development of predictive models and projections for use at regional scales*

**Research Objective 6.** *Development of alternative scenarios to bridge the gap between physical climate sciences and humanities*

*Add text...*

### 1.c. Grand Challenge III

*Improving and achieving sustainable ocean governance - with focus on Research Objectives 7 to 9:*

***Research Objective 7.** Develop knowledge on best practices for multilevel governance approaches to ocean climate adaptation and mitigation*

***Research Objective 8.** Develop understanding on key ingredients for transformation towards more sustainable, equitable and inclusive governance approaches to fisheries and aquaculture*

***Research Objective 9.** Support implementation of post-2020 biodiversity targets for marine spatial planning and marine protected areas*

*Add text...*

### 1.d. Innovation Challenge 3

*To advance understanding of ecological feedbacks in the Earth System*

*Add text...*

### 1.e. Innovation Challenge 4

*To advance and improve the use of social science data for ocean management, decision making and policy development*

*Add text...*

### 1.f. Innovation Challenge 5

*Interventions to change the course of climate impacts*

Dr. Nina Bednaršek has been the lead and the only member of the Innovation Challenge 5 up until spring of 2024. This report contains the description of the four different activities done by Dr. Bednaršek with respect to the IMBER's list of the *Synthesis Activities* strategized at the IMBER meeting in Paris and proposed to be achieved by 2025.

**1<sup>st</sup> activity:** Dr. Bednaršek presented at the ECCWO-5 International Symposium's on the Effects of Climate Change on the World's Ocean (April 2023, Bergen, Norway) on the **Predictable patterns within the kelp forest can indirectly create temporary spatial refugia for ocean acidification**. This was done at session 18: Beyond blue carbon: Ocean-based carbon dioxide removal (mCDR) approaches.

At the conference, several members of the Innovation Challenge 5, gathered and discussed the potential of the connecting the blue carbon management topics with the climate change interventions, effectively connecting the activities of the Innovation Challenge 5 and 6. This activity relates directly to the ***Synthesis Activities on the Climate interventions into blue carbon management***.

**2<sup>nd</sup> activity:** Nina presented at the ESSAS (Ecosystem Studies of Subarctic and Arctic Seas conference) in May 2023 in Bergen, Norway (invitation and collaboratively with IC5 member, Sam Rastrick). This fostered a collaboration between the ESSAS efforts and the Innovation Challenge 5. Dr. Bednaršek presented on two topics:

- Predictable patterns within the kelp forest can create temporary spatial refugia for ocean acidification;
- Natural ocean acidification analogues in the subpolar and polar Northern regions: a synthesis study.

The discussion at the ESSAS conference was conducted with the aim to develop the adaptation and mitigation aspects on the regional level (e.g. IMBeR e.g. Arctic, coastal) or by sectors (e.g. Aquaculture, fishers, shipping), also including the topics into the ICES report on carbon and fisheries and adaptation strategies for the fishery industry to limit emissions and effects on the carbon cycle. This work directly relates to the IMBeR's Synthesis activities on the ***Case studies on climate interventions across regional to global level.***

**3<sup>rd</sup> activity:** Dr. Bednaršek has also been an IMBeR representative for the IOC-R (Integrated Ocean Carbon Research), attended the meeting in Brussels (May, 2023). She was involved in two work groups (Theme 2 and 4), she was a rapporteur on Theme 4 and led or co-lead several writing sections of the updated IOC-R report. The content of the two teams addressed for IMBeR:

#### **Theme 2: What is the (changing) role of biology in the ocean carbon cycle?**

This theme addressed these gaps:

- How do changes in the physicochemical environment affect biological production?
- How do changes in the physicochemical environment affect carbon transfer/sequestration/respiration /dissolution?
- How do changes in functional biodiversity affect carbon production?
- What is the role of viruses / microbes ?
- What is the impact of changes in ocean circulation on the biological carbon pump?]
- What is the impact of changes in ocean acidification on the biological carbon pump?
- How does adaptation / evolution affect the rate of carbon production and release?
- How do regime shifts / distribution changes / tipping points in functional diversity affect carbon production and release?
- How do changes in rates (production/ remineralisation/ dissolution) affect the BCP?
- How do changes in functional diversity of pelagic calcifiers affect carbon production?
- How do human influences change functional diversity?

#### **Theme 4: How are humans altering the ocean carbon cycle and what are the resulting feedbacks?**

This theme addressed these gaps:

**a. Impact of climate change (multiple stressors) on the carbon cycle across scales and extreme events**

**b. Impact of anthropogenic pressures on carbon cycle across scales – Gaps in understanding the impacts of trawling, fishing, structure building, mining, dredging, marine renewables, pollutants (plastics and others), shipping, increased run-off from the rivers and sediment built-up, effect of**

large wind farms on altering stratification and mixing, impacts of hydroelectric changing river's seasonal cycle, related effects on the carbon cycle in the fjord system and related marine ecosystems, eutrophication, of mesopelagic fishing (fish, krill removal, etc.), of aquaculture (fish, kelp/macroalgae/seaweeds, shrimp) farm

### **c. Marine carbon dioxide removal (mCDR)**

Placing this in the context of the IPCC, that this topic should be addressed, legislated and regulated, need to address the efficiency, feasibility, scalability, etc., what are ecological risks and impacts of mCDR, need to explain why the success depends on where the water ends up (if subducted, then this would be successful), how to support direct CO<sub>2</sub> capture on land.

Dr. Bednaršek led the writing of the section on this report: **New process studies and experiments**

Dr. Bednaršek also co-wrote the chapter in the IOC-R report related to the **Future changes in the carbon cycle from deliberate ocean-based climate interventions**, as well as the **Role of biology in the ocean carbon cycle?**

All of these activities directly relate to the IMBeR's proposed Synthesis activities:

- ***Gap analyses on climate interventions***
- ***Case studies on climate interventions across regional to global level***

**4th activity:** Dr. Bednaršek is also part of the scientific steering committee for the Ocean Acidification (OA) Mediterranean Hug. In collaboration with the OA Mediterranean Hub, dr. Bednaršek has led and designed the survey on the topic of Marine Carbon Dioxide Removal techniques in the Mediterranean: status quo, gaps and recommendations. The survey has been well shared via our newsletter (>80 members) and on the social media accounts (Twitter, Facebook, Instagram) and our personal LinkedIn accounts, through the MedECC network. Important aspect is that 50% of the surveyors were from the government and 50% from the academia. This was specifically designed so that the survey would directly relate to the IMBeR's proposed Synthesis ***Understanding and enhancing intervention governance frameworks (global, regional, national and local) for intervention.*** Dr. Bednaršek is currently analysing the results of the survey and plans to submit the manuscript in a month.

In spring 2024, new member **Dr. Rowan Trebilco** became a co-champion of the IC5. Dr. Bednaršek and Trebilco has several discussions on the activities that would contribute to the proposed Synthesis activities. The ideas continue being discussed and developed, with the prevailing idea of having a multi stakeholder workshop (coordinating with IMECAN, potentially co-branded/convened with FISH-MIP). These activities are currently undergoing.

**1.g. Innovation Challenge 6**

*Sustainable management of Blue Carbon ecosystems*

Add text...

---

**2. Selected highlights****2.a. Selected scientific highlights since last report (1-5)**

*Last report was submitted to SSC meeting, April 2023*

Add text...

**2.b. Publications since last report**

*Please add all publications since last report to the table below (see notes for details on “Class” and “Activity” fields).*

<b>Publication with DOI</b>	<b>Class 1, 2, 3</b>	<b>Activity*</b>
<i>[Add more rows if needed]</i>		

*\*If appropriate, please list the IMBeR activity through / by / from / during which the publication arose*

**\*\*\*\*Notes on publications\*\*\*\***

Publications are logged in the IMBeR Zotero library which is publicly accessible online –

[Publications since 2016](#) | [Publications prior to 2016](#)

Publications are categorised by “Class” and linked to “Activities”:

**Class 1 publications** are specifically generated through/by/from/during **IMBeR activities** - for example, arising from IMBIZOs and IMBeR conferences such as the IMBeR open science meeting and the IMBeR West Pacific symposia and from the activities of the working groups, regional programmes and the SPIS scoping teams.

**Class 2 publications** are on topics relevant to the IMBeR Science Plan that benefitted from some interaction with IMBeR or **IMBeR activities**, for example by IMBeR symposium attendees, past and present SSC members, working group, regional programme and endorsed project members, or national contacts.

**Class 3 publications** are on topics relevant to the IMBeR Science Plan but for which there is no direct link to or benefit from an IMBeR activity. These might include publications by SSC members, working group, regional programme or endorsed project members or members of the IMBeR international community that were written as part of the normal scientific activity of the authors and would have occurred irrespective of IMBeR's existence. You can report Class 3 publications, but they will no longer be logged in the IMBeR database.

[See "[What is an IMBeR publication?](#)" for further information]

**Why list 'Class' and 'Activity'?** This helps us to declare authentically which publications IMBeR has helped to generate, and it makes it easier for us to demonstrate the value of the Regional Programmes, the Working Groups, and IMBeR in general, and it helps us to justify support for IMBeR activities when we can list tangible outputs.

## 2.c. Events, Meetings, and Workshops

*List all international and national events, meetings and workshops. Describe the level of participation: e.g. chairing session/workshop, organising meeting. Include Endorsed Projects committee meetings and workshops.*

*Format: Title of event. Date. Location. Description of participation. Any other pertinent details.*

*Add text...*

---

## 3. International collaboration and links

*Add text...*

---

## 4. Input to management, policy and SOCIETY\* over the last year

*Add anything that is not covered under "1.c. Grand Challenge III"*

*\*As previous reporting forms requested 'input to management and policy' only, please add any 'input to society' not captured in previous reports*

*Add text...*

---

## 5. Education, outreach and Capacity Development

*Add text...*

---

## 6. Planned activities

### 6.a. Activities and Outreach and how they link to the Challenges (including, but not limited to convening sessions, meetings, summer schools, workshops, etc)

*Add text...*

### 6.b. Upcoming papers (Community-Position-Review-etc)

*Add text...*

---

## 7. Funding

### 7.a. Funding from external sources

### 7.b. Funding proposals in progress or planned

### 7.c. Funding requested from IMBeR for 2024-2025

*Include a brief budget and justify requests*

---

## 8. Changes to Organisational Structure

*Add text...*

---

## 9. Images / Figures

*\*\*\*\*It is always good to have some recent photos / figures / infographics to create more exposure for the Regional Programmes, Working Groups, etc. These can range from those suitable for a very scientific audience, to those that would engage the general public. IMBeR would use these, on the website (e.g. <http://www.imber.info/> and <http://www.imber.info/en/news>), in tweets (@imber\_ipo), in presentations, etc. In addition, Future Earth (one of our sponsors) regularly asks us to provide high quality images for their glossy reports. These can highlight the activities of IMBeR and their other Global Research Projects (see pdfs of past Future Earth reports here <https://futureearth.org/publications/annual-reports/>)*

*So, please provide any images that you might think are useful. These can be pasted in this document or emailed as an attachment to [imber@ecnu.edu.cn](mailto:imber@ecnu.edu.cn).\*\*\*\**

---

## 10. Anything not covered above

*Add text...*

---

**11. How to improve this form**

*Please give suggestions on how to improve this form and make it better next time.*

*Add text...*

---

**12. Appendices**

*Add appropriate meeting / workshop reports and include URLs (this helps to track where online content is missing)*

*Add text...*