MEOPAR

Canadian Integrated Ocean Observing System (CIOOS) Pilot Phase
PROTOTYPE REGIONAL ASSOCIATIONS

Request for Statements of Work

Canadian Integrated Ocean Observing System (CIOOS) Pilot Phase: Request for Work Plans

A. Towards a Canadian Integrated Ocean Observation System

A Canadian Integrated Ocean Observing System, built through a public, private and academic partnership, will bring together and leverage existing Canadian and International ocean observation data/programs/projects. It will generate value-added data products on an open web-based platform that maximizes utility to end-users, and provide timely access to a broad range of environmental information.

This Request relates to the initial two year pilot phase as the basis for establishing a sustained national approach.

Canada has the longest coastline of any nation in the world, making the ocean of great cultural and economic importance nationwide. To meet diverse needs for information, ocean observations are conducted by numerous sectors in Canada, including government, academia, industry, non-governmental organizations (NGO), as well as, increasingly, by the general public through citizen science. Using a variety of platforms and sensors, these groups collect large amounts of data. However, Canada currently lacks a national vision and strategy for ocean observation. As a result, there is also no national-level coordination or collaboration mechanism which allows for integration of data from various sources in order to make them available for end-users. Canada's lack of a national integrated approach leads to fragmented and isolated data as well as overlap and gaps in ocean observation and research. To effectively and efficiently observe the ocean, Canada needs an integrated ocean observing system.

Consequently, multiple Canadian organizations have been collaborating over the past several years to bring Canada's ocean observing community together. As part of this effort, the community has written two white papers; [A Canadian Contribution to an Integrated Atlantic Ocean Observing System (IAOOS)](), and [Towards a Unified Vision for Ocean Data Management in Canada: Results of an Expert Forum](). Building on these, Fisheries and Oceans (DFO) funded three investigative evaluations into data management, cyberinfrastructure, and data visualization, related to the development of a national integrated ocean observing system (the reports of these investigative evaluations are available on MEOPAR's website, www.meopar.ca). The results of these collaborative efforts suggest that the ocean research community is well-positioned to undertake an initial roll-out of a national Canadian Integrated Ocean Observing System or CIOOS. The initial focus, intended as a proof of concept, will target ocean data management which is envisioned as one of a range of activities that will comprise the scope of a fully mature CIOOS.

The agreed upon architecture for CIOOS is based on the creation and integration of Regional Associations covering Canada's marine areas. Once Regional Associations have been identified, a governance structure, including an Executive Committee, will be established to ensure that the RAs adopt a consistent approach with the goal of establishing a coherent and integrated national system. The Executive Committee will ensure interoperability, multi-sectoral partnerships, and national and international functionality. Each RA will be expected to participate actively in the Executive Committee. MEOPAR will contribute to and provide additional resources for national project management of the initiative.

MEOPAR's Strategic Plan (2012-2017) identifies Ocean Observation as one of the Network's 4 challenge areas with "establishment of a national, multi-sectoral approach to ocean observation and data management" as the key intended outcome for this challenge area. MEOPAR's Observation Core, in particular, "promotes national and international sharing of data and expertise, and works to support the coordination of observation programs". Hence MEOPAR will support the establishment of CIOOS through its Observation Core in order to deliver on a key outcome of its strategic plan.

A comprehensive ocean observing system, such as the proposed CIOOS, is essential for evidence-based decision making and policy development and is therefore also of interest to DFO, given its mandate for ocean stewardship and the potential of CIOOS to deliver a wide range of benefits to Canada. MEOPAR intends that its support for CIOOS will align directly and seamlessly with DFO's interests. DFO has indicated future support for CIOOS, consequently work plan proposals received in response to this request will be shared with DFO as well as with other organisations interested in supporting the establishment of CIOOS.

The overall funding level for the first 2 years (until March 31, 2020) will be up to **$3.75 million** to fund up to three Regional Associations and the National Web Presence. The suggested allocation of this overall funding envelope for development of the National Web Presence is equal to or less than 15 % (i.e. $562,500 max)

B. Structure of the Request

The pilot phase for CIOOS should demonstrate the feasibility and utility of the coordination of ocean observation in Canada making use of multi-sectoral Regional Associations which will work together cooperatively as part of a national system. The request for work plans is structured to ensure that all funded partners can work together cooperatively towards a common goal and that data holdings of the Regional Associations will be interoperable and consistent with international standards.

The timeline for the initial pilot phase is starting in July 2018, and concluding by the end of March, 2020. While there is every intention to support CIOOS for a longer period, this will be conditional on the progress made in this phase. The evaluation of proposals will be conducted by MEOPAR's Research Management Committee (RMC) with the participation of external experts.

C. Pilot Phase Expectations

The pilot, proof-of-concept phase for CIOOS, should establish three prototype Regional Associations, a national web-presence, and the tools and processes that will be the foundation for future development. The prototype Regional Associations (RAs) will engage with data providers and users, and work cooperatively to demonstrate management, dissemination and interoperability for an initial subset of essential ocean variables (EOVs; see Annex I), as well as applicable and appropriate visualization tools and applications.

In the pilot phase, up to three RAs will be established covering data management needs for Canada's Pacific and Atlantic coasts and the Gulf of St. Lawrence[1]. As CIOOS must cover all of Canada's marine areas, in subsequent development stages, the system will expand to cover additional areas, including the Arctic and Inuit Nunangat. CIOOS will also develop "thematic nodes" for handling of complex data types and/or model output at the national scale. At a later stage, CIOOS aims to develop capacity to

---

[1] Pacific covers the coastline of British Columbia, Atlantic covers the coast of Labrador, east coast of Newfoundland and Nova Scotia, and the Bay of Fundy. The Gulf of St. Lawrence includes the Gulf, the Estuary and the River.

coordinate regional observation programs. The planning for these additional elements will run concurrently with the pilot development phase. The RAs will be expected to participate in those discussions.

During the pilot phase, the RAs will work cooperatively to deliver:
- a scalable, interoperable system for data assembly, management, quality control and dissemination for essential ocean variables (EOVs)
- cyberinfrastructure solutions that are fit-for-purpose and scalable for future needs
- management of an initial, limited set of essential ocean variables (EOVs) for its region.
- data access and visualization tools that promote data access by end-users.

In delivering this, the RAs must:
- engage with regional data providers and end-users that will promote the use of CIOOS as a national system for handling ocean data, as well as the use of such data for decision-making as well as scientific research
- meaningfully and appropriately engage and partner with Indigenous (First Nations, Inuit, and Métis) governments, organizations, and communities, when and where appropriate, ensuring Indigenous sovereignty and territorial rights are recognized.

As a separate part of this call, individual prospective RAs, teams of prospective RAs or other entities can propose to develop and maintain CIOOS' national web-presence. This will include a searchable metadata catalogue of data held by the regional associations and other connected data-provider nodes. The national web presence will also develop the branding and "look-and-feel" for CIOOS that will be used by all the regional associations.

See Section G for more details.

D. Requirements

Each application will identify a Project Lead as well as any additional participants who will receive funding. The work plan will define clear deliverables for each of the 2 years of funding, as well as concrete and measurable milestones for each of the 2 years. The milestones should be accompanied by risk assessments where appropriate.

The deliverables and milestones will form the basis for annual reporting of information and assessment of progress and will include information such as: cash and in-kind funding from partners; a progress report; explanation of any delays and/or work plan changes; corrective actions; etc.

The Project Lead for each group receiving MEOPAR funds will enter into a Performance and Reporting Agreement (PARA) with the Network, which will identify funding schedules as well as reporting timeline and processes.

It is the responsibility of the Project Lead to ensure that all necessary certifications, permits, licenses and other approvals have been obtained before any work is carried out in whole or in part. If an environmental or ethics assessment is required for the proposed work plan, MEOPAR will need a copy of the appropriate institutional certification committee approval prior to funding start.

E. Budget

A detailed budget with specific breakdowns and justification for each category, as well as

relationships between the Project Lead and other funded team members, is required. For example, in the "Personnel" section, be specific about the number of people to be hired and their status (Research Associate, technician, summer student, etc.). If listing in "Equipment" category, specify the type of equipment, approximate cost and rationale for purchase or rental. If listing in "Travel" category, include information such as the intended destinations and number of people traveling. Differentiate between travel required for user-engagement activities, travel related to the Annual Scientific Meeting and CIOOS Executive Council meetings.

Applicants for RAs and/or the National Web Presence must include funding for at least one representative to attend MEOPAR's Annual Scientific Meeting during each year that the project will receive funding. These will be held in the following locations:

Date	ASM Location
June, 2019	Victoria, BC
June, 2020	Ottawa, ON

Additionally, the applicant should budget for a representative to attend a) two CIOOS Executive Committee meetings and b) two centrally hosted technical workshops per year. The hosting responsibilities for CIOOS executive meetings will rotate between the RAs and non-travel expenses for hosting one meeting should also be budgeted.

The budget must be submitted in the format of the attached template (Appendix B). For Non-NCE contributions from partners, indicate in the attached template (Appendix C) whether partner contributions are in the form of cash or in-kind. Review the NSERC Guidelines on Eligibility and Value of In-Kind Contributions. Proposals and letters of support should clearly explain the nature of the participation and any financial commitments. Generally, applicants should seek to identify partner support (cash and/or in-kind) which meets or exceeds 25% of total costs required to perform the work plan.

Following approval in principle, final project activities and budgets will be negotiated with the selected RAs.

The first year of the project is July, 2018 – March 31, 2019. MEOPAR's fiscal year closes on March 31 and funding for the following year will be released in April 2019, conditional on compliance with all requirements in Year 1.

F. Intellectual Property

The ownership of Intellectual Property (IP) supported by MEOPAR research grants is determined by the policies and by-laws of the participating host organizations (see Work Plan Description for details about 'host organizations'. The authority and responsibility for making decisions regarding the legal protection and commercialization of IP rests with the owners of the IP and/or their institution. MEOPAR asserts no claim to any intellectual property, but reserves the right to use the results of the work for reporting and promotional purposes.

However, proposals must clarify their position on IP issues, under the general guidance that the principle of CIOOS is for a free, open and accessible system available broadly. Thus, while constructing the regional associations and national web portal, it is expected that any code developed should be tracked using a revision control system such as GitHub, and made public so others may make use of the tool. GitLab, open source software for a self-hosted version control code repository similar to GitHub, is also an option.

G.   Procedure

Two types of work plans can be submitted:
- Work Plan Type 1 for a Regional Association (RA)
- Work Plan Type 2 to establish a national CIOOS web-presence

If an organisation is proposing both types of work plans, they should be submitted as separate documents.

Submission should respect the word or page limits indicated.

Documents should be single-spaced (no more than six lines per inch), 12-point Times New Roman font, with margins not less than 0.75".

Work Plan Descriptions

1. **Cover Page (1 page)**
   - Name of the regional association (RA) and the geographical region that the RA will address.
   - The Project Lead's name, position title, organization, address, phone number and email address.
   - Names of any additional ot co-lead participants who will receive funds directly. List the name of each individual, their position title, organization, phone number and email address.

For Regional Assocation Work Plans (Type 1):

2. **Regional Association Overview Information (1 page)**
It is expected that each of the RAs will be affiliated with a host organisation[2] capable of receiving and managing funds from MEOPAR and/or government. The host organization must be able to provide human resource and financial services, office space and other required in-kind support. Each Regional Association must have sufficient autonomy within their host organization to set workplans, staffing, finances etc., to ensure appropropriate delivery of the RA's contribution to CIOOS.
   - List the host organization's type, legal name, address (number and street), city, province/territory, postal code, country, organization website address, and business GST/HST#.
   - Name of authorized signing authority for funding including position title, organization, address, phone number and email address.

3. **Host Organization's Mandate and Activities (2 pages)**
   - Provide a description of the host organization's general mandate and activities and its capacity and/or experience that enable and justify it to host the RA. This should include: experience and capacity for conducting ocean data management; existing connections to key, regional data originators and data users; any specialized abilities/ expertise of the organisation (e.g. national and/or internationally-recognised roles/ expertise).
   - Describe the nature of the relationship between the RA and the host organisation during

---

[2] Can be an institution, a major research project or institute within a university, a not-for-profit organization or a private company.

the pilot phase (oversight, financial management, sharing of staff, etc.). This relationship should be explained in a letter of support and explain how the host organisation will assure that financial support for the RA will be used exclusively for the support of CIOOS.

- Describe the infrastructure, assets and services that the organization will make available for use by the RA (e.g. space, facilities, hardware, internet access, communications, etc).
- List any additional in-kind, cash or personnel support available to support the RA from the host organisation and other entities. In-kind and cash support listed here should also appear in Appendix C and confirmed through letters of support.

4. Excellence of the Project Team (2 pages)

This section is to demonstrate that existing and planned human capacity and expertise is sufficient to lead and guide the development of the RA during the pilot phase.

- Provide a staffing plan for the RA. Each RA is expected to be fully staffed within 6 months of project start; provide a justification if your plan deviates from this.
  The staffing plan should address leadership/ management (including experience and capacity in the management of complex, multi-institution initiatives), technical capacity for data management and support for, and approach to, end-user engagement, partnership, and ongoing outreach. For each position, identify key tasks, required expertise and justify any positions that are not full-time.
- Identify and name existing personnel who will fill these roles and provide a short description of their qualifications and experience. If staff are to be hired provide a recruitment plan.

5. RA Work Plan (maximum 5 pages)

- Provide a narrative overview of the approach to establishing the regional association during the initial pilot phase, taking into account the host organisation's initial situation and existing experience. Identify the main challenges expected, and the work plan priorities. The overview needs to include a description of the proposed work (max. 800 words), as well as the the objectives, anticipated benefits (in point form), expected results, risks and associated risk mitigation measures, of the proposed work.
- The work plan should cover the following topic areas listed. For each topic area, define deliverables and a number (1-3) of concrete, measurable milestones for both Year 1 and Year 2. If a milestone or deliverable involves considerable risk of not being met or being delayed, explain the nature of the risk.
    i. Data and metadata management and dissemination. The RA is expected to demonstrate data and metadata management and dissemination for a limited number of EOVs (see list in Annex I). Identify potential sources of these data within the RA's geographic area. The data need to be gathered from multiple data nodes, and the workplan needs to discuss who/where those data providers are. The RA can include additional variables (listed under Pilot Areas in Appendix A), as long as the baseline variables listed in Appendix A are accessible, downloadable, interoperable, and where relevant, include time series data, and are georeferenced.
    ii. Cyberinfrastructure. Describe your proposed approach to cyberinfrastructure and how it is consistent with data standards and recommendations described in the Cyberinfrastructure Investigative Evaluation report. This should include the following areas: well defined process for data ingestion including tool support, federation (the ability to share data among RAs and with the national portal), and stable, reliable storage with backup, data discovery (search, visual exploration, and interoperation with other data repositories), and data access. This section

should include plans for both provision and sustainability of hardware and software, including whether it will be provided in house or contracted out, with justification.

iii. Visualization. Describe the RA's approach to providing regional data visualization. Tools should include, at minimum, near real time visualization of EOVs, and a web-based map of data holdings within the region, and an asset map, plus the ability to perform queries about datasets (including an asset map).

Note: The RAs will need to coordinate the development of their visualization tools with the supplier of the national web presence and with each other, in order that they share a common CIOOS "look and feel". All web portals, visualization tools and online documention must be bilingual (French/ English).

- Include a Gantt chart that provides a narrative overview and work plan.

6. **Partner/End-User Engagement (maximum 2 pages plus appendix)**
In this section, provide a plan for user engagement during the pilot phase. The type of partnership and engagement may change over time, and could include activities such as: partnering directly with key end-users, canvassing the various end-user communities to determine data needs; usability of visualization tools; information and training workshops for data providers and end users; site visits and outreach activities; etc.
- Resources for end-user engagement should be identified in the budget and budget justification. If partnering with other organisations for this activity, explain the reasons and associated plan and, if appropriate, a letter of support. In some cases, and in some regions an RA may decide to partner with another CIOOS RA to access specific communities or sectors: explain the nature of any such arrangements.
- As an appendix, provide a table of organisations, entities and communities within your region that you have identified as either data providers, potential users of CIOOS products, or cooperation partners for your RA. This can include government entities, NGOs, community groups, industry partners, international organisations, etc. For each organisation/ entity, identify the status of any existing engagement and a brief explanation of your plan for engagement over the pilot phase.
- Provide information about your partners, and how they will support and utilize the work plan activities. Describe the nature of their contribution. The content of these contributions should be reflected in the letters of support. Values of cash and in-kind contributions listed in this section are to appear in Appendix C.

7. **Regional Oversight Committee**
Each RA must create a Regional Oversight Committee that will have balanced representation of data providers, end users, major partners, etc. Note in the appendix mentioned above who is under consideration for this Committee. It should be populated and functional during Year 1.

For National Web Presence Work Plans (Type 2):

Prospective RAs, groups of RAs and/or other entities can propose a separate work plan to develop the national web-presence for CIOOS, including the "look and feel" and branding that will also be used by the RA web-pages. The national web presence must also be bilingual (French/English). (Note: If the proposal is from a team that is not also proposing to establish a RA, there should very clear definition of how the entity plans to work closely with the RAs once

they are established). The work plan should also include development and provision of the tools required to provide an appropriate level of access to the data holdings of the RAs. By the end of the pilot phase, the national web-presence should provide sufficient functionality so that an end-user can discover data across the country that are held and visualized by the RAs.

Applications to this part of the call should include the following sections:

A. Excellence of the Project Team (2 pages max)
This section is to demonstrate that existing and planned human capacity and expertise is sufficient to lead and guide the development of the National Web Presence during the pilot phase. The section should address: who will conduct the work; how the different aspects of the work plan will be assigned; the experience of the project team that demonstrates capacity to perform the work plan.

B. Work Plan (5 pages maximum)
Provide an overview narrative of the overall work plan, describing how the national web-presence for CIOOS will be developed and delivered. Subsequently, the following specific topics should be addressed:

- "Look-and-Feel". How will the CIOOS branding and look-and-feel for the web-presence be arrived at?
- Cyberinfrastructure and data aggregation tools: how/ where will the national web presence be hosted? How will data and metadata be harvested from the RA's? What tools will be provided centrally and how will they be sourced or developed?
- Visualization: what visualization tools will be provided at the national level? (Note: during the pilot phase, it is envisioned that most CIOOS data exploration and dissemination will occur at the regional level, hence the functionality of the national site should be developed in very close coordination with the RAs).
- Engagement and partnering: how will the National Web Presence team coordinate and interact with the RAs and other relevant entities (e.g. other national data portals)?

The following sections are common to both types of Work Plans:

8. Budget and Non-NCE Contributions (Appendices B & C)
- Use the budget template provided (Appendix B).
- Be specific on budget line items (as noted in section G).
- Include travel expenses to MEOPAR's Annual Scientific Meeting for one representative.
- Include travel expenses for two CIOOS Executive Committee meetings and two technical workshops, all centrally hosted, annually.
- Include costs of hosting one meeting, annually.
- Use the non-NCE contributions template (Appendix C). In-kind and cash contributions listed in Section 3 should be included.

9. Budget Notes and Justification (maximum 2 pages)
- Include budget notes and justification for expenses.
- Where it says "specify" in the budget template, explain in the notes and justification.
- If applicable, make note of in-kind contributions towards the proposal.

10. Curriculum Vitae
- The Project Lead and any funded participants must submit a CV.

- CVs may be submitted in any of the standard Tri-Council formats including the draft version generated through the Canadian Common CV website. However, any personnel described in the "excellence of the project team" section who are not Tri-Council eligible may submit a simple curriculum vitae.
- Combine all funded investigator CVs into a single PDF document.

11. **<u>Letter(s) of Support (maximum of 2 pages each)</u>**
   - Each letter of support should explain the involvement of the partner with the prototype RA and provides sufficient details and concrete examples of how they will engage with and utilize the RA.
   - The content of these letters should reflect the commitments of partners described in the "Partner/End-User Support" section.
   - There is no limit on the number of letters of support.

K. Submission Timeline

The application deadline for this Request for Proposals is 4:00 p.m. Atlantic Time, Thursday, June 7, 2018. Applications must be submitted electronically in PDF format to alexa.reedman@meopar.ca. All interested applicants must contact Alexa Reedman before submitting their proposal.

An acknowledgement of receipt will be sent by MEOPAR's Research Program Coordinator. The Research Program Coordinator will provide an initial compliance screening. Proposals that do not follow these requirements explicitly will be returned to the applicant (PI) and given a 24-hour period to comply and resubmit. Proposals that still do not comply with these criteria or miss the 24-hour resubmission timeline will not be considered for funding.

Proposals will be reviewed and assessed by MEOPAR's Research Management Committee (RMC) and additional outside expert reviewers as needed. Successful proponents will be notified in July 2018, with funding to be transferred in July or August 2018.

L. Proposal Evaluation

The Research Management Committee and invited external experts will review all proposals and evaluate them against the following criteria. Proposals will be rated on a 0-5 scale[3].

   0 – The proposal fails to address the criterion or cannot be assessed due to missing or incomplete information.
   1 – Poor. The criterion is inadequately addressed, or there are serious inherent weaknesses.
   2 – Fair. The proposal broadly addresses the criterion, but there are significant weaknesses.
   3 – Good. The proposal addresses the criterion well, but a number of shortcomings are present.
   4 – Very Good. The proposal addresses the criterion very well, but a small number of shortcomings are present.
   5 – Excellent. The proposal successfully addresses all relevant aspects of the criterion. Any shortcomings are minor.

---

[3] This interpretation of scores is based on the Horizon 2020 model.

Criteria	Proposals for Regional Associations	Proposals for National Web Presence
1. Nature of Organization	Mandatory • The host organization is appropriate and suitable for support of a Regional Association, including receipt and management of funds from MEOPAR and/or government agencies. • The host organization will allow the RA independence to engage partners and manage financial and human resources so that they are used for support of CIOOS. • The host organization will provide sufficient space, facilities and communications access to allow the RA to function effectively. Preferred • The host organization's overhead rate (percent of grant funds retained by the host to offset overhead costs) is specified, and is capped at no more than 10%.	Mandatory • The organization is appropriate and suitable for the task of developing and maintaining a national web presence for CIOOS and is able to receive and manage funds from MEOPAR and/or government agencies. • The organization has experience and capacity for designing and supporting web-pages suited to providing access to scientific and technical data. • The organization has a credible and realistic plan for how to work with the CIOOS RAs. • The organization has access to the technical capacity required to provide national functionality and access to data held by the RAs.
2. Excellence of Project Team	Mandatory • The project team has experience and capacity for conducting ocean data management. • The project team has experience and capacity in the management of complex, multi-institution initiatives. • The staffing plan is appropriate and addresses the requirements for the workplan, providing for management, data management, and user engagement tasks within 6	Mandatory • The project team (or project lead) has access to or a clear plan on how to recruit the required technical staff. • The project team has experience and capacity in the management of complex, multi-institution initiatives. Preferred • Key personnel with the required experience and skills are already identified in the proposal. • The project Lead has demonstrated project management capability.

	months of the release of funds. Preferred • Key personnel with the required experience and skills are already identified in the proposal. • The project Lead within the RA has demonstrated project management capability.	

3. Work Plan	Mandatory
	• The overall plan for establishment of the RA is realistic in terms of time and budgets, and addresses the key technical requirements expected for a prototype RA in each of: Data and metadata management; Cyberinfrastructure; Visualization
		Mandatory
		• The work plan provides an appropriate level of detail and clear procedures for arriving at:
		  ○ A national look-and-feel
		  ○ The required cyberinfrastructure
		  ○ Appropriate and useful visualization tools

4. Partner and end-user engagement	Mandatory • Key regional partners appropriate for the pilot phase are identified in the table included in the appendix. No obvious, important partners are missing. Key partnerships are in place or have been discussed. • The plan for engagement of data providers and data users is appropriate and feasible, and sufficient resources are allocated to this task. • The Regional Oversight Committee has an appropriate balance of data providers and end-users, or the procedure to establish such a Committee is clear, realistic and timely. Preferred	Mandatory • The plan for engagement with RAs and other national entities necessary to develop the web presence is appropriate and feasible, with sufficient resources allocated.

	• Letters of support from key partners	
5. Budget	Mandatory • The proposed budget is well justified and fits within the overall scope of funding for the CIOOS pilot phase. • Sufficient budget is allocated to attend workshops, and CIOOS Executive meetings, and MEOPAR Annual Scientific Meetings. Preferred • There is in-kind and cash support provided by partners which will contribute to CIOOS capacity and sustainability. • Matching funds (cash and/or in-kind) of 25% of the total proposal value have been identified.	

Questions?

For all questions about the RFP, please contact Alexa Reedman, Research Program Coordinator: alexa.reedman@meopar.ca.

Annex I

Essential Ocean Variables

Baseline Variables:
1. Surface currents
2. Water level
3. Waves
4. Wind
5. Ice cover
6. Temperature
7. Salinity
8. Density
9. Dissolved oxygen
10. pH
11. Nutrients (phytoplankton/Chl)

Pilot Areas:
1. Satellite/ocean colour
2. Fish and/or marine mammal distribution
3. HF Radar
4. Acoustics
5. Omics