The Global Ocean Observing System
www.goosocean.org

GOOS authoritative guidance on system design:

EOV & ECV requirement setting

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IOC WMO UN environment International Science Council

SO5: Provide **authoritative guidance** on integrated observing system design, synthesizing across evolving requirements and identifying gaps.

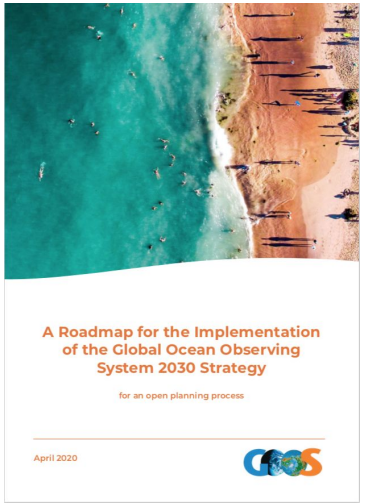
Currently, the only clearly-stated global **GOOS design is for climate** - although it remains to be fully integrated across the disciplines.

*"GOOS will enhance its undertaking of **multidisciplinary assessment and synthesis** across a range of **evolving requirements**, in order to **guide and support implementation decisions** from global to regional, and across platforms, networks and technologies (...)"*

Societal requirements

Defining requirements (phenomena, EOVs)

Implementation guidance



SO3: Regularly **evaluate system impact** to assess fitness for purpose.

Evaluation of global ocean observations against **climate objectives** is made possible through the frameworks of Global Climate Observing System (GCOS) and the WMO Rolling Review of Requirements.

*"Working through the Framework process, GOOS and its partners will collaborate to undertake **regular evaluations** of how the observing system is delivering **fit-for-purpose information** for societal benefit areas and applications."*

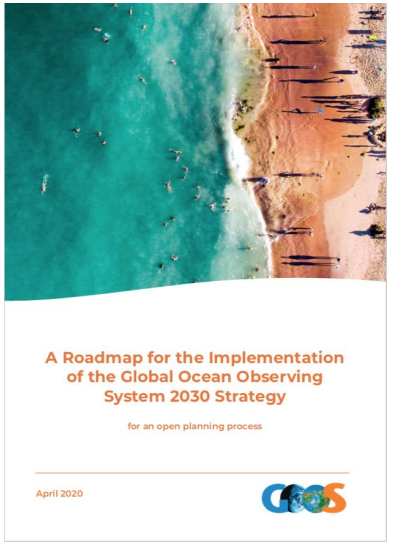
Societal requirements

Defining requirements (phenomena, EOVs)

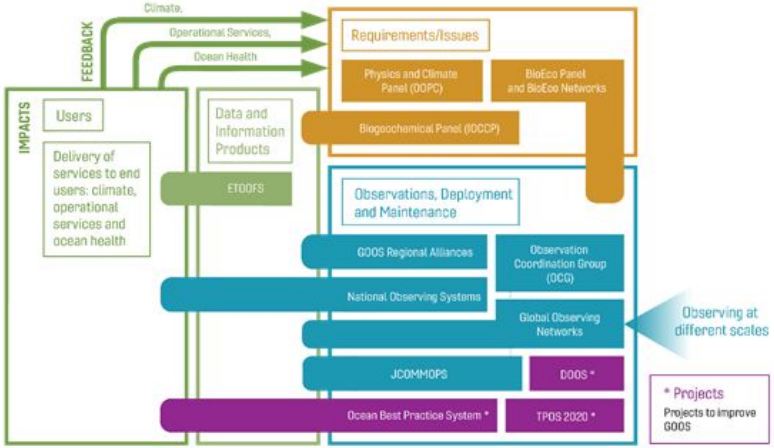
Cycles of assessments

Implementation guidance

Tracking



Role of GOOS structures in providing authoritative advice



- Core business of GOOS
- GOOS Panels providing **scientific oversight** on:
  - Requirement setting (all Panels)
  - System evaluation and review (OOPC)
- Requirements communicated through **EOV Specification Sheets** (goosocean.org/eov)
- **Developing targets** for coordinated observing networks (OCG)
- **Improving** (e.g. Tropical Pacific Obs. System - TPOS2020) or **initiating** new (e.g. Deep Ocean Observing Strategy - DOOS) system design through GOOS Projects

- Due **acknowledgement of community support** is needed
- Recognition that GOOS cannot deliver authoritative guidance alone

Various issues addressed during GOOS-SC-8 and GOOS-SC-9

GOOS SC-8

Eighth Session of the GOOS Steering Committee

1 - 3 May 2019, Kiel, Germany

Overview | Agenda | Documents | Participants

[Order these documents by how recently they were updated]

goosocean.org/goos-sc-8

Presentations

Agenda #	Code	Title
12		GOOS resourcing
5		Disbandment of JCOMM: Implications for GOOS
7		DOOS: Project Legacy Goals for GOOS
9.1		The Ocean Observations Physics and Climate panel
7		AtlantOS: An All-Atlantic Ocean Observing System - High-level Strategy
11.2		OCG Priorities for Open Data and Information
9.4		OCG GOOS SC8
11.2		WIGOS and WIS
4.2		WMO Development of new structure: Earth System Approach
11.1		Guiding Capacity Development: Group of Experts Recommendations
9.5		GOOS Regional Alliances (GRA)Update
8		GOOS Governance Workshop 30 April: Priority Issues
2 & 3		Global Ocean Observing System 2030 Strategy &□Implementation Planning
7		GOOS Framework for Ongoing Evaluation, Projects Legacy
9.2		GOOS Biogeochemistry Expert Panel Report and Work Plan
4.4		The International Science Council The Global Voice for Science
7		TPOS 2020 Project
11.4		Partnerships for Delivery
9.3		GOOS BioEco Report 2018-2019 presentation
11.2		The Copernicus Marine Service
11.1		Global Capacity Building for related to Ocean Observation
8		Polycentric ocean governance
11.2		IODE viewpoint
10		The Global Ocean Observing System (GOOS)
1		Ocean Observing Governance: Introduction
6		GOOS Partnership for Delivery
8		Ocean Observing Governance, Introduction for SC8, Principles of governance
11.2		Biogeochemical Data Sets
4.1		IOC, Ocean Science Decade, and GOOS
11.2		OBIS capability to support biological EOV data
11.2		GOOS SC-8 Data opening

- Capturing the legacy of GOOS projects (e.g. TPOS2020, DOOS, AtlantOS)
- Lack of transparent guidelines and an efficient process for requirement setting, including responding to new EOV requests
- Harmonization of EOV and ECV requirements
- Establishing a framework for observing system evaluation and review

<u>Decision to establish two Task Teams</u> with Terms of Reference to address the outstanding issues:

- **Task Team on EOVs**

  High priority - formally not established, but significant work done over the past months
- **Task Team on Evaluation & Review Framework**

  Not established, pending stability in OOPC office support

EOV Task Team

To establish an **EOV Teak Team** composed of **relevant experts on the SC, the Panel chairs, and experts from OceanObs'19 Community White Papers** that addressed EOVs and the Framework, satellite community **users of EOVs/ECVs**, and potential users from the modelling community (e.g. OSSEs), to establish guidance on the EOV process.

<u>The Task Team would address (inter alia):</u>

- What are the criteria for EOVs? What is the process for reviewing and adding new EOVs?
- Who is currently using EOVs/ECVs and for what purpose? Is the current design of these requirement setting frameworks fit for purpose?
- How are EOVs used to review the status of observing system development or needs for new / better technology?
- How are stakeholders consulted about their needs for EOVs and EOV reviews? (Needs of funding / implementing agencies?)
- What level of coordination or harmonization is needed between EOVs and ECVs, EBVs and the WMO Global Observing System Rolling Review of Requirements process?

Who is using the EOVs, and for what purpose?

- **Funding** agencies, **satellite** observing programs
- EOVs as drivers for **establishing new observing networks** for Biology & Ecosystems (e.g. Global Ocean Macroalgal Observing Network - GOMON)
- **Shift from platform-specific** to EOV-specific observing networks, e.g. Surface Ocean Carbon reference Observing Network (SOCONET)
- EOV-based requirements useful for **informing OSSEs**, **setting targets** for coordinated observing networks
- **New observing systems** based around EOV requirements: Deep Ocean Observing Strategy (DOOS), Sustaining Arctic Observing Networks (SAON)

Status of work:

In late 2020, Maria Hood prepared a comprehensive review of the current and recommended uses of EOVs as presented by the community across OceanObs'19 CWPs and during the Conference breakout sessions.

→ background information for the EOV Task Team (and quite an interesting read!)

How to ensure a transparent and efficient communication of the EOV process?

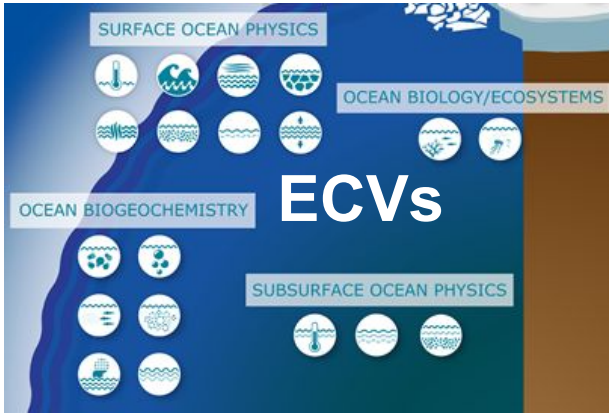
- Each Panel has adopted a **different approach to selecting EOVs** as basis for setting disciplinary requirements - a **stumbling block for true system integration**
- A peer-reviewed publication (Miloslavich et al. 2018, GCB) on **BioEco approach to requirement setting**.
- The overall process remains **not transparent** for the ocean community.
- **Urgent need for a GOOS publication** describing the value of the EOV framework, the adopted approach to its implementation, and **a forward look on its evolution**.

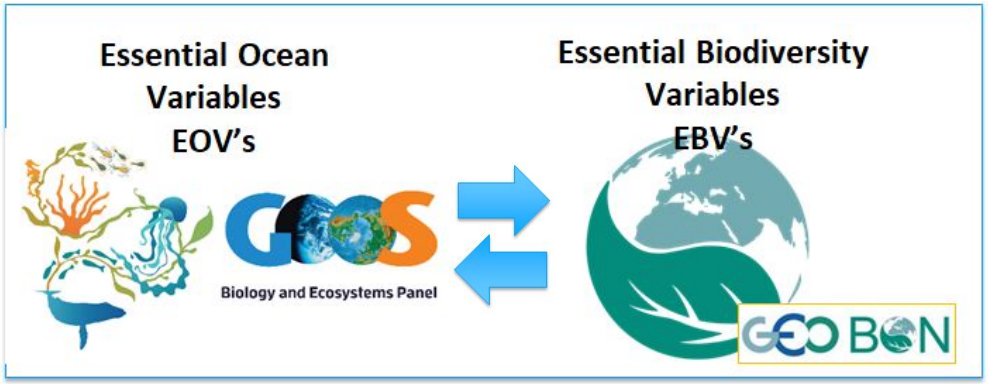
From Miloslavich et al. (2018)

Status of work

- Early draft paper for *Nature Geosciences* prepared by Bernadette Sloyan et al., back in 2019.
- Further input and updated scope by Maria Hood in 2020.
- Final manuscript to be prepared by the EOV Task Team, pending its formation and hiring a dedicated GOOS consultant to run the Task Team. Reps from all Panels will be asked to join.

How can we integrate requirement setting frameworks?





Extensions to GOOS EOVs:

- Deep Ocean EOVs
- Essential Arctic Variables (EAVs)

EOV vs ECV - differences and issues

GOOS requirements	GCOS requirements
For climate, operational services and ocean health - provided by three disciplinary Panels of GOOS	For climate only - provided by OOPC also on behalf of IOCCP and BioEco Panels of GOOS
No reporting timelines established (no update since 2017)	Fixed reporting timelines around GCOS IP (ca. every 5 years)
Communicated through EOV Specification Sheets	Communicated through IP and ECV Fact Sheets
No formal public review	Formal public review
Requirements provided for oceanographic phenomena NOT for EOV sub-variables or products	Requirements provided for user products (not the underlying measurements)
Requirement types: coverage, resolution (spatio-temporal), accuracy	Requirement types: definition, layer, coverage, resolution (spatio-temporal), timeliness/latency, uncertainty, stability
No unified process or format for all GOOS Panels	One process and format for all GCOS Panels
No explicit link to global indicator frameworks and their requirements (e.g. SDG, CBD, WMO climate indicators)	Link to WMO climate indicators (but not explicitly listed in any ECV documents)

EOV vs ECV - some conclusions

There are significant differences in how GOOS and GCOS approach requirement setting. This creates confusion and reporting fatigue among experts and the ocean observing community.

GCOS has established a mature process which is consistent across all GCOS Panels, but it does not fully match with the way GOOS sets requirements across all of its disciplines.

GOOS lacks a transparent, efficient and consistent requirement setting process for all GOOS Panels

In GOOS, we need to get our house in order before we can make real progress on integrating with GCOS requirements.

<u>The goal is to:</u>

Optimize the process of setting & reviewing EOV/ECV requirements with minimal reporting effort placed on GOOS Panels of Experts.

I.e. one common source of ocean requirements to be used for various reports and other uses
I.e. less work for experts, less work for secretariat, clear and consistent message to all stakeholders

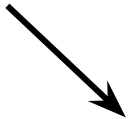
Revised requirements from 2019 - big step forward

New template designed by Katy Hill and myself, approved by OOPC, IOCCP and BioEco Panel. Used by all GOOS Panels to update GCOS requirements in 2019.

- Used by GCOS Secretariat to basically copy-paste the information into GCOS requirement tables.
- Expanded to form the basis for GCOS Status Report ECV assessment
- Same template hopefully can be used to update the corresponding EOV specification sheets, GCOS Fact Sheets, WMO Rolling Review of Requirements and future GCOS reporting cycles

OOPC and other experts should not be asked to repeatedly provide the same information using different tables and formats. This should now be (almost) accomplished.

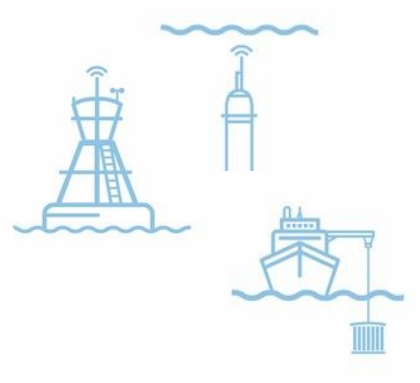
Example #1: Ocean Heat Fluxes requirements



Exception: EOV sub-variable requirements NOT always the same as product requirements
(e.g. non-satellite measurements, no products at all)

Harmonizing and updating EOV information

- GOOS Panels Secretariat took up the internal part of EOV Task Team's work
- Prepared a new common EOV template designed to centrally and consistently collect information on EOVs from all GOOS Panels.
- Incorporates the work done by OOPC and others from 2019-2020 on updated requirements. Will be linked to the 2020 ECV assessment.
- Basis for updated EOV Specification Sheets to be published with a professional layout by end of 2021 (see OCG Network Specification Sheets as model example), with DOI numbers assigned and version control established.
- To aid the EOV Task Team work, the Secretariat will also prepare a 2-page guide on the EOV process, including proposal how to handle requests for new EOVs, cycles of EOV updates, etc. To be approved by the Panels and GOOS SC.



Harmonizing and updating EOV information

What is OOPC asked for?

- Assign persons responsible for each EOV (if not yet done) and agree on a timeline to complete these revisions. BioEco and IOCCP have already initiated the process with the aim to publish together by end of 2021.
- With Belén's assistance, please transfer the information from OOPC EOV Spec Sheets into the new template.
- Unless you didn't update the requirements with Katy in 2019, you probably don't need to look at those again beyond addressing comments from the public review.
- Please highlight any issues with EOV subvariable vs ECV product requirements.
- Make any necessary updates (new products, new datastreams, etc.), clear internal inconsistencies, or make adjustments to the new format of some EOV Specification Sheet tables (mostly a simplification and removal of redundancies).

- For most of you, this should mean minimal effort.
- It is meant to save the panel experts time and energy, maintain legacy of your inputs, improve overall GOOS messaging, and enable full integration with GCOS processes by the next reporting cycle.

Quick walk through the template

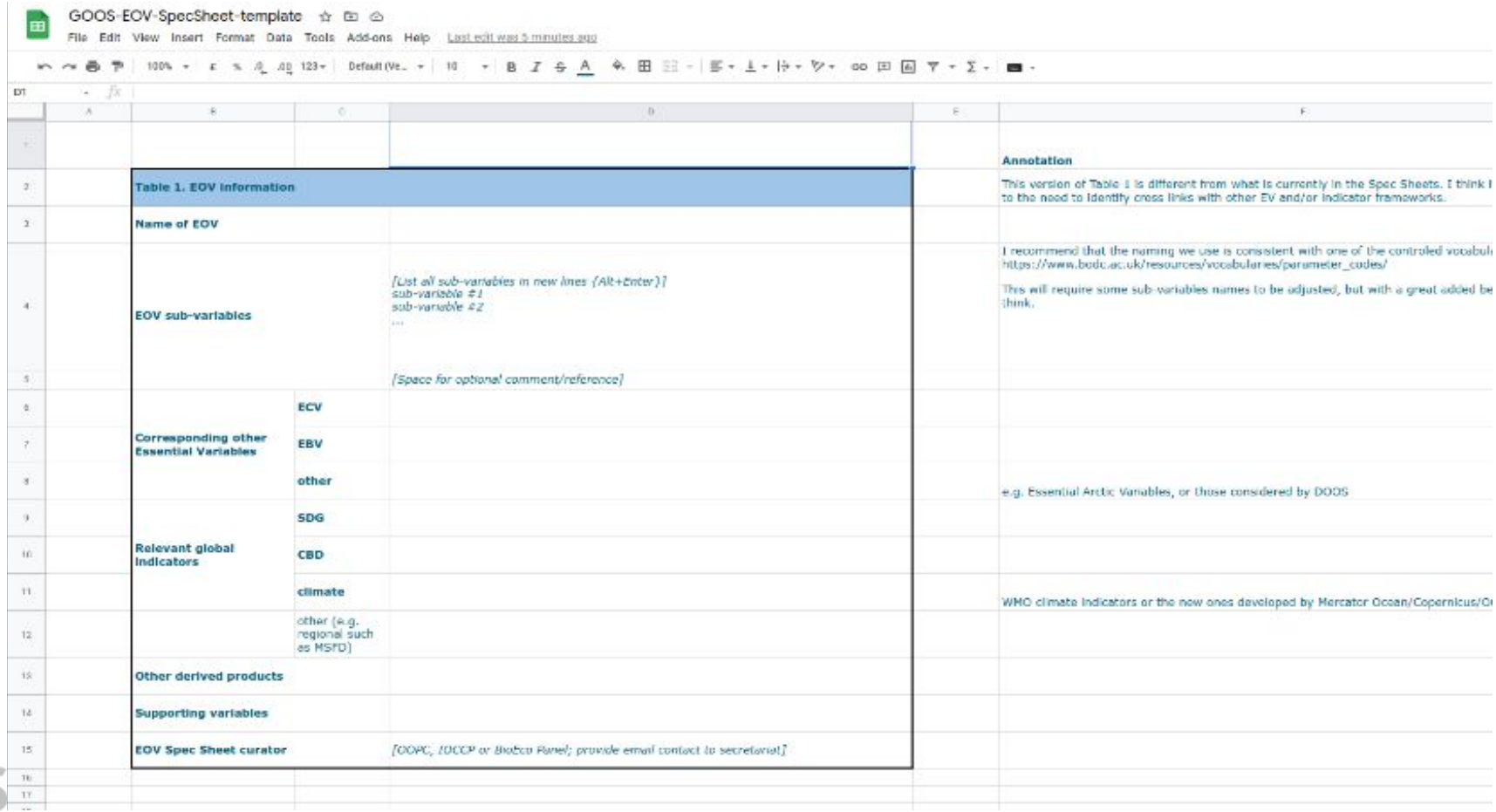
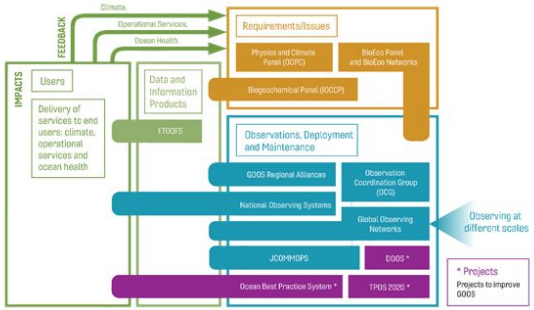


Table 1. EOV information		
Name of EOV		
EOV sub-variables		*[List all sub-variables in new lines (Alt+Enter)]* *sub-variable #1* *sub-variable #2* ...
		[Space for optional comment/reference]
Corresponding other Essential Variables	ECV	
	EBV	
	other	
Relevant global indicators	SDG	
	CBD	
	climate	
	other (e.g. regional such as MSFD)	
Other derived products		
Supporting variables		
EOV Spec Sheet curator		*[OOPC, IOCCP or BioEco Panel; provide email contact to secretariat]*

Thank you

Lack of established process and adequate forward planning limit the authority of GOOS in this domain



- Process around EOVs lacks transparency and efficiency
- Roles and responsibilities of each GOOS structure are not clearly stated with respect to SO5 and SO3 - a prerequisite for evaluating existing and initiating new partnerships

- Lack of a common way forward identified to address among other things:
  - integrating across observing system objectives
  - inviting stakeholders to co-develop guidelines for the community

Urgent need for GOOS **to show leadership** in providing guidance on the observing system design and evaluation to avoid losing credibility.

How to capture the legacy of GOOS projects?

GCOS • GOOS • WCRP OOPC

Existing regional system reviews:

- Tropical Pacific (TPOS2020)
- Tropical Atlantic (TAOS)
- Indian Ocean (IndOOS)

Phenomena-based reviews planned:

- Heat and Freshwater Storage & Transports observing capacity
- Air-Sea Fluxes

Regional/topical systems in design phase:

- Deep Ocean Observing Strategy (DOOS)
- All-Atlantic Ocean Observing System Program (AtlantOS)
- Integrated Marine Debris Observing System (IMDOS)

Essential to establish a common set of guidelines and best practices for future reviews and assessments, building upon the collective experience of past and ongoing reviews.

Urgent need for GOOS, rather than the OOPC, to show leadership in providing guidance on the observing system design and evaluation.

GOOS TPOS 2020 Tropical Pacific Observing System AtlantOS DEEP OCEAN OBSERVING STRATEGY CLIVAR GOOS IndOOS-2

What are the triggers for observing system reviews? *[draft]*

Under what circumstances is a review necessary? - lessons learnt from a regional observing system review

- When there are major threats to the Observing System
  (e.g., the dramatic fall in data returns from TAO-TRITON array in the Equatorial Pacific)

- When there are major changes in capability
  (e.g., when new technology becomes available; for example, Argo in the past, or coming soon, SWOT-Swath Altimetry, Saildrones, wave drifters, gliders, etc.)

- When there are major changes in the use or requirements of the data
  (e.g., the development of coupled numerical weather prediction, which will require the observing system to operate in a different way with rapid delivery, higher space-time resolution, etc.)

GCOS • GOOS • WCRP OOPC

TPOS 2020 Tropical Pacific Observing System

Suggested Action: Evaluation & Review Framework Task Team

To **establish a Task Team** with ToRs reflecting also the results of **consultations post-OceanObs'19**, including:

- To address questions posed in the GOOS-SC-8 Background Document *"Should GOOS oversee a framework for ongoing evaluation of the observing system?"*
- To prepare guidelines on when reviews should be triggered and how they should be done,
- To prepare guidelines and best practices for observing system reviews,
- To prepare guidelines and best practices for observing system design studies, and
- To develop an evaluation framework along the value chain, assessing readiness, including FAIR data principles, sustainability of observations, governance, links to global networks, etc.

Task Team is suggested to be composed of **relevant experts** drawing from the observing system community, the GOOS Panels, OCG, JCOMMOPs, and observing system networks, with a **responsible lead appointed from the GOOS SC**.

The Task Team would be expected to operate on a **1-year timeline**, due to r**eport at GOOS-SC-10 in 2021.**

Questions for discussion

- What authoritative guidance is needed, and by whom, to inform the process of system design/development and evaluation?
- How does GOOS organize to deliver this guidance, while ensuring the process is consistent and transparent?
- What partners are needed to address the gaps? What do we need to do to engage those partners?

Suggested actions

- Establish two Task Teams on: (i) **EOVs**, (ii) **Evaluation and review framework**
- Identify SC champions, GOOS structure members & partners to engage in the Task Team activities
- Allocate sufficient resources to each task team:

Itemized budget (tentative)	**Cost description**
Coordination and output delivery by GOOS Secretariat staff or consultant	4 person month salary (0.33 FTE) Cost: host-institution dependent
One in-person meeting (ca.15 attendants)	2-day meeting + travel support Cost: ca. 25,000 USD