The Global Ocean Observing System

GOOS Today: Building a fit-for-purpose global ocean observing system

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Intergovernmental Oceanographic Commission of UNESCO

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The Ocean is key to pressing societal issues

Climate and weather

The ocean plays a huge role:

- 25% anthropogenic carbon / yr.
- extreme weather prediction
- 90% excess heat

At the same time, it is being affected by climate change.

Ocean health

Life in the ocean gives us the oxygen we breathe and the food we eat. Overfishing, climate change and pollution are putting biodiversity and food security at risk, and their impacts are critically under-observed.

Coastal communities

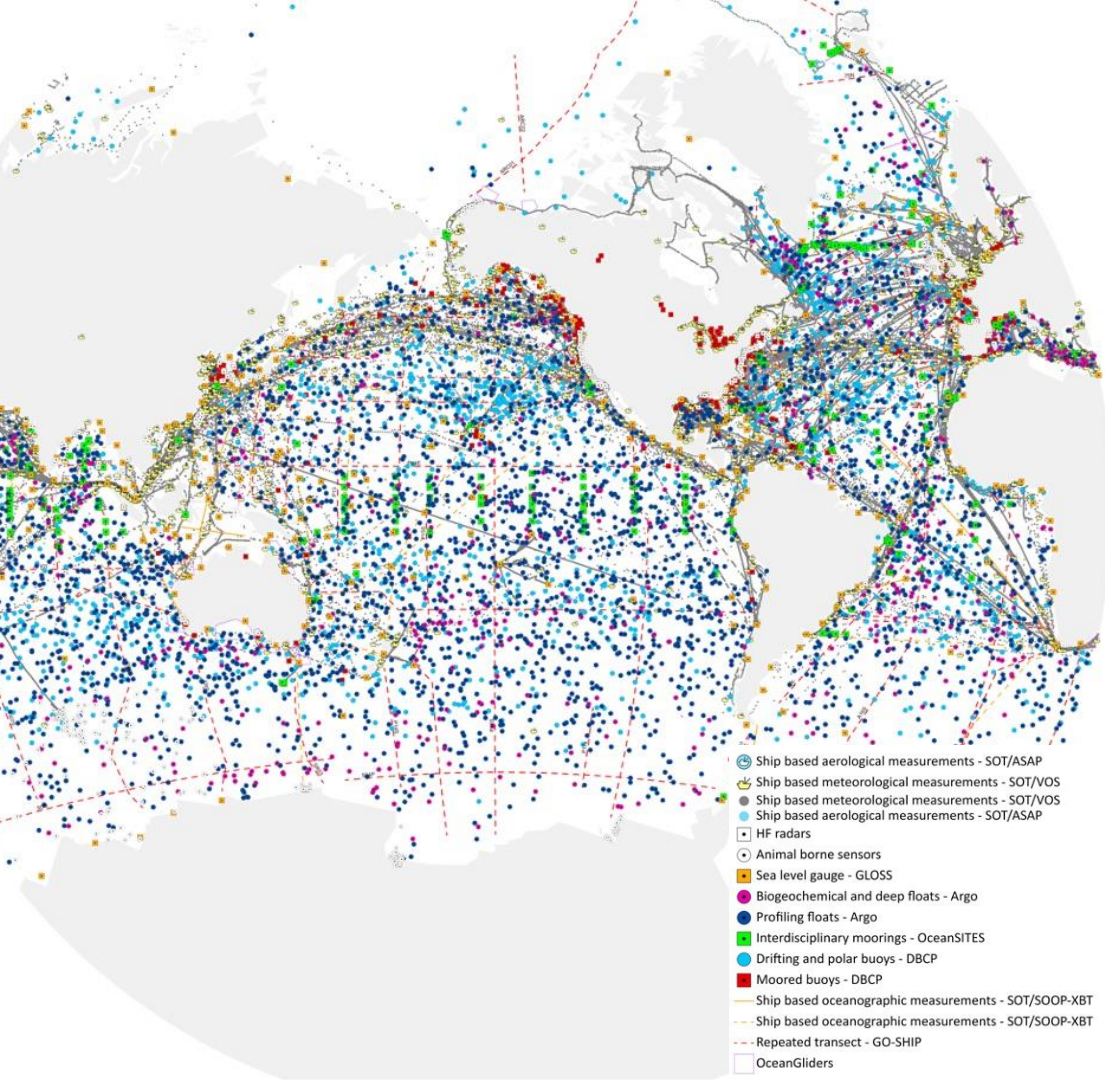
Coastal communities are in the front line facing threats posed by changing oceans. Communities in many less developed areas are particularly at risk from changing weather and ocean patterns, and increased disaster risk.

If we haven't got data underpinning our decisions, we might as well be guessing at solutions

The GOOS 2030 Strategy

Vision
A truly global ocean observing system that delivers the essential information needed for our sustainable development, safety, wellbeing and prosperity

Mission
To lead the ocean observing community and create the partnerships to grow an integrated, responsive and sustained observing system

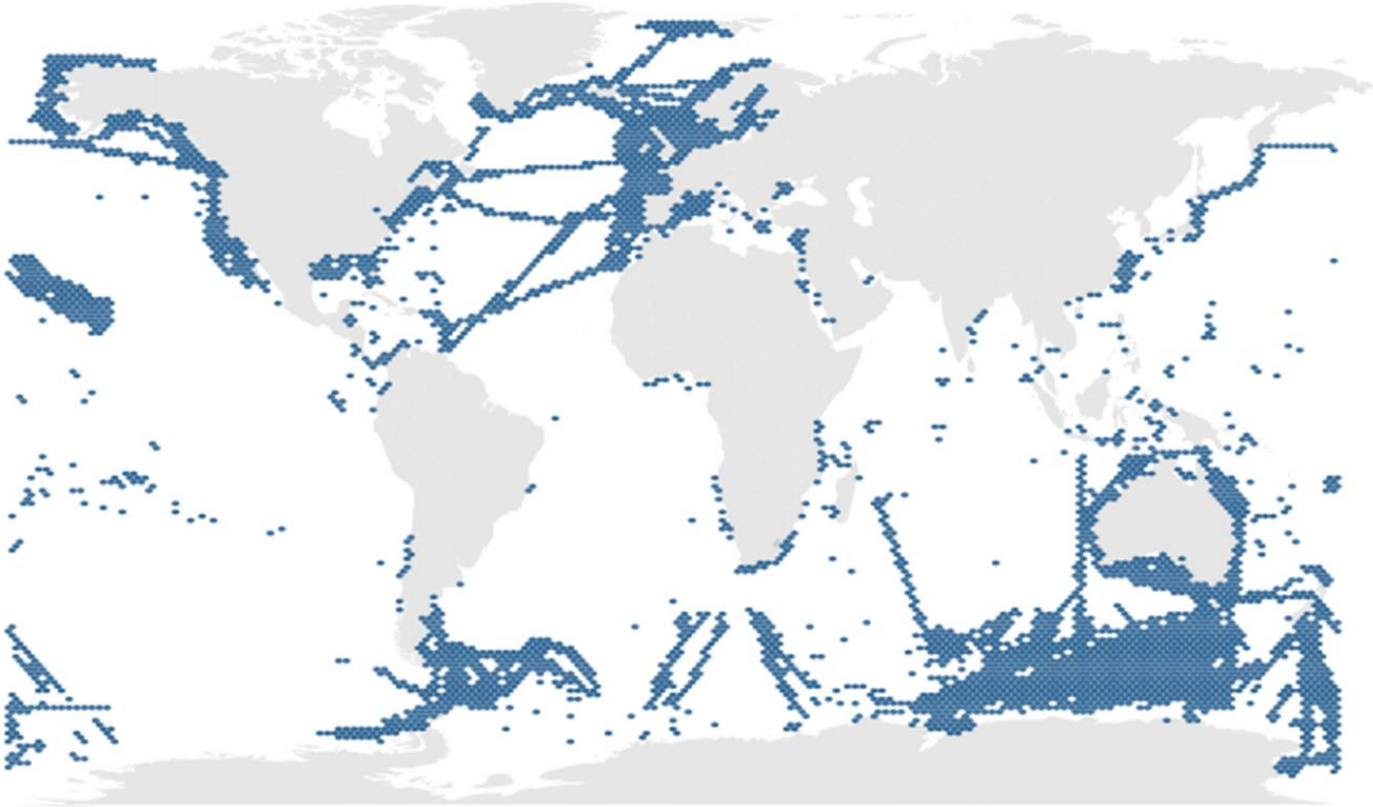


GOOS Today

- **84 countries, 8,700+ observing platforms, 13 global networks**
- **More than 100,000 observations per day - delivering an accessible, safe and productive ocean**

DBCP: ~2000 platform in operation
1518 drifter
416 moored buoy
41 tsunami buoy

"The weather forecasting systems will run off the rails if they don't have the surface pressure information over the ocean to constrain them" - Lars Peter Riishojgaard, Director of the Earth System Branch WMO



Satterthwaite et al. (2021) Frontiers in Marine Science - GOOS news

Biological & ecological observations

- 203 active, long-term programs that systematically sample BioEco EOVs
  …and more out there..
- Only 7% of the ocean surface has an *identified* active monitoring program
- Some of the biggest gaps are in areas of high biodiversity and high human pressure

Biology and Ecosystems Panel

GOOS Core Coordination

GOOS Steering Committee

Expert Panels

Ocean Observation Physics and Climate Panel (OOPC)

Biology and Ecosystem Panel (BioEco)

Biogeochemical Panel (IOCCP/BGC)

Observing

Observations Coordinating Group (OCG)

Global Regional Alliances (GRA)

OceanOPS

GOOS National Focal Points

Projects (TPOS, DOOS, OBPS, AtlantOS)

Prediction

Expert Team on Operational Ocean Forecast Systems (ETOOFS)

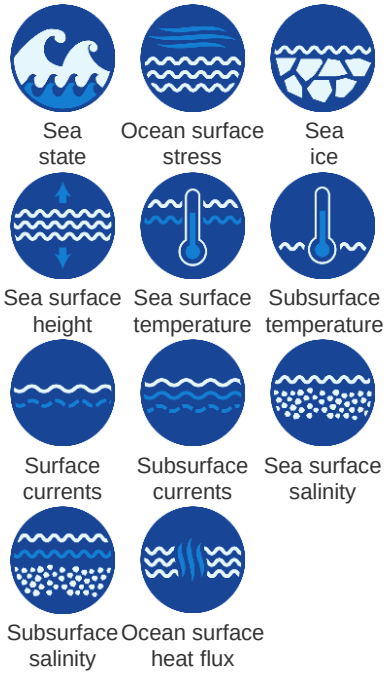
In-situ observing network status

GOOS *in situ* networks [1]	Implementation STATUS [2]	Data & metadata REAL TIME [3]	Data & metadata ARCHIVED DELAYED MODE [4]	Data & metadata META-DATA [5]	Best practices [6]	GOOS delivery areas [7] OPERATIONAL SERVICES	GOOS delivery areas [7] CLIMATE	GOOS delivery areas [7] OCEAN HEALTH
Ship based meteorological - SOT	★★☆	★★☆	★★☆	★★☆	★★☆	✓	✓	
Ship based oceanographic - SOT	★★☆	★★½	★★★	★½☆	★★☆	✓	✓	
Repeated transects - GO-SHIP	★★½	Not applicable	★★★	★☆☆	★★★		✓	✓
Sea level gauges - GLOSS	★★½	★★☆	★★★	★☆☆	★★☆	✓	✓	
Time series sites - OceanSITES	★★☆	Not applicable	★★½	★★☆	★★☆		✓	✓
Moored buoys - DBCP	★★½	★★★	★★★	★★☆	★★½	✓	✓	✓
Tsunami buoys - DBCP	★★☆	★★★	★★★	★☆☆	★★★	✓		
HF radars	★½☆ Emerging	★½☆	★☆☆	★☆☆	★★★	✓	✓	
Drifting buoys - DBCP	★★★	★★½	★★½	★½☆	★★★	✓	✓	
Profiling floats - Argo	★★★	★★★	★★★	★★★	★★☆	✓	✓	
Deep & biogeochemistry floats - Argo	★☆☆ Emerging	★★½	★★½	★★★	★★☆	✓	✓	✓
OceanGliders	½☆☆ Emerging	★★☆	★☆☆	★½☆	★★☆	✓	✓	✓
Animal borne sensors - AniBOS	½☆☆ Emerging	★☆☆	★★☆	½☆☆	★★☆	✓	✓	✓

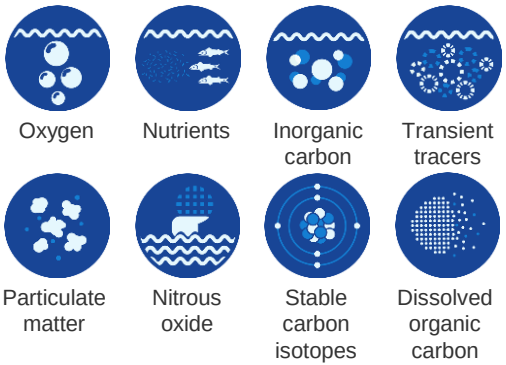
Observations Coordination Group

34 Essential Ocean Variables (EOVs)

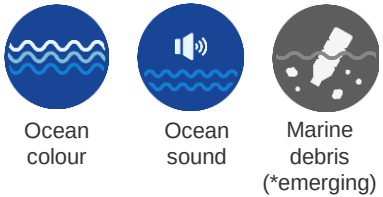
Physics



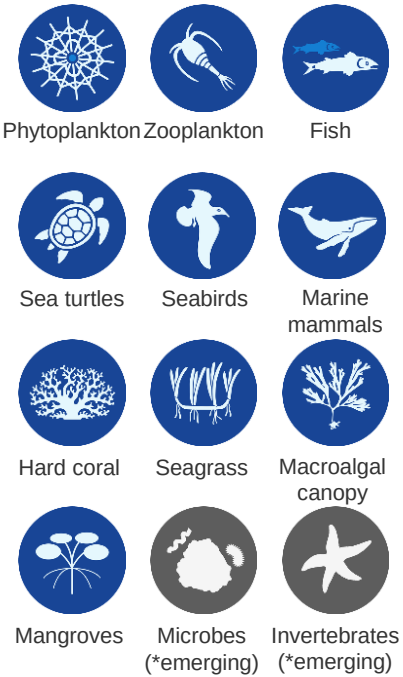
Biogeochemistry



Cross-disciplinary



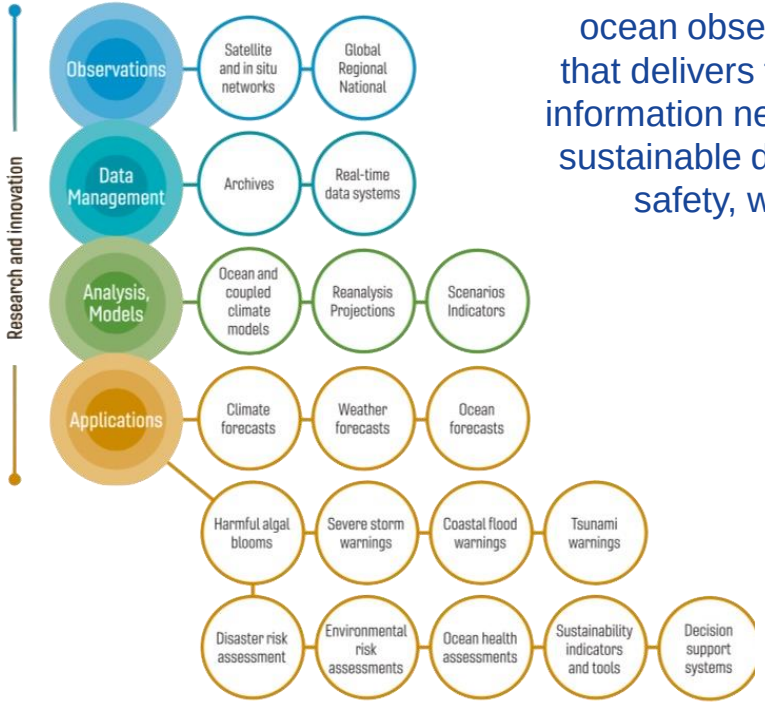
Biology & ecosystems



We face key challenges in expanding observations and enhancing fit for purpose of our system

Need a step change…

Underpinning a wide range of applications

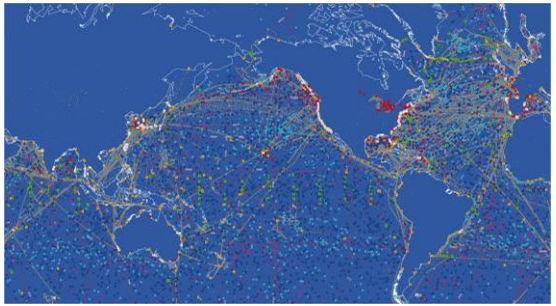


Vision: A truly global ocean observing system that delivers the essential information needed for our sustainable development, safety, wellbeing and prosperity

To help achieve the Global Ocean Observing System 2030 Strategy and the Ocean Decade outcomes, GOOS has launched 3 integrated programmes that will be foundational building blocks for the Ocean Decade.

- CO-DESIGN
- COASTAL OCEAN
- CAPACITY DEVELOPMENT

GOOS and the Ocean Decade



Ocean Observing Co-Design

by The Global Ocean Observing System

Ocean Observing Co-Design will transform our **ocean observing system assessment and design processes.**

CoastPredict

with The Global Ocean Observing System

CoastPredict will revolutionise **Global Coastal Ocean observing and forecasting**.

Observing Together

by The Global Ocean Observing System

Observing Together will **meet stakeholder needs** and make every observation count through **enhanced support to both new and existing community-scale projects.**

Ocean Observing Co-Design

by The Global Ocean Observing System

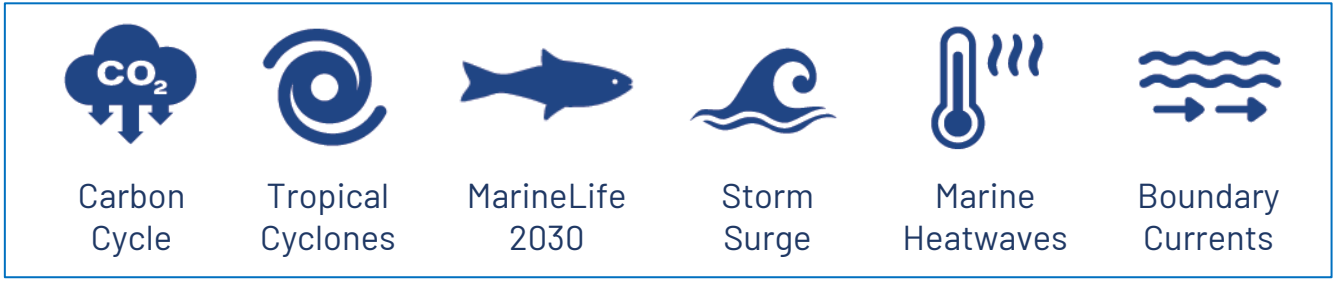
Transforming our ocean observing system assessment and design process

Ocean Observing Co-Design will build a system co-designed with scientific experts in observations and forecasts, and with key user stakeholders.

First steps: develop process and system capability through co-design 'exemplar' projects

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

EXEMPLAR PROJECTS



Develop best practices

Implement recommendations as part of GOOS infrastructure tools that track, evaluate, and communicate recommendations

First Co-Design Exemplar

- Address key ga
  manner observi
  - users
- More accessible
  information, ser
- A fit for purpose
  observing syste
- Inform investme
  governments
- System diagnos
  capability and ir

ving marine resources
s and establishing

nd natural resources.

versity and economies
ent, tourism, climate and

tected Area management,
ing and weather forecasts.

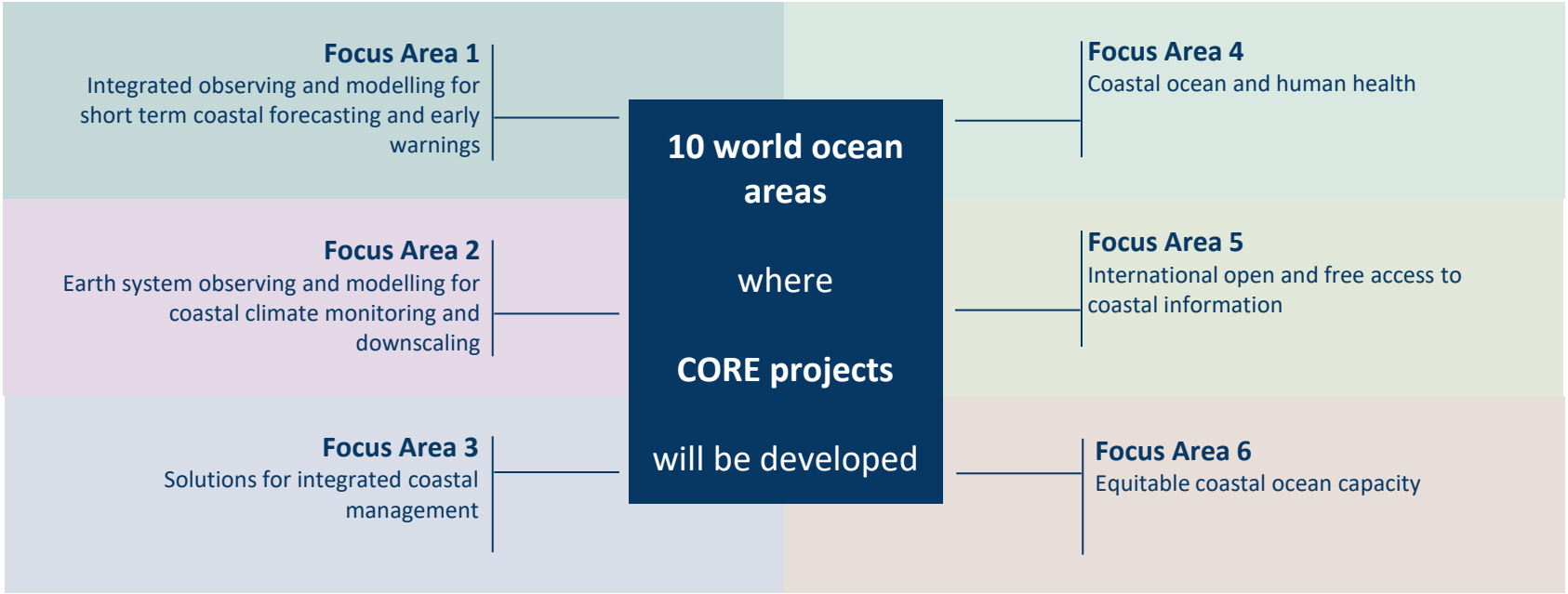
NATIONAL OBSERVING SYSTEMS DEVELOPMENT

- **Enhancing ocean observing system within the Republic of Mauritius**
- **Enhancement of hydrographic and oceanographic observations in the Kingdom of Morocco**

- developing and enhancing national systems to advance ocean knowledge and forecasting
- strengthen capacity in terms of platforms and network development
- develop modelling capabilities
- benefit from and adhere to best practices
- contribute to the regional programmes of African / Indian Ocean regions

Photo by Guillaume Baudusseau on Unsplash

Focus areas and initial projects

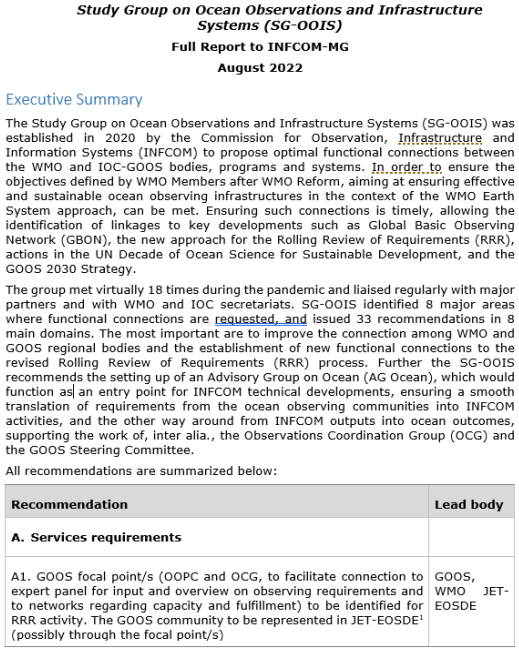


Partners already submitted **30** contributing projects.
3 Core Projects are endorsed

Recent Decisions of interest: WMO, IOC(GOOS)

Study Group on Ocean Observations and Infrastructure Systems (SG-OOIS)

- Established in 2020 by WMO INFCOM to propose optimal functional connections between the WMO and IOC-GOOS
- Vencat (co-chair), Emma Heslop (GOOS), Boris Kerry-Gerreyn (DBCP), Dave Berry (VOS), John Siddorn (MetOffice, GOOS SC), Champika (WMO), Sid Thurston (NOAA, WMO SC-ON), Karen Grissom (DBCP)… long process several reviews - OCG, OOCP, DBCP and VOS.
- 18 meetings, many documents…
- Final Report made 33 recommendations across 8 major areas
- High priority Requirements with 6 recommendations, most related to the WMO Rolling Review of Requirements (RRR)



Study Group on Ocean Observations and Infrastructure Systems (SG-OOIS)

Full Report to INFCOM-MG

August 2022

Executive Summary

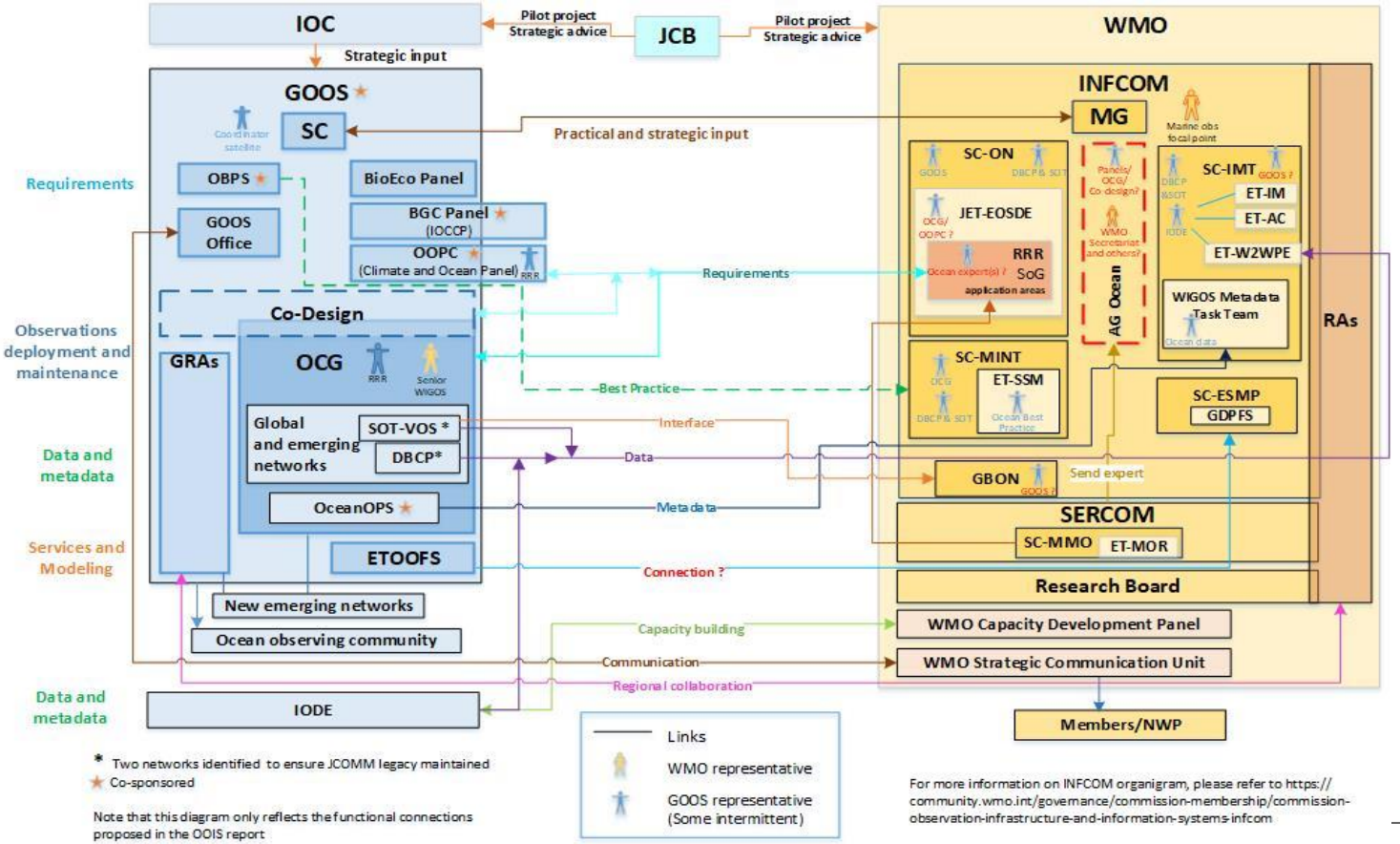
The Study Group on Ocean Observations and Infrastructure Systems (SG-OOIS) was established in 2020 by the Commission for Observation, Infrastructure and Information Systems (INFCOM) to propose optimal functional connections between the WMO and IOC-GOOS bodies, programs and systems. In order to ensure the objectives defined by WMO Members after WMO Reform, aiming at ensuring effective and sustainable ocean observing infrastructures in the context of the WMO Earth System approach, can be met. Ensuring such connections is timely, allowing the identification of linkages to key developments such as Global Basic Observing Network (GBON), the new approach for the Rolling Review of Requirements (RRR), actions in the UN Decade of Ocean Science for Sustainable Development, and the GOOS 2030 Strategy.

The group met virtually 18 times during the pandemic and liaised regularly with major partners and with WMO and IOC secretariats. SG-OOIS identified 8 major areas where functional connections are requested, and issued 33 recommendations in 8 main domains. The most important are to improve the connection among WMO and GOOS regional bodies and the establishment of new functional connections to the revised Rolling Review of Requirements (RRR) process. Further the SG-OOIS recommends the setting up of an Advisory Group on Ocean (AG Ocean), which would function as an entry point for INFCOM technical developments, ensuring a smooth translation of requirements from the ocean observing communities into INFCOM activities, and the other way around from INFCOM outputs into ocean outcomes, supporting the work of, inter alia., the Observations Coordination Group (OCG) and the GOOS Steering Committee.

All recommendations are summarized below:

Recommendation	Lead body
A. Services requirements	
A1. GOOS focal point/s (OOPC and OCG, to facilitate connection to expert panel for input and overview on observing requirements and to networks regarding capacity and fulfillment) to be identified for RRR activity. The GOOS community to be represented in JET-EOSDE[1] (possibly through the focal point/s)	GOOS, WMO JET-EOSDE

33 recommendations



Study Group on Ocean Observations and Infrastructure Systems (SG-OOIS)

Report finally submitted to INFCOM-2 session with following decisions:

- Request the Management Group of the INFCOM and Standing Committees to **implement relevant recommendations**.
- Request the president of the INFCOM to **engage with stakeholders listed in the report in order to implement relevant recommendations**, with a priority on the collaboration among regional entities and the establishment of a Global Ocean Observing System (GOOS) satellite coordinator.
- Through the Draft Resolution 5.2/1, INFCOM-2 **established Advisory Group on the Oceans (AGOcean)** to provide overall coordination on the application of ocean monitoring, including but not DBCP-38/Doc. 0.0.0, DRAFT 1, p. 3 limited to observations, data management, data sharing, data utilization and products, to the activities related to the terms of reference of the Infrastructure Commission.

GOOS - WMO requests and areas of expansion

Global Basic Observing Network

- WMO request to GOOS on potential ocean contribution to GBON
- GOOS identified an initial subset of candidate networks for GBON (negotiating this internally within GOOS and with WMO)
- Demands on OceanOPS are increasing. OceanOPS is essentially a community supported capability.

WMO RRR Application Areas

- WMO SC-ON and JET-EOSDE invite GOOS (OCG) to identify a 'coordinator' to update SOG for WMO ocean application areas
- Ocean and 3 Atmosphere Application areas have strong ocean component, plus climate and Earth Systems
- Some concerns on the part of GOOS
  - Resourcing
  - Alignment with GOOS (organization and processes)
  - Benefits for global observing and its wide range of supporters

IOC EC-55 Decision EEZ and next steps

The Executive Council adopted Decision IOC/EC-55/3.4.

Ocean Observations in Areas under National Jurisdiction

The Executive Council,

Considering the unique convening power of the IOC between Member State representatives and the scientific community,

Takes note of the report of the Experts Workshop on “Ocean Observations in Areas under National Jurisdiction” (GOOS Report 246);

Invites GOOS to provide detailed information on the issues regarding sustained ocean observations in areas under national jurisdiction identified in the report of the workshop;

Requests the Executive Secretary to invite Member States to provide information on their experiences regarding sustained ocean observations in Areas under their National Jurisdiction including on the issues identified by GOOS;

Further requests the Executive Secretary to compile and summarise the information received and report back to the IOC Assembly in 2023;

Also invites GOOS to propose awareness-raising and capacity building activities to help States realize the value of observations, including positive impact on States’ adaptation to climate change and sustainable economic development.

Advocating for ocean observing…

THE LAW OF THE SEA

+ BBNJ

Convention on Biological Diversity

GPA Global Programme of Action for the Protection of the Marine Environment from Land-based Activities

UNEP Regional Seas

UNESCO United Nations Educational, Scientific and Cultural Organization — The Protection of the Underwater Cultural Heritage

New: ILBI on Plastic Pollution 2024

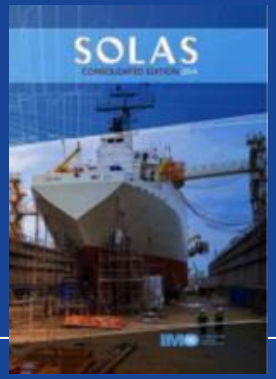
Sendai Framework for Disaster Risk Reduction

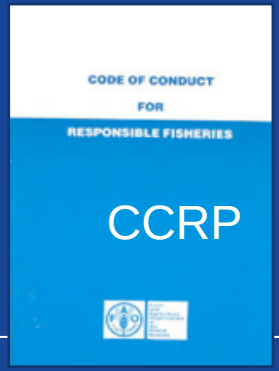
2015 - 2030

ISLAND VOICES GLOBAL CHOICES

UN Conference on Small Island Developing States

SAMOA PATHWAY






Ocean observing: an opportunity to address climate change and economic sustainability.
The time to act is now.

The Global Ocean Observing System

Thank you

goosocean.org

unesco Intergovernmental Oceanographic Commission

WORLD METEOROLOGICAL ORGANIZATION

UN environment programme

International Science Council