16th Observation Coordination Group (OCG-16)

7-10 April 2025, Brest, France

GOOS SMART Cables Network

Prepared/submitted by SMART Cables International Programme Office

1. Highlight the key network successes

Implementation Milestones: The SMART Cables initiative has successfully transitioned from concept to implementation (emerging) with two fully funded regional projects:

- InSea Wet Demo system installed December 2023 and working, sending data to archives; data consistent with data from nearby instruments.
- Portugal Atlantic CAM (Continent-Azores-Madeira) SMART system advancing on schedule for 2026 deployment
- France-supported Tamtam SMART system between Vanuatu and New Caledonia progressing with local stakeholder engagement on schedule for 2026 deployment.
- Substantial funding support from EC DG-Connect CEF-2 programme (Connecting Europe Facility).

Strategic Partnerships: Expanded collaboration through the ITU/WMO/UNESCO-IOC Joint Task Force (JTF) with new partnerships including:

- Subsea Telecommunications industry engagement with major cable providers developing SMART capability.
- Development banks expressing interest in financing regional systems as part of their Environmental, Social and Governance principles.
- Academic and research institutions integrating SMART Cables into ocean observation research programs

Technical Validation: Completed successful trial of integrated sensor technologies for measuring temperature, pressure, and seismic activity with the InSEA Wet Demo project.

Policy Integration: SMART Cables recognized in multiple international policy frameworks for disaster risk reduction and climate monitoring, enhancing visibility and commitment to the network through our UN sponsor agencies.

2. How has the network advanced across the OCG Network Attribute areas[1]

The SMART Cables initiative has made significant progress across multiple OCG Network Attribute areas as it moves toward becoming a mature and globally recognized ocean

[1] https://oceanexpert.org/downloadFile/45372

observing network and continues to advance towards full recognition as an operational and sustained global ocean observing network. Through strategic collaboration and ongoing system deployments, SMART Cables is poised to contribute significantly to the Global Ocean Observing System

Below is an overview of how SMART Cables aligns with and advances in these attributes:

1. Global in Scale
    - SMART Cables aims to establish a global network by integrating environmental sensors into subsea telecommunications cables worldwide.
    - Key projects include systems in Portugal (CAM), France-Vanuatu (Tamtam), and Italy (InSEA Wet Demo), with more under discussion.
2. Observes Essential Ocean and Climate Variables
    - SMART Cables collect data on temperature, bottom pressure, and seismic activity—critical parameters for climate monitoring, tsunami warning, and geophysical research.
    - These measurements contribute to the Global Climate Observing System (GCOS) and GOOS Essential Ocean Variables.
3. Sustained Observations
    - The initiative ensures long-term, continuous data collection beyond individual research projects by embedding sensors within commercial subsea cables, which typically have a lifespan of 25+ years.
    - Efforts are underway to secure sustainable funding for long-term maintenance and operations.
4. Community of Practice
    - The initiative is driven by a global consortium of scientists, subsea telecom operators, cable owners, and international organizations, coordinated through the ITU/WMO/UNESCO-IOC Joint Task Force (JTF).
    - Regular workshops, conferences, and strategic planning meetings foster collaboration and governance.
5. Maintains Network Mission and Targets
    - SMART Cables' mission—to enhance ocean and earth monitoring for climate disaster risk reduction—is well-defined, with clear targets for deployment and expansion.
    - Progress is tracked through international engagement with governments, scientific communities, and industry stakeholders.
6. Delivers Free, Open, and Timely Data
    - SMART Cables aims to provide real-time and delayed-mode data in adherence to FAIR principles (Findable, Accessible, Interoperable, and Reusable).
    - Coordination with OceanOPS and other data centers is a priority for ensuring seamless data accessibility.

7. Ensures Metadata Quality and Delivery
    - Metadata reporting and data-sharing frameworks are being developed to align with GOOS and OceanOPS standards.
    - The initiative seeks to integrate cable metadata into international databases for broader scientific and operational use.
8. Develops and Follows Standards and Best Practices
    - SMART Cables works with ITU, WMO, and UNESCO-IOC to establish industry-wide best practices for sensor integration, deployment, and data management.
    - Ongoing efforts focus on standardizing calibration, validation, and data quality assurance.
9. Capacity Development and Technology Transfer
    - The initiative engages developing nations in SMART Cables projects, particularly in the Pacific and Atlantic regions, to ensure inclusivity in ocean monitoring.
    - Training programs and knowledge-sharing activities help build capacity in underrepresented regions.
10. Environmental Stewardship Awareness

- By leveraging existing telecom infrastructure, SMART Cables minimizes additional environmental impacts while maximizing ocean data collection.
- The initiative actively promotes sustainable practices within the subsea telecom industry.

3. Future Plans and Opportunities - at network and/or cross-network OCG level

Global Implementation Strategy (2025-2030):

- Develop a phased approach for SMART Cable integration into planned cable refreshes and new routes
- Prioritize climate-critical ocean monitoring and high-risk seismic region gaps
- Create a sustainable funding model combining public science funding, disaster preparedness allocations, and telecom industry contributions

Knowledge Exchange and Capacity Development:

- Host international workshop on SMART Cable data processing and integration (Q4 2025)
- Develop training programs for regional partners in data management and sensor maintenance
- Create virtual community of practice connecting SMART Cable operators, scientists, and end-users

Cross-Network Integration Opportunities:

- Collaborate with Argo to complement spatial coverage for temperature and pressure monitoring
- Partner with GLOSS for enhanced sea level monitoring capabilities
- Coordinate with OceanSITES to validate SMART Cable data against fixed-point observations

4. Challenges and Concerns - at network and/or cross-network OCG level

- **Funding Constraints:** Continued need for financial support to sustain the SMART Cables International Programme Office (IPO) and new deployments.
- **Regulatory and Legal Barriers:** Addressing legal and regulatory challenges that vary by region, potentially delaying implementation. Request SMART be added to the on-going efforts by IOC, WMO, and ITU regarding data and UNCLOS.
- **Cross-Sector Coordination:** Bridging the gap between the telecom industry and ocean science communities to align priorities and objectives.

5. Asks from OCG (Exec, networks, OceanOPS, and/or GOOS) and any priority topics that should be addressed at OCG-16

Network Recognition and Integration:

- Formal recognition of SMART Cables as a GOOS Network with updated specification sheet
- Integration into GOOS reporting frameworks and assessment processes
- Support for securing the network's long-term operational funding

Data Management Support:

- Technical assistance from OceanOPS to develop metadata standards compatible with WIS2.0
- Collaboration with EMSO, INGV, IPMA, and Ifremer to establish data quality control procedures
- Development of visualization tools for SMART Cable data presentation alongside other GOOS networks

Cross-Network Coordination:

- Facilitation of working sessions with complementary networks (Argo, GLOSS, OceanSITES)
- Support for developing integrated products combining SMART Cable data with other observation systems

- Assistance in identifying priority deployment regions based on gaps in current observation networks

6. Recent publications, articles, etc. (if you want to share)

- Howe, B. et al. (2019) "SMART Cables for Observing the Global Ocean: Science and Implementation," Frontiers in Marine Science, 10:1105590.
- Rowe C. et al (2022) SMART Cables Observing the Oceans and Earth
- Joint Task Force SMART Cables (2024) "Implementation Roadmap 2025-2030," ITU/WMO/UNESCO-IOC Joint Task Force.

Additional considerations:

- What requirements do you base your system design/completeness on - e.g. for the report card? Are you utilizing / are responsive to any requirements from e.g., GCOS, WMO RRR? If yes, what and how?

- Alignment with GCOS Essential Climate Variables for subsurface temperature and pressure
- Conformance with WMO observational requirements for tsunami early warning systems
- Contribution to monitoring of GOOS Essential Ocean Variables, particularly in deep ocean regions
- Responsiveness to UN Sendai Framework requirements for multi-hazard early warning systems

We are asking for guidance to develop what is necessary for the report card.

- What would you like to see in OceanOPS 2026-2030 strategic plan?

Include SMART Cables as core infrastructure for ocean observation

Develop integration protocols for SMART Cable data with other observing platforms

Create dedicated capacity development initiatives for regions implementing SMART Cable systems

Establish monitoring frameworks to assess SMART Cable contributions to GOOS objectives

- Questions for other networks, networks specific questions for discussion at the session, and highlight cross OCG questions for discussion next day session
  Argo, OceanSITES and DART networks

    - Can you share your current data process within the GOOS framework?
    - Can you share how you integrate the data into GOOS? You do it by sensor? By device?
    - Can you share your current budget to maintain these networks?
    - Can you share any agreement, between your network with any/all governments
    - Can you share the milestones accomplished to become a mature network withing GOOS? How was the process and how they communicated?
    - Does GOOS, OceanOPS have a monthly or quarterly meeting, to see if the network is working accordantly their expectations. If not, what is the process? Does it involve an emergency fund budget?
    - Can you please share the KPI's and positive ranges your network need to have so is considered useful for end users.
    - Is there any additional information/ documentation you can share with SMART Cables to use as a reference?
    - Would you both be willing to support a SMART Cable session to share your lessons learned and suggest how we should proceed in the best way possible.
- What are your links to the Ocean Decade? (List programs etc. you are involved in)

SMART Cables contribute to disaster risk reduction, climate resilience, and ocean sustainability efforts under the UN Decade of Ocean Science. We are an endorsed project in the Ocean Decade "Science Monitoring And Reliable Telecommunications (SMART) Subsea Cables: Observing the Global Ocean for Climate Monitoring and Disaster Risk Reduction, ID 94"