

GOOS (Emerging) Network Name: SMART Cables Network

Prepared and submitted by ITU/WMO/UNESCO-IOC Joint Task Force SMART Cables

SMART Cables has been working with our sponsoring UN agencies since 2010, and GOOS at least since 2016. This began with the effort to make ocean bottom pressure an Essential Ocean Variable (EOV, in). Over the years, as the Initiative developed, the JTF attended many GOOS and Tsunami Programme meetings to solicit advice and help, and keep the communities up-to-date on progress. Having briefed OCG-14 and the GOOS Steering Committee, we are at the point of expecting full endorsement as and Emerging GOOS Observing Network by the OCG.

1. Key network successes

- Two SMART subsea cable systems are funded and contracts signed. Both will be installed and ready for service in 2026. The supplier for both is ASN – Alcatel Submarine Networks, the largest supplier of submarine cable systems. SMART Cables (“Climate Change CC nodes”) are just one aspect of their strategic corporate strategy for climate change. Each CC node will have temperature, pressure and seismic sensors.
 - The TAMTAM SMART Cables System will have 4 SMART modules between Vanuatu and New Caledonia. President Macron of France first announced support for SMART capability 27 July 2023, amounting now to €18M. This will be the second international cable for Vanuatu – extremely important for economic resilience, while improving earthquake, tsunami, and volcano early warning and providing ocean observations
 - Atlantic CAM SMART Cable System in Portugal replacing an old system, will link the Continent to the Azores and Madeira in a 3,700-km ring – CAM. The SMART cable will have 20 CC nodes along the 4000 km of cable. The prime motivator is the very destructive 1755 earthquake and tsunami; the ocean observations will be very relevant for contributing to the understanding of the Atlantic Meridional Overturning Circulation in the Northeast Atlantic. SMART capability will have an incremental cost about 15% of the cost of the telecom system (total cost is €154M). For reference, this means a Portuguese citizen pays about €2 for 25 years of early warning service. Or, the SMART component is equivalent to 1 or 2 DART buoys over the 25 years.
- We are leveraging this \$5 billion per year industry to our advantage - and theirs. We are tapping into connectivity funding. The European Commission Directorate General for Digital Connectivity issued requests for proposals that stated project

costs can include “environmental sensing (e.g., SMART cables)”. Portugal obtain €40M to date to offset their costs.

2. How has the network advanced across the OCG Network Attribute areas¹

Global in scale

SMART Cables has a global vision. To develop SMART Cables all around the globe, we are working with Regional and National focal points (ITU, WMO, and UNESCO-IOC) and all other relevant stakeholders so they can have the understanding and take ownership of systems that are develop in their waters.

Observes one or more Essential Ocean Variables or Essential Climate Variables

SMART Cables contribute to the Essential Ocean Variables Subsurface Temperature and Ocean Bottom Pressure. (If there were analogous Variables for the solid earth, it would be seismic motion.)

Sustained observation

SMART Cables will be the only truly real-time, high reliability network that will provide temperature, pressure, and seismic data to the Global Ocean Observing System.

Community of Practice

The ITU/WMO/UNESCO-IOC Joint Task Force SMART Cables has been advocating in the subsea telecom industry, ocean and earth science community, and governments around the globe to provide guidance on setting up standard practices to develop SMART Cables locally and internationally.

Maintains network mission and targets

SMART Cables will develop a defined role and track and assess progress of the network within GOOS.

Delivers data that are free, open, and available in a timely manner

SMART Cables has a data management committee in coordination with our UN agencies sponsors WMO and UNESCO-IOC. The committee is working to set up an advanced data management infrastructure through data centers and/or standard services including the WMO Global Telecommunications System/WIS2.0 and web based services and it will operate under FAIR principles. We expect the SMART Wet Demo system install off Sicily in December 2023, as well as the planned ASN CC node test system to be installed off southern France in 2025, to serve as live test beds for data management, so when the two systems come on line in 2026, data will immediately flow as expected.

¹ <https://oceanexpert.org/downloadFile/45372>

Ensures metadata quality and delivery

SMART Cables will submit complete platform metadata to OceanOPS in a timely manner.

Develops, updates and follows Standards and Best Practices

SMART Cables will develop Standards and Best Practices, in the following two years before deployment, during the commissioning phases (~1 year) and thereafter. These will reflect the continually evolving and expanding SMART Cable Observing Network.

Undertakes capacity development and technology transfer

SMART Cables enable new (developing and disadvantaged) communities of ocean observers and supports inclusivity and diversity in its members.

Environmental stewardship awareness

SMART Cables advocate to minimize environmental footprint and contributes positively towards a healthy ocean.

3. Future Plans² and Opportunities - at network and/or cross-network OCG level
Develop SMART Cables around the globe, setting up a standard procedure for SMART data.
4. Challenges and Concerns - at network and/or cross-network OCG level
We need to interact more with WMO to ensure SMART data has a standard procedure that will be used in the first SMART Cables systems and then improved for subsequent ones.
5. Asks from OCG (Exec, networks, OceanOPS, and/or GOOS), perhaps related to the responses to parts 3 and 4 and how OCG can support your network
 - Keep promoting synergies between science, industry governments and other related stakeholders
 - Have an OCG representative in the Joint Task Force SMART Cables to provide guidance and support.
 - *Should we consider to have an ECV?*
 - Have all GRA as allies to promote SMART cables in an organized way.
6. Recent publications, articles, etc. (if you want to share)
 - [Joint Task Force \(JTF\), ITU/WMO/IOC SMART Cables for Observing the Ocean](#) Science Monitoring And Reliable Telecommunications, Climate Monitoring and Disaster Mitigation
 - [SMART Cables for Observing the Global Ocean: Science and Implementation, 2019](#). Frontiers of Marine Science

² Future plans on implementation, instrumentation, data management, test, new sensors, plan for new EO/ECV observations, capacity development, etc.

- [SMART Subsea Cables for Observing the Earth and Ocean, Mitigating Environmental Hazards, and Supporting the Blue Economy, 2022](#), Frontiers of Earth Science
- [SMART Cables Observing the Oceans and Earth](#), Marine Technology Society, 2022.
- Wet Demo off Sicily to be installed 2023, INGV, Funded
- Alcatel Submarine Networks (ASN) 2020.09.29 [Press release - climate change](#) an integral part of business strategy, 2023.03.14 [Press Release - developing Climate Change Solution](#); will supply SMART capability 2025.
- Portugal SMART Atlantic CAM system Continent-Azores-Madeira ring, 3700 km, 50 SMART repeaters, ready for service 2025, €154M. [Authorized by Gov't 2022.04.13](#); [2022.10.20](#); RFP issued [2022.12.13](#); [Description and implementation of the "Observer Part" of a SMART Cable, 2023.01.27](#), [Science paper](#). [Early Warning Paper](#).
- Vanuatu-New Caledonia - [Leaders signed MOU for 2nd international cable 2022.07.29](#), SMART, France will support a SMART Cable between Vanuatu and New Caledonia - President Macron's speech in Vanuatu 27 July 2023 ([video \(minute 11\)](#) and [text](#))
- [Tamtam installation contract signed between ASN and Prima, January 2024](#). It will connect Vanuatu and New Caledonia with a SMART Cable.
- [NZ-Antarctica/McMurdo Base SMART Cable, US National Science Foundation](#) and [workshop report](#) and [desk top study](#); 2-year project funded to continue planning, October 2023
- [NZ-Chatham Islands - MBIE report under consideration, w/ SMART](#), and [Science workshop report](#)
- Norway-Japan via Arctic - [Far North Fiber - under consideration, welcome SMART](#). [NORDUNet PolarConnect Video](#). [NORDUNet Webinar 20230907](#)
- [MEDUSA - Lisbon-Egypt - raising funds for SMART portion](#)
- [Indonesia – in-country development – 50 km 2 node single ended system; SMART Cable Potential in Indonesia](#), Salaree et al, [Pure Appl. Geophys, 2022](#)
- [Moore Foundation has awarded Joint Task Force/UHawaii \\$7M to facilitate SMART, globally, regionally, as well as Vanuatu-New Caledonia, proposal](#)
- ITU - [Circ. Letter Member States, Assemblies \(WTSA-20, WTDC-22, PP-22\)](#); [Study Group 15/Q8 G.SMART](#). Forwards - Submarine Telecom, [2019/20](#), [2021/22](#)
- [SMART endorsed as Project of the UN Decade of Ocean Science for Sustainable Development 2021-2030, Supporting Docs, Web page](#), with GOOS, Tsunami
- [Global Ocean Observing System \(GOOS\)](#) accepts Ocean Bottom Pressure as an Essential Ocean Variable; and SMART as a GOOS Project. 2022.11.28.
- [European Union Funding: CEF-2 Digital Global Gateways, Submarine Cables, Call 2](#) 2022.10.12, w/ SMART, outlying territories, €153M, 30-70% of project cost; ([see DG Connect ppt](#)); [Call 3 2023.10.17](#), [RFP](#).
- [JTF SMART Cable Workshop 19-20 January](#) after PTC23 in Honolulu, followed by Moore SMART Cable project meeting 21-23 January.
- Asia-Pacific Countries with Special Needs Development Report, 2023: [Strengthening Regional Cooperation for Seamless and Sustainable Connectivity](#), ESCAP
- Workshop, [SMART Cables, Science and Society](#), University of Aveiro, 22-23 May 2023
- New SMART Cables web site (in addition to the ITU site at top), <https://www.smartcables.org/> and [video](#).
- [Observer part of the SMART Atlantic CAM Request for Tender, LEA Jan 2023](#)
- [News article – June 2022 – Making subsea cables smart, and helping save the planet: How SMART repeaters could help the fight against global warming](#)
- SMART [Wet demonstration system installed by Guralp and INGV](#) December 2023
- JTF Meeting 20 January 2024 just before PTC24 in Honolulu. [Slides](#).
- [Short video](#) about the JTF, by GoatKnight.