Observing the Ocean and Earth with SMART Subsea Cables: Tsunami

Science Monitoring And Reliable Telecommunications

Bruce Howe

Chair, Joint Task Force for SMART Subsea Cables

Ceci Rodriguez Cruz

Director, SMART Cable International Programme Office

Thirtieth Session of the Intergovernmental Coordination Group for the Pacific Ocean Tsunami Warning and Mitigation System

ICG/PTWS-XXX
11-15 September 2023
Kingdom of Tonga

The Joint Task Force

- Joint Task Force SMART Cables formed in 2011 by 3 UN agencies:
  ITU, WMO, UNESCO-IOC, 200 volunteers
- Work with UN Agencies:
  - ITU: Telecommunication Standardization and Development Bureaus, G.SMART Study Group, ITU Climate and DRR Resolutions
  - WMO: Tsunami (DBCP) and GOOS units, Data Management
  - IOC: Tsunami Unit, GOOS Project
- UN Decade of Ocean Science for Sustainable Development
  Project, with GOOS and Tsunami Programmes

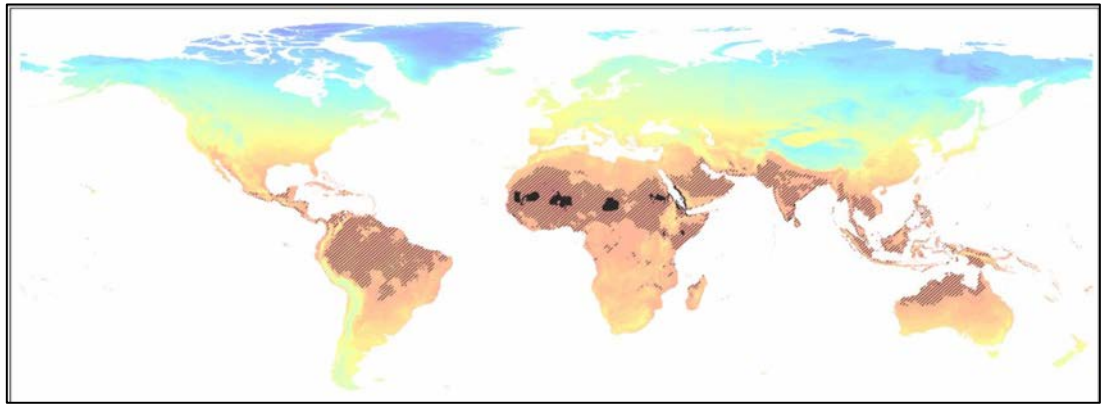
2021 2030 United Nations Decade of Ocean Science for Sustainable Development

ITU WMO unesco

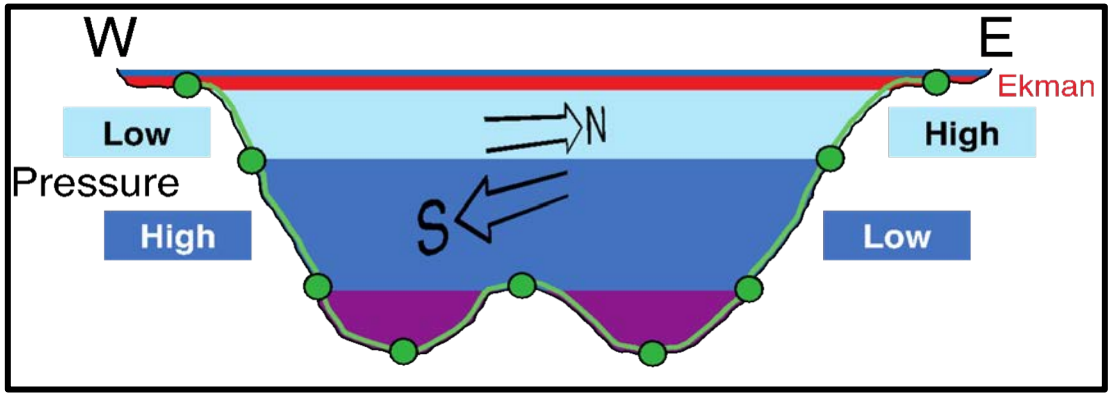
GOOS DEEP OCEAN OBSERVING STRATEGY pogo Partnership for Observation of the Global Ocean

WHAT WE DO : Climate and DRR

TODAY – 1% of land too hot for humans – future?

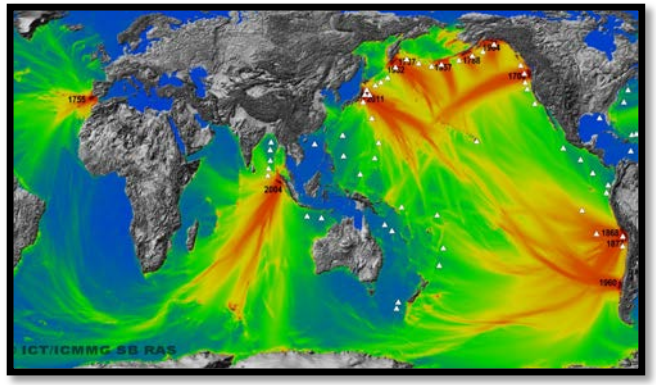


Climate change



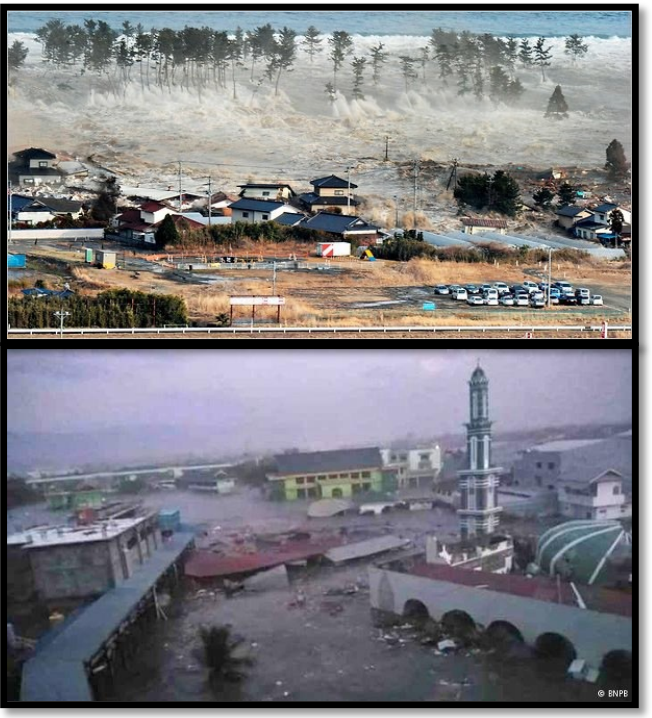
Sea Level Rise

Ocean circulation



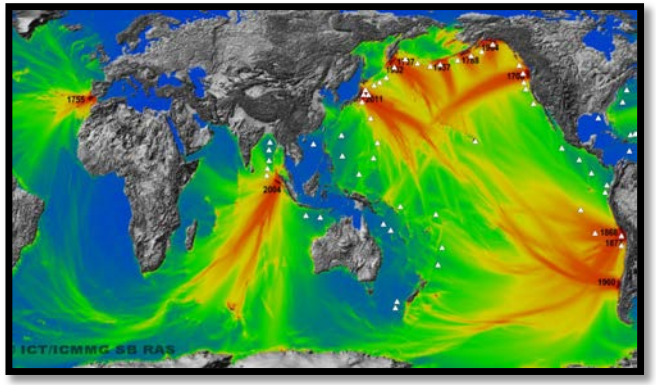
Earthquakes and Tsunamis

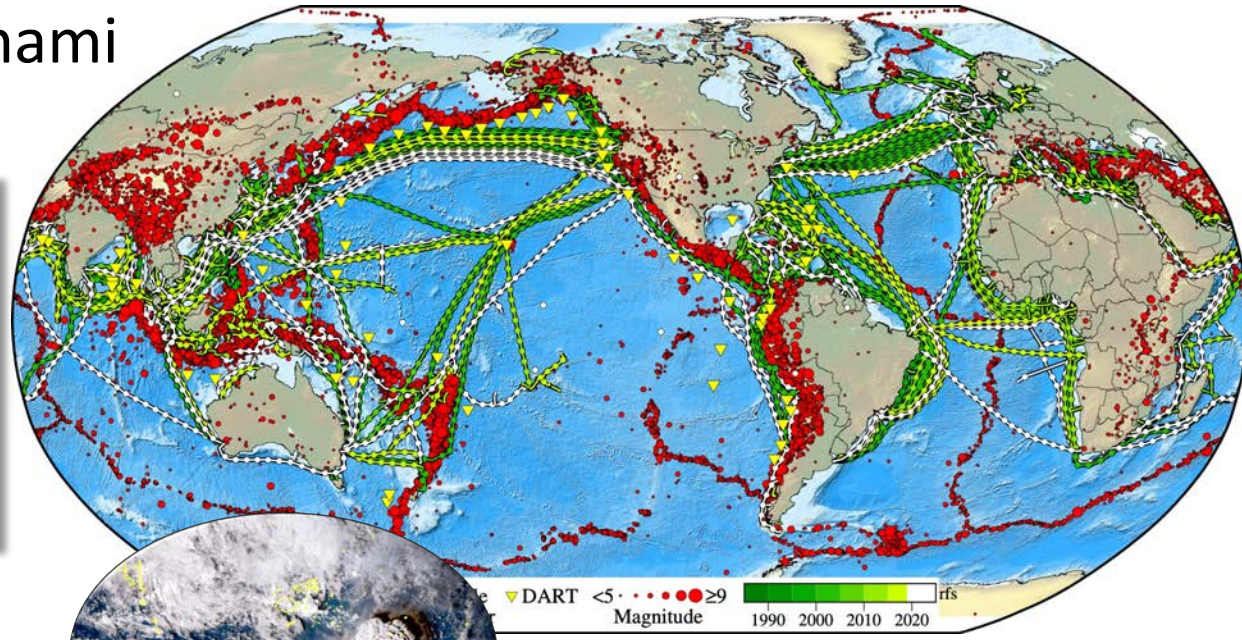
Earthquakes and Tsunamis



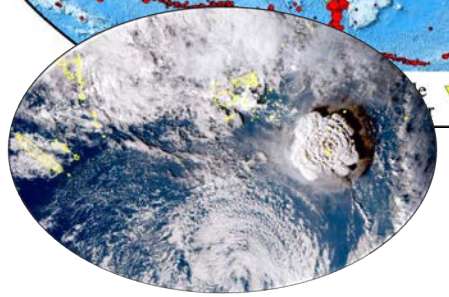
Earthquake warning: time to “Drop, Cover, and Hold On!”

Survive to escape Tsunami





Tonga 2022



DART tsunami warning buoys
Sep 2023, 59/76 working

1755

Place	Year	Mag	H (m)	Deaths	Cables cut
Algiers	2003	6.8	3	2,244	All Europe-Mid-East
Tohoku	2011	9.0	10	19,000	~10

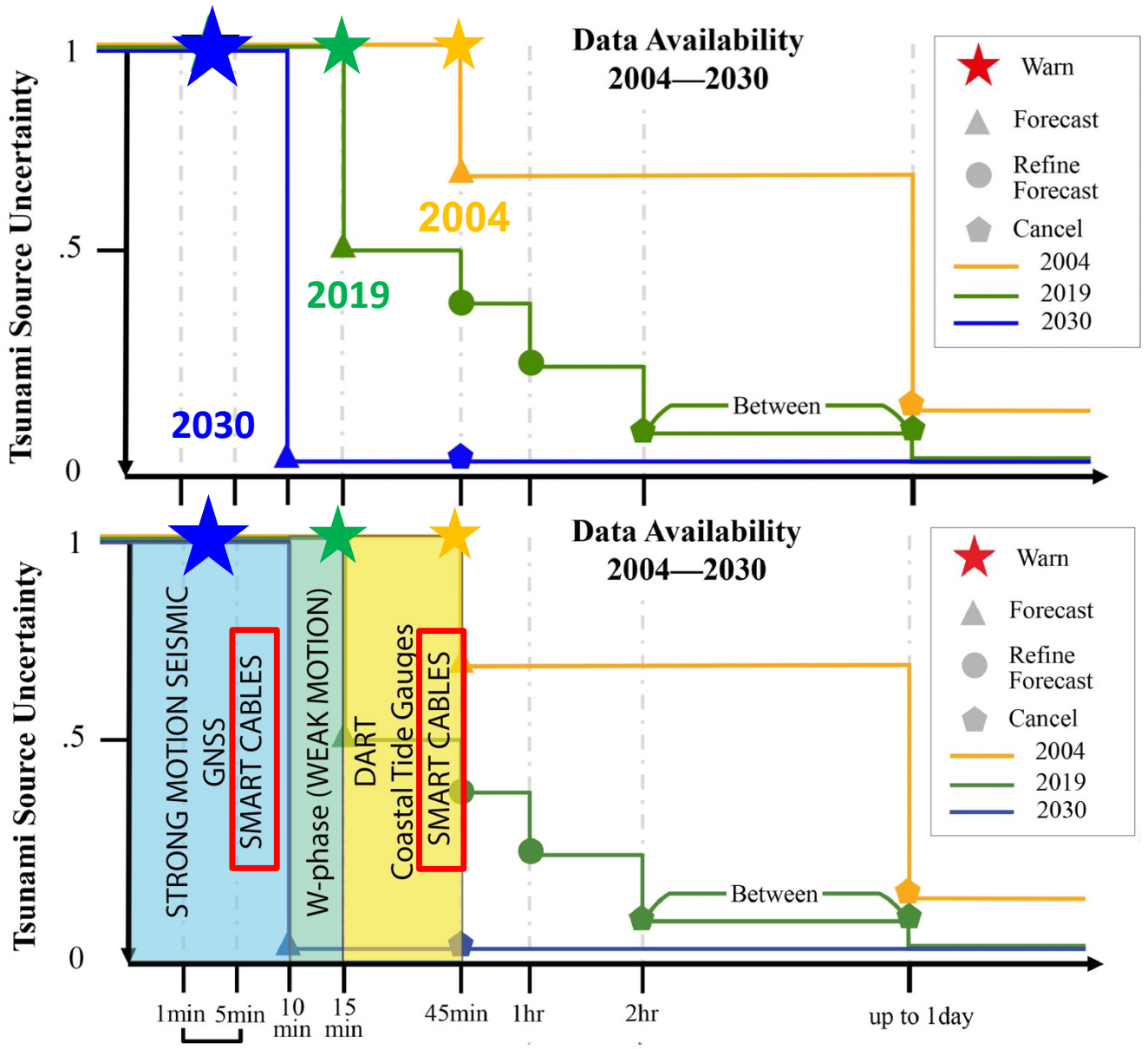
Taiwan

Climate change increasing typhon number and intensity (e.g., Morakot 2009)
+ earthquakes trigger submarine turbidity currents - Cut 42 cables 2006-2013

Improvement in early warning (SMART, GNSS)

UN Ocean Decade Goal:

Integrate SMART Cable technology into innovative early warning systems



2021 2030 United Nations Decade of Ocean Science for Sustainable Development

ITU WMO unesco

Climate Change solution (SMART* technology)

ASN, the key partner for
undersea data acquisition
With scientific sensors

ASN solution based on CC-Nodes

New generation of submarine networks integrating sensors for Climate Change observation

dual use (telecom + CC) & dedicated CC systems

CC-NODE

temperature | accelerometer
pressure | specific sensors

Key applications

Risk monitoring

- Earthquake detection
- Tracking of tsunami wave
- Tsunami warning

Scientific observation

- Sea bottom movements
- Sea level rise
- Slow drift of sea bottom temperatures
- Sea water currents by temperature & pressure combination

ASN, part of the Ocean Decade

"Science we need for the ocean we want"

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

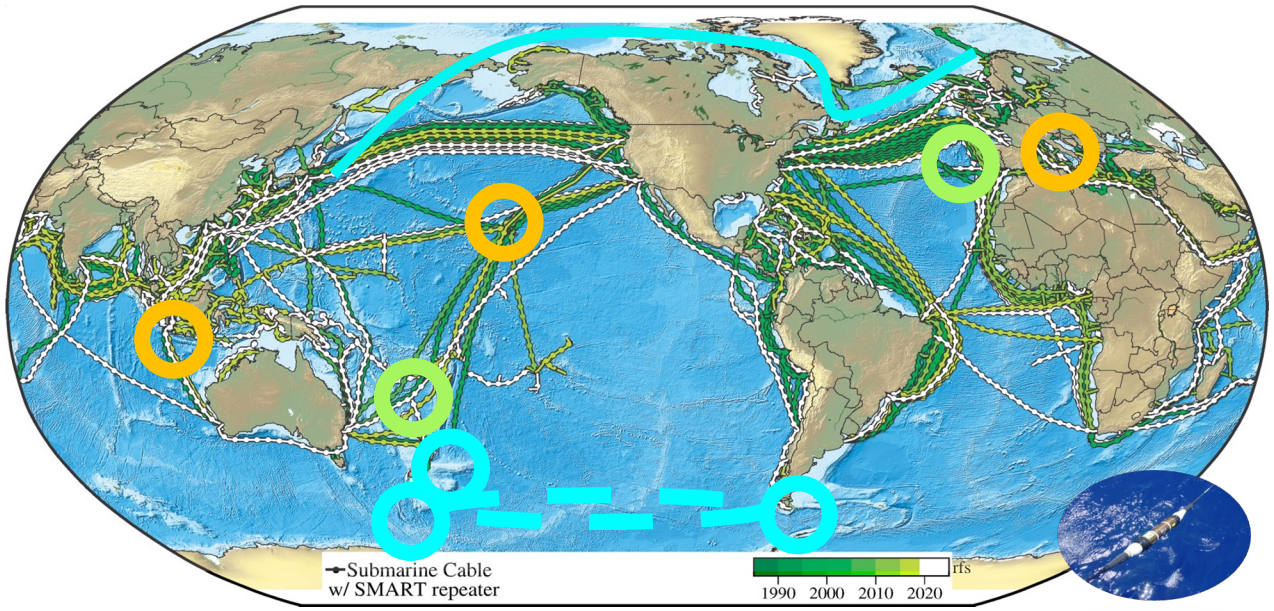
First SMART projects planned for 2025 / 2026

- South Pacific
- Atlantic
- Asia

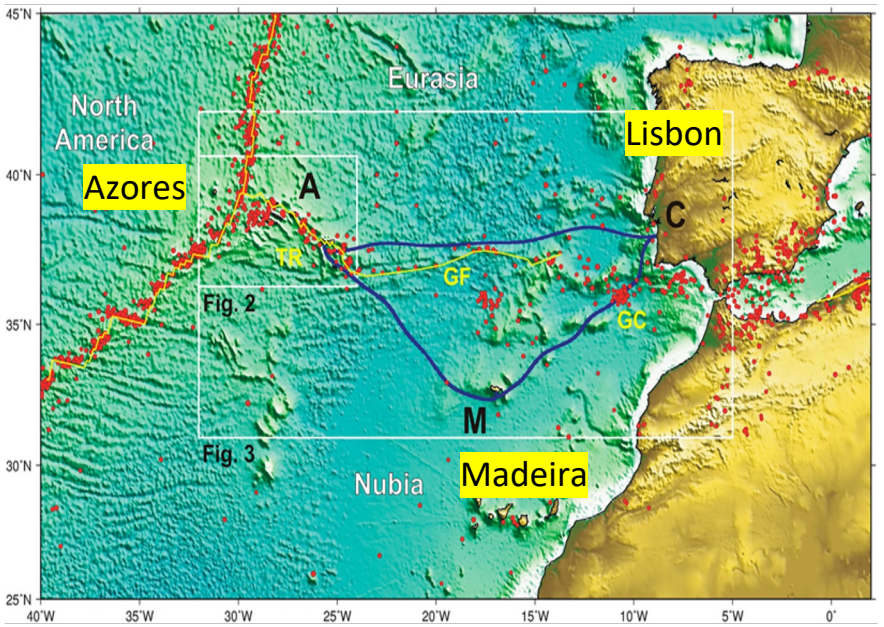
* *Scientific Monitoring And Reliable Telecommunications*

SMART Subsea Cables: REAL CASE

Create a Planetary sensor, power, Internet network



Portugal SMART Atlantic CAM



Global climate, ocean, sea level, earthquake, tsunami

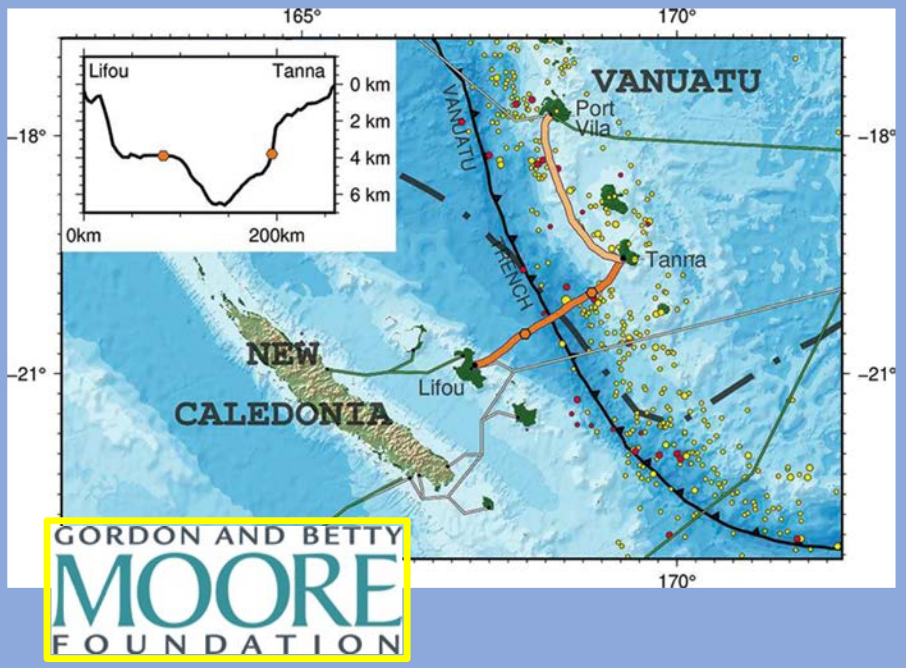
GOOS Essential Ocean Variables (EOV)
Ocean Bottom Pressure
Subsurface Temperature

EU financial support for international cable connectivity including environmental sensing

- 3700 km, 50 SMART repeaters, €154M
- RFP 2023, Ready For Service 2025
- 25+ year life, reliable, low lifetime cost
- Leverage $5B/y industry, 170 y experience

SMART 10% €15M = €1.5/citizen/25 y
Or ~1 DART buoy for 25 years,

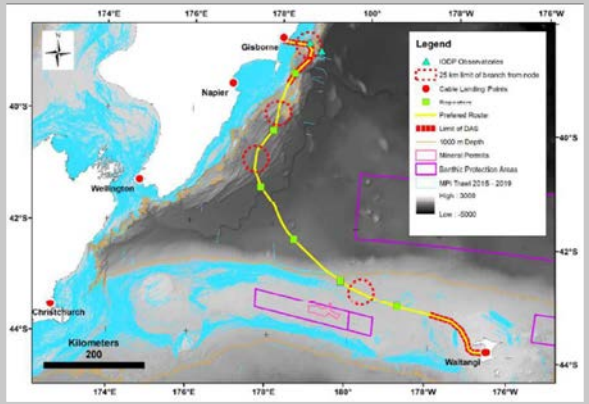
SMART Cables - Pacific PLAN



GORDON AND BETTY MOORE FOUNDATION

Vanuatu – New Caledonia

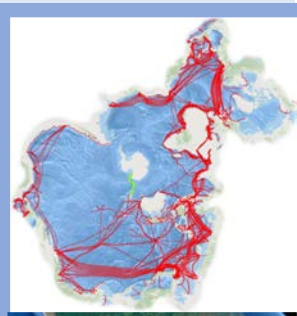
- In process:
- ~400 km, 4 or 6 SMART nodes, 2025/26
- France is supporting SMART portion
- Telecom portion being negotiated



NZ–Chatham Islands

SMART + DAS + BUs/nodes

Under gov't review (MBIE)



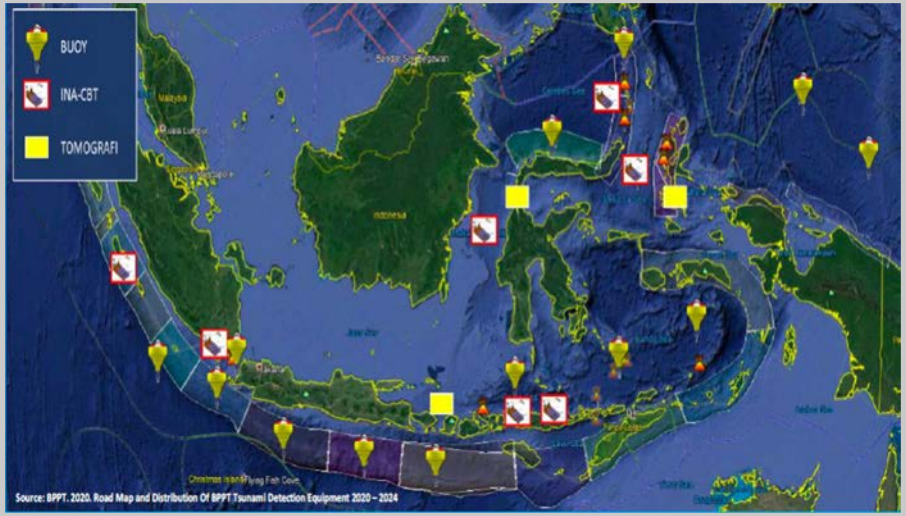
NSF

Antarctica – NZ

Improve connectivity

SMART Cable

Workshops, NSF, NAS, Chile



Indonesia

In country development

Ina-CBT

Single ended, 50 km, 2 module test system working off Labuan Bajo

Far North Fiber

14,000 km

Low latency

Communities

Contract 2023

RFS 2026

SMART integral

Next steps – PTWS – 1

Each and All Regional Working Groups (RWG):

- Works with each country to connect with relevant ministries (PM, climate, hazards, telecom, finance), with help of SMART IPO, ITU, WMO, IOC, and TP and GOOS Establish National Focal Points matrix for all
- Educate them and enlist aid
- Report on current and potential SMART opportunities (e.g., replacing retiring cables, 2nd and 3rd international cables, etc). Include in RWG annual reports.
- Assist in planning and implementation
- Investigate and clarify data sharing policies unique to SMART and to region and countries
- Perform regional observing system simulations to optimize and quantify benefit

WG2 TT Task Team Integrated PTWS Sensor Networks – expand effort, integrate inputs from RWGs, connect with GOOS

Next steps – PTWS – 2

PTWS to IOC and others:

- Coordinate SMART activities across all ICGs
- IOC improves coordination between GOOS and the TP, within IOC and the OD.
- In designing a multi-purpose observing system, the requirements for the different purposes need to be balanced for a global optimization (e. g., pressure being used both for oceanography (barotropic flow) and tsunami purposes). (in ODTP)
- Work with GOOS to formalize SMART Cables as an emerging network (e. g., with Portugal/V-NC)
- IOC assist the JTF in accessing Climate and DRR sections of funders, e.g., multilateral development banks. (This is part of OD remit)
- Work together as part of the UN Early Warning For All

- The IOC Tsunami Programme web pages be re-newed and modernized.

SMART Subsea Cables

Science Monitoring And Reliable Telecommunications

Video

Tonga, September 2023

SMARTCables.org

ITU/WMO/UNESCO IOC
Joint Task Force
SMART Cables

GORDON AND BETTY MOORE FOUNDATION

ITU WMO unesco

SCHMIDT MARINE TECHNOLOGY PARTNERS