

Observing the Ocean and Earth with



The SMART Cable Initiative



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Session 9. Climate services and ICT linkages

A banner for the DATA X BLUE PACIFIC event. On the left is a colorful circular graphic with concentric rings of dots in orange, yellow, green, and blue. The text "DATA X BLUE PACIFIC" is centered in a blue, stylized font. Below the title, it says "23-25 October 2024 • Sydney, Australia". At the top right are logos for ADB and PRIF. At the bottom are logos for ADB, Australian Aid, New Zealand, European Union, European Investment Bank, JICA, and World Bank Group. On the right side of the banner, there is a faint illustration of palm trees.

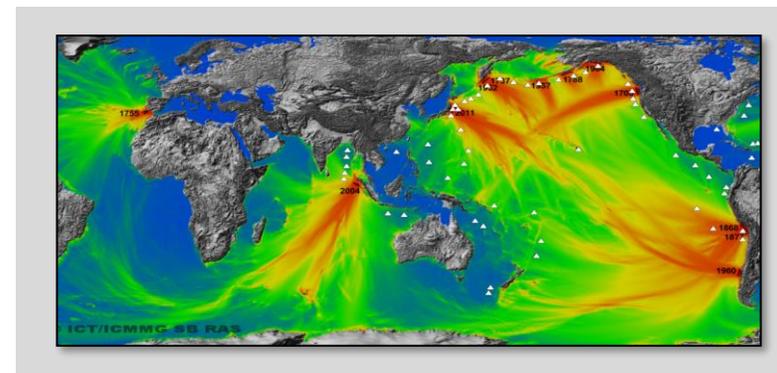
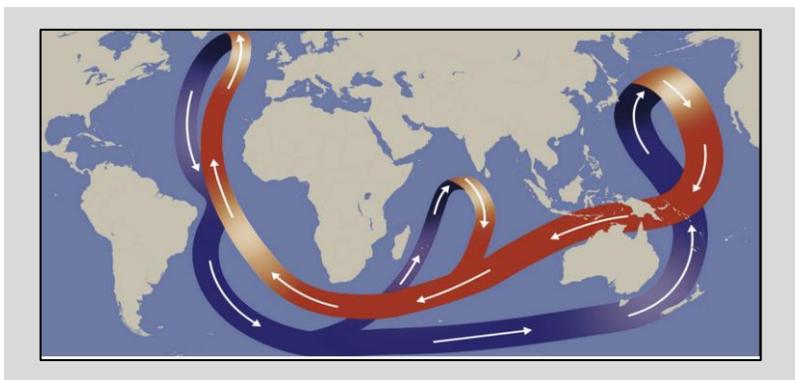
DATA X BLUE PACIFIC
23-25 October 2024 • Sydney, Australia

ADB PRIF

ADB Australian Aid NEW ZEALAND European Union European Investment Bank JICA WORLD BANK GROUP

United Nations effort uniting science with the telecom industry to observe the oceans and Earth

Ocean general circulation – all scales

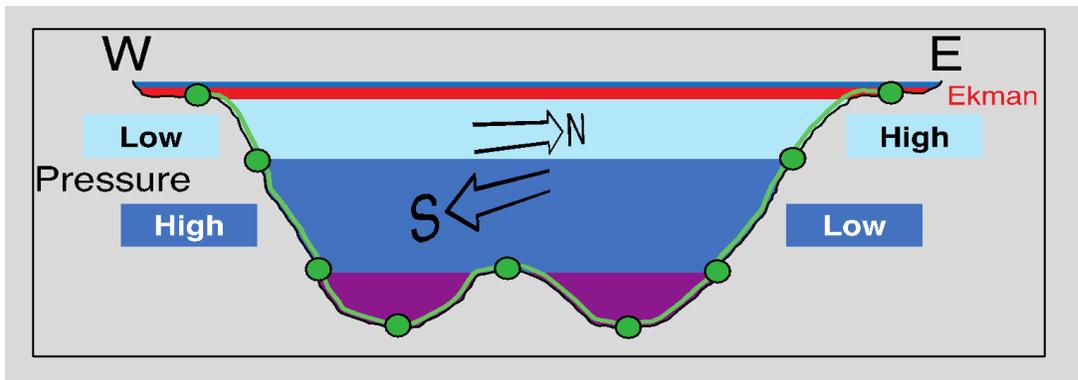


Earthquakes and Tsunamis



Climate Change

Sea Level Rise



Ocean heat and circulation

Global Array for Climate, Oceans, Sea Level, Earthquakes, Tsunamis

Create a Planetary sensor, power, Internet network



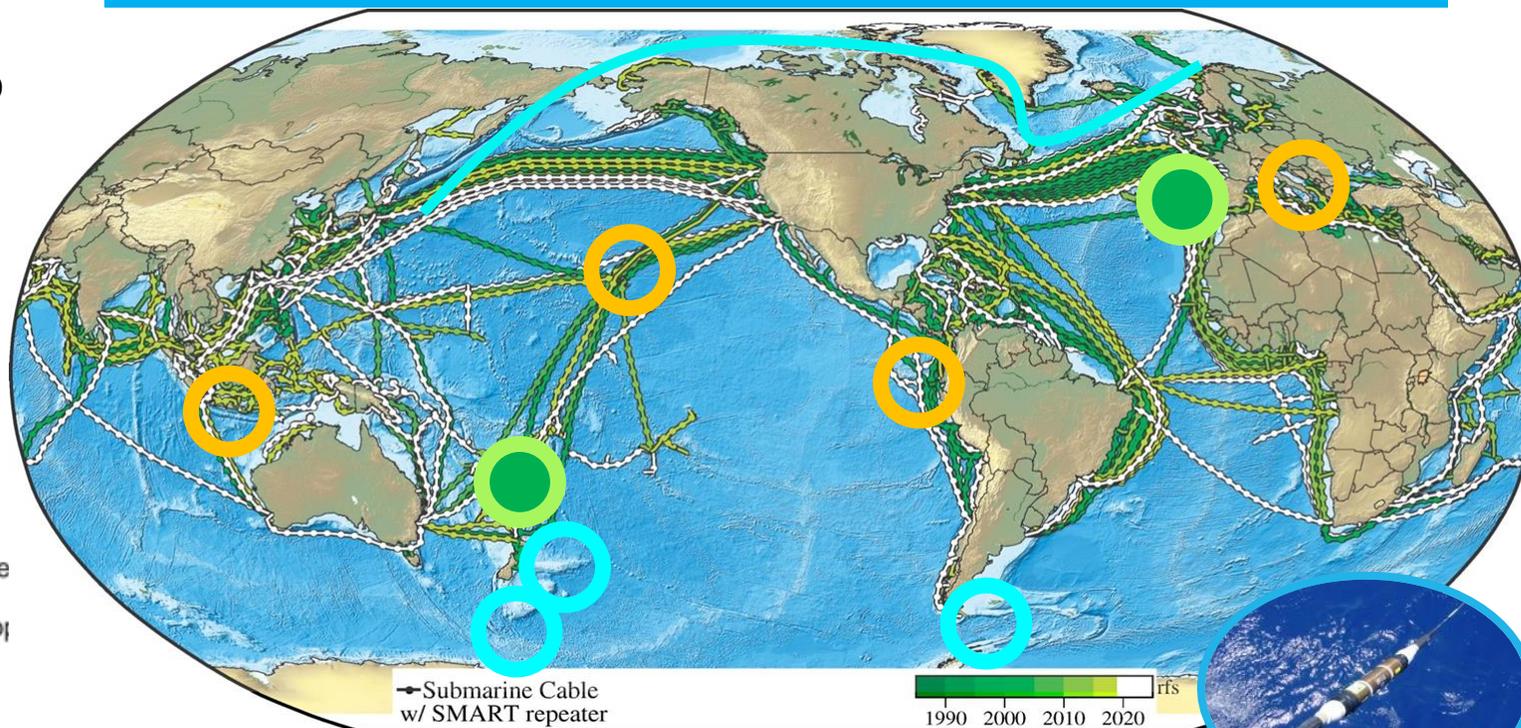
1st order addition to Ocean-Earth observing system

Share submarine cable infrastructure
Telecom + science
↓€\$

NO Interference

1.4+ GM
~20,000 repeaters
20 year refresh

repeaters ~100 km



2021-2030 United Nations Decade of Ocean Science for Sustainable Development

SMART Atlantic CAM and Tamtam V-NC Funded, install 2026

Know the environment protect the network

Bottom temperature, pressure, seismic motion



Climate change – humanity’s greatest existential threat

Societal and environmental issues - SDGs +



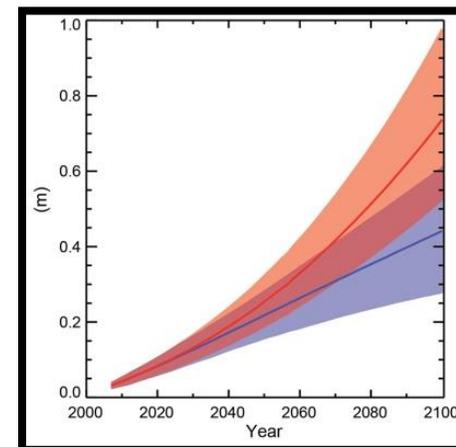
- **Climate change** – ocean temperature and heat content, circulation
- **Sea level rise** – hazard for coasts, islands, cities
- **Disaster Risk Reduction** – tsunami and earthquake monitoring
- **Societal Connectivity** – Resilient and sustainable telecom infrastructure



UN Decade of Ocean Science for Sustainable Development, 2021-2030

2021-2030 United Nations Decade of Ocean Science for Sustainable Development

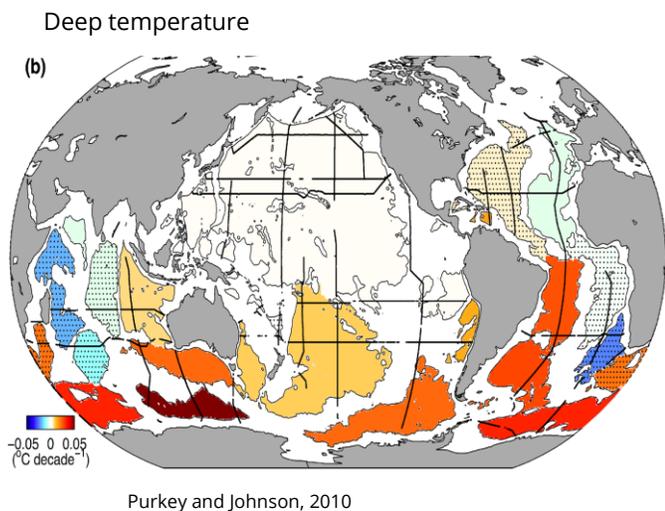
Sea Level Rise



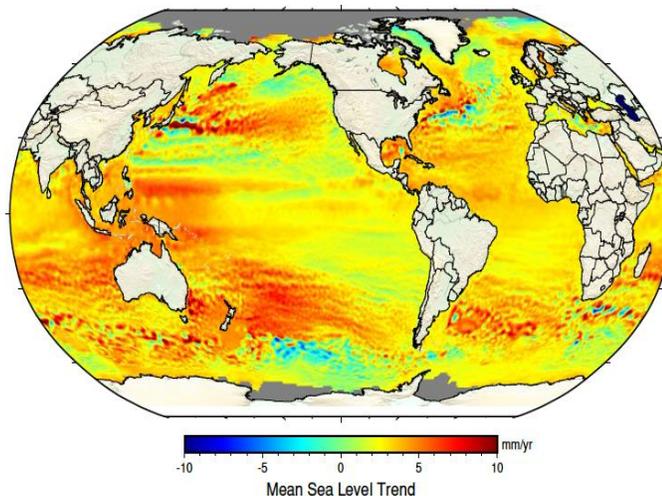
Tsunami



Climate and Oceans: Temperature, Pressure and Sea Level

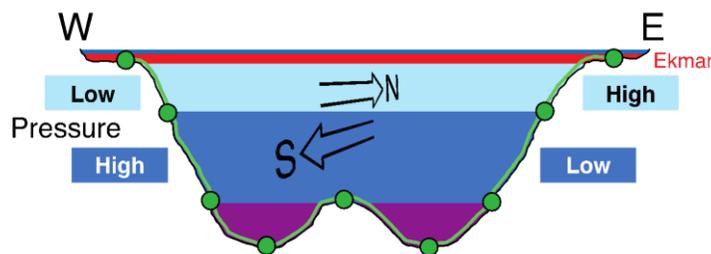


Sea Level mm/yr



- SMART → Temperature, EOVS
- Deep ocean heat content / thermal expansion → sea level rise
- Δ deep ocean temperature → Δ circulation, Δ climate

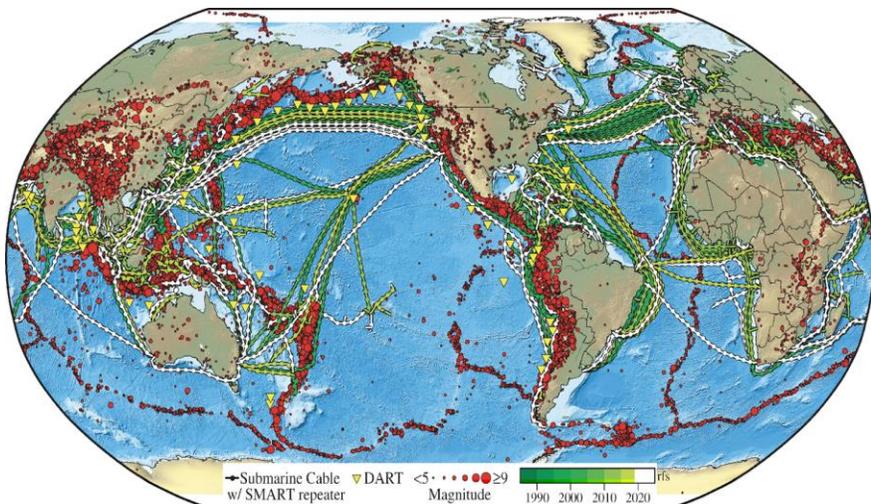
- SMART Ocean bottom pressure (OBP, EOVS) → added mass of melting ice → sea level change (x,t)
- Δx between OBP → depth-averaged currents and ocean circulation



70 % ocean

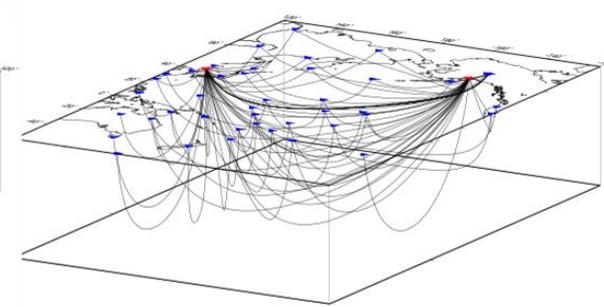
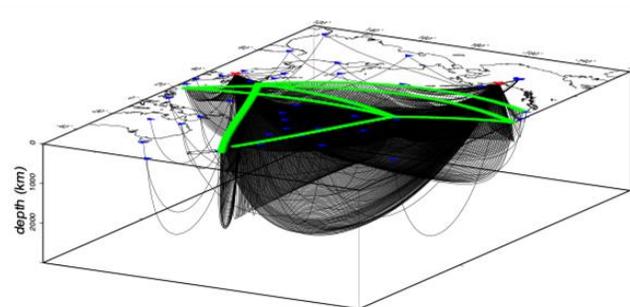
70 % ocean

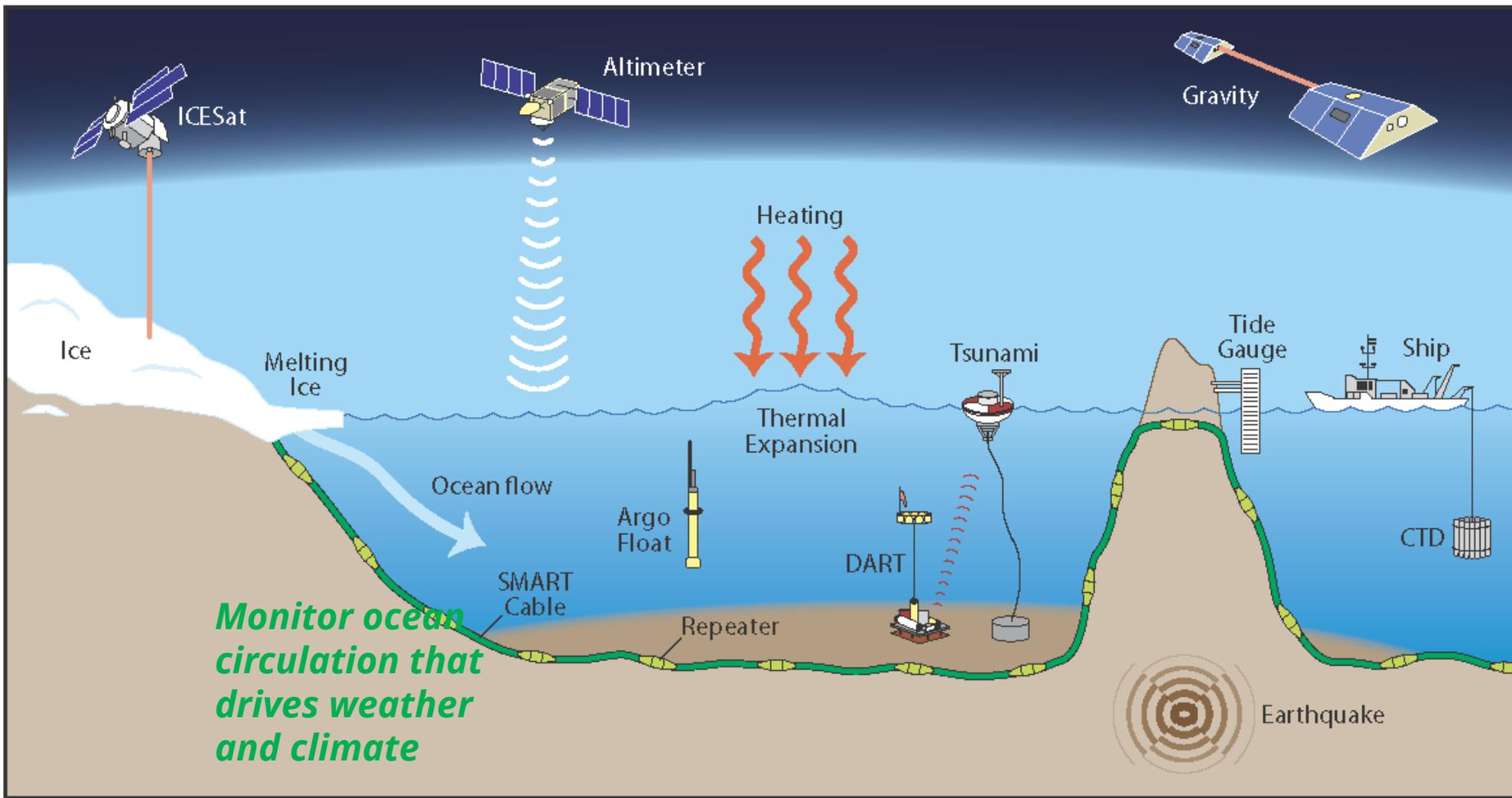
Hazards: Earthquakes and Tsunamis



- SMART cables - vastly increase existing ocean pressure/seismic sensors
- Improve tsunami warning precision, reduce unnecessary warning/ evacuations

- SMART Seismic sensors → advance seismology
- Detect, locate small quakes
- Rupture type and dynamics, larger offshore earthquakes
- Image the Earth's interior



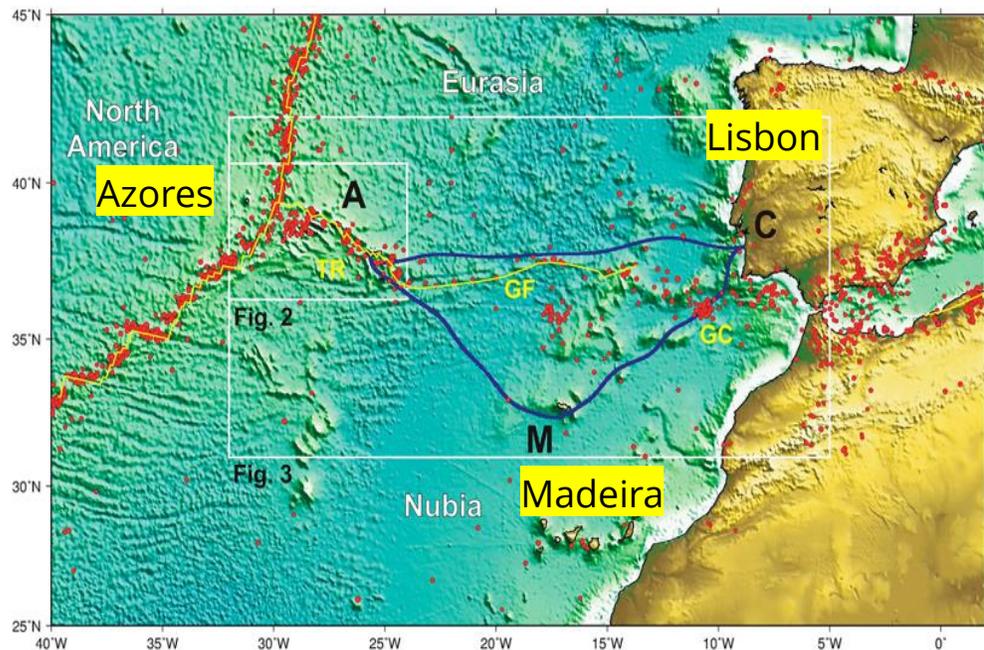


2024
SMART Cables
Emerging
Observing
Network
of
GOOS = Global
Ocean Observing
System

SMART Cables measure Essential Ocean Variables:
Temperature, Pressure; Seismic motion + ...



Portugal SMART Atlantic CAM



- 3700 km, ~20 SMART modules
- Gov't €154M. EU support €56M
- SMART 15% → €22M ~ €2/citizen/25 y



TAMTAM SMART Cable System

Contracts signed
ASN
RFS 2026

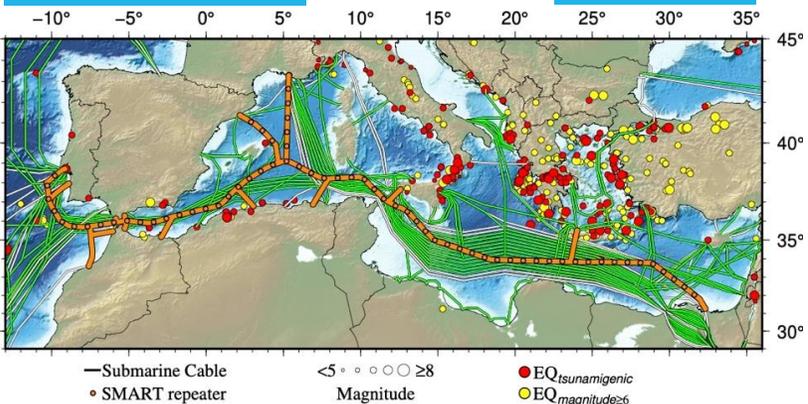


- 450 km long, 4 SMART modules
- France funding SMART (telecom: AFD, ADB)

• 25+ year life, reliable, low lifetime cost
• Leverage \$5B/y industry, 170 y

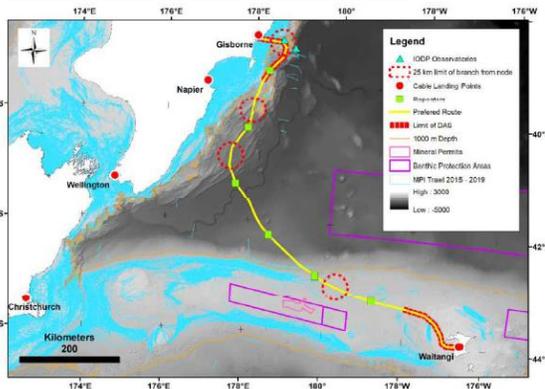
Optical Fiber Sensing in both

Medusa



MISTS

NZ - Chathams



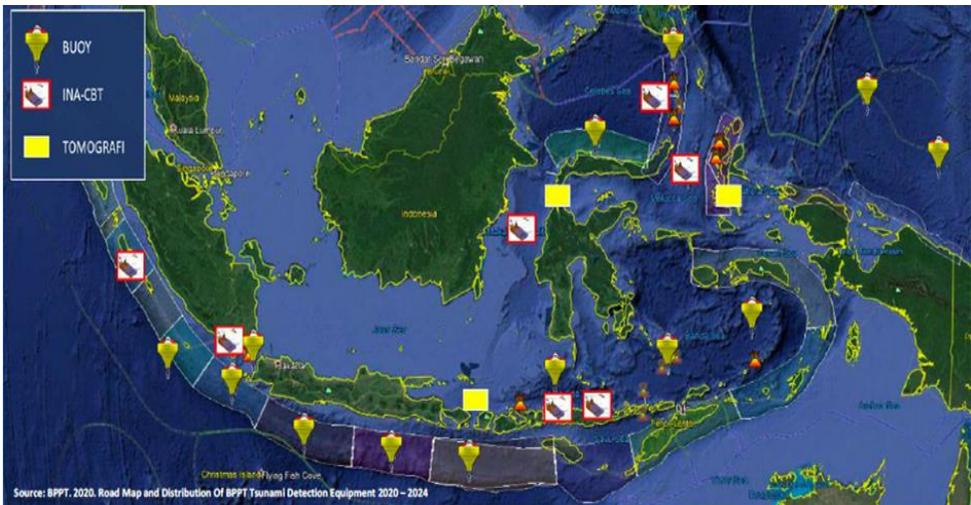
Polar Connect Far North Fiber

Tusass
Pisces
CAM



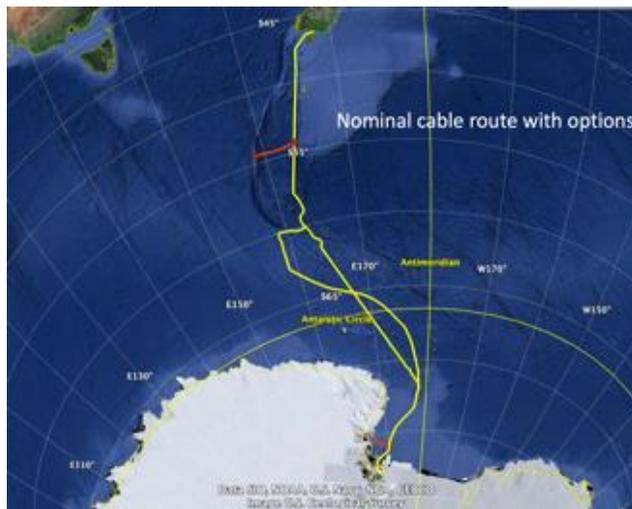
Source: NORDUnet map

Indonesia



50 km, 2 module test system installed off Labuan Bajo

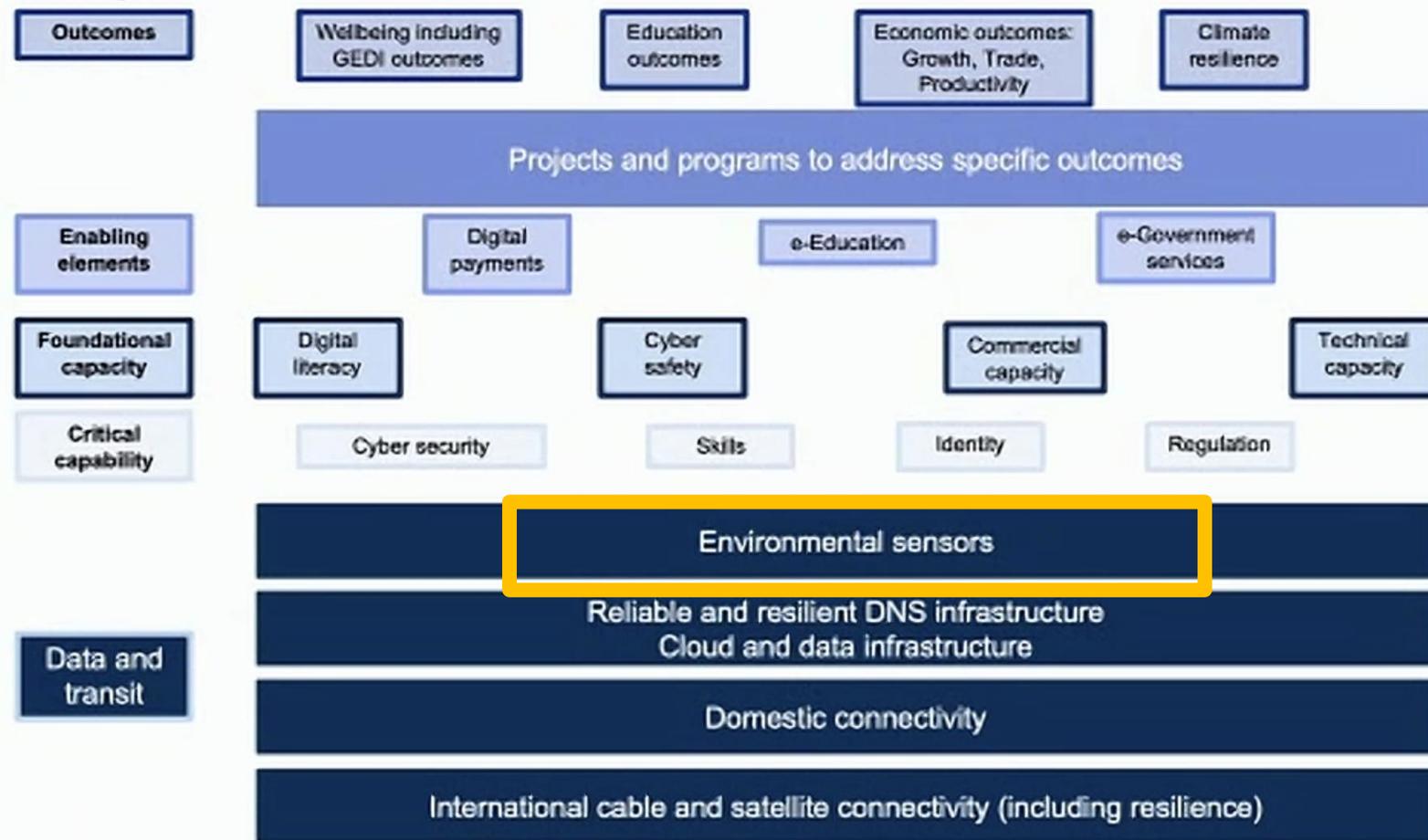
Antarctica US Chile



Positive impacts:

- Improve Global Ocean Observing System with new EOV long-term, deep data
- Improve the understanding of ocean currents and heat content and sea level rise for climate change
- Improve earthquake and tsunami early warning
- Improve cable integrity – cables no longer “deaf, dumb and blind”
- SMART is multi-disciplinary, **multi-purpose – telecom + science/EW**
- Catalyse research and development, long-life infrastructure for ocean obs
- Address Finance, Legal and Regulatory, Security issues

Strengthening Digital Readiness & Resilience: a possible theory of change



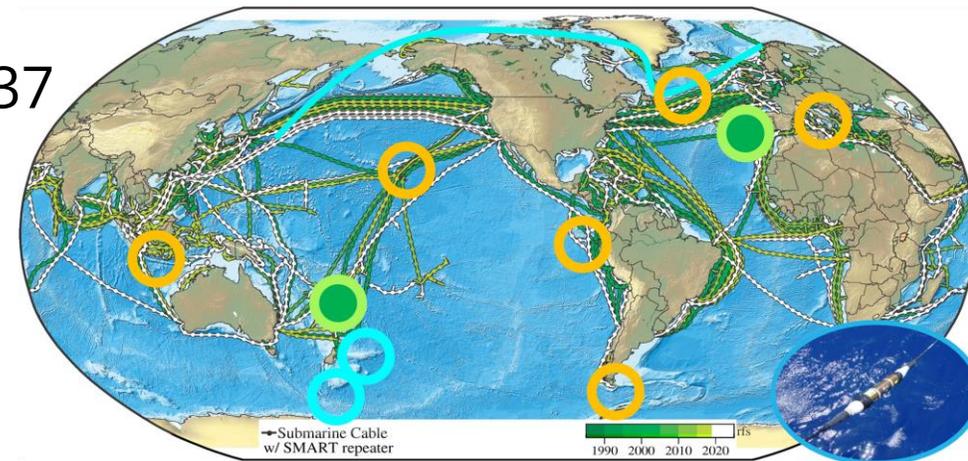
From Paul Twomey yesterday

- **SMART: CONNECTIVITY + CLIMATE/OCEAN + DRR**
- Critical infrastructure with environmental sensing
- Two (or three) for the price of one. Dig once.
- **If governments and MLDBs are funding any submarine cable, should include environmental sensing / SMART by default**
- Need data quickly, build up global coverage
- Long-term, big picture view needed
- Can PIRF and ADB help?

Global Array: Climate, Oceans, Sea Level, Earthquakes, Tsunamis

Create a Planetary sensor, power, Internet network

- SMART – marriage with telecom – connectivity, climate, DRR – three for the price of one – saves on all fronts
- Anticipated additional 1.3 Gm of cable in water by 2037
- Leverage annual investment ~ \$ 5 Billion
- 25+ year life, highly reliable, low lifetime cost
- Recent successes – set precedents for future systems
- Challenges: \$, tech, data, permitting, legal, security, ...
- EU Funding: Cables w/ SMART – need MLDB, more ...
- Working with ITU (standards), GOOS, RENS
- SMART Cables → better climate, DRR →



Saving Lives

Still much to achieve

Economic growth, well being, climate change resilience





SMART CABLES



GORDON AND BETTY
MOORE
FOUNDATION



Data X Blue Pacific
Sydney
Australia
23-25 October 2024

SMARTCables.org

[ITU/WMO/UNESCO IOC Joint Task Force](#)



Scan to Join!

Danke Gracias Thank you धन्यवाद Merci Tankyu tumas
Arigatō Xièxiè Terima kasih Takk Grazie
Mālō 'aupito Kop koon Salamats po S' efharistó

Shared Cable Infrastructure: Telecom + Science



Repeater



Sensor module on bottom
(INGV Wet Demo)

Existing Technology



Sensors:

- Temperature
- Pressure
- Seismic

Key point:

- Essential Ocean Variables, Global Ocean Observing System

No Interference

Climate Change solution (SMART* technology)



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

Commercially available

Separate modules:

- + Variable spacing
- + More flexible sensors
- ↑ \$/unit

Key applications

Risk monitoring

- ⌘ Earthquake detection
- ⌘ Tracking of tsunami wave
- ⌘ Tsunami warning

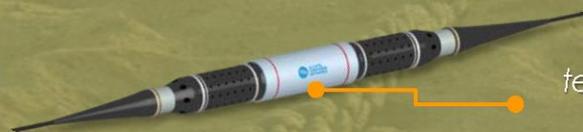
Scientific observation

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

ASN 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

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