

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 DATAx BLUE PACIFIC event. On the left is a colorful, circular Maori-style pattern. The text "DATAx" is in a large, blue, stylized font, with "BLUE PACIFIC" in a smaller, blue, sans-serif font to its right. Below this, the dates "23-25 October 2024" and location "Sydney, Australia" are listed. At the bottom, a row of logos includes ADB, Australian Aid, New Zealand, European Union, JICA, and the World Bank Group. On the right side of the banner, there is a faint illustration of palm trees.

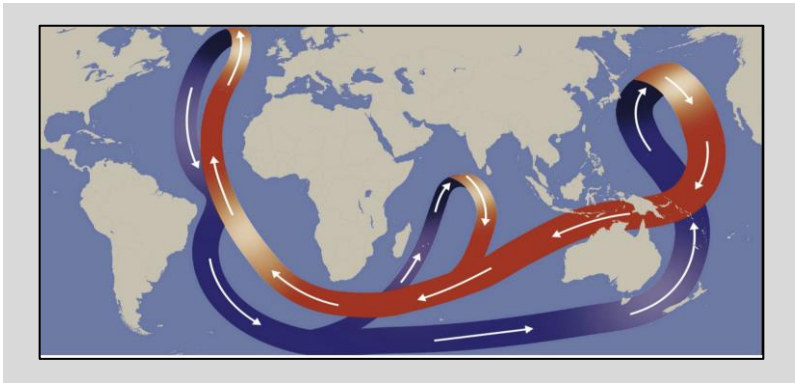
DATAx BLUE PACIFIC

23-25 October 2024 • Sydney, Australia

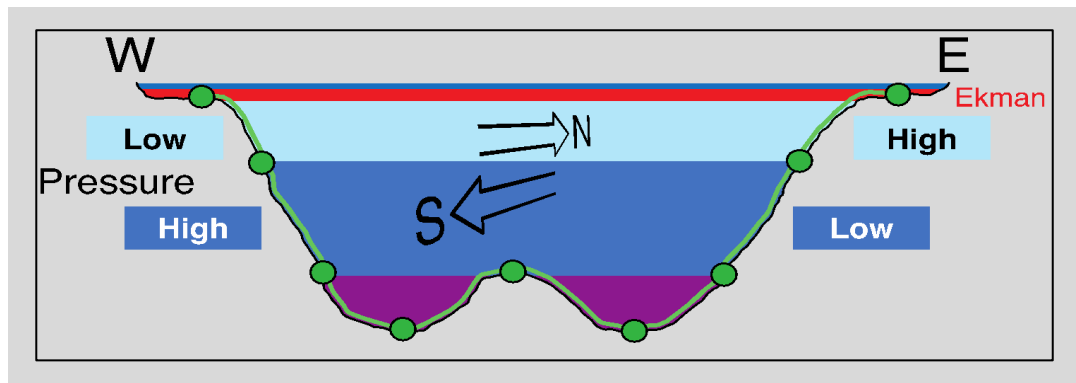
ADB Australian Aid NEW ZEALAND European Union JICA WORLD BANK GROUP

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

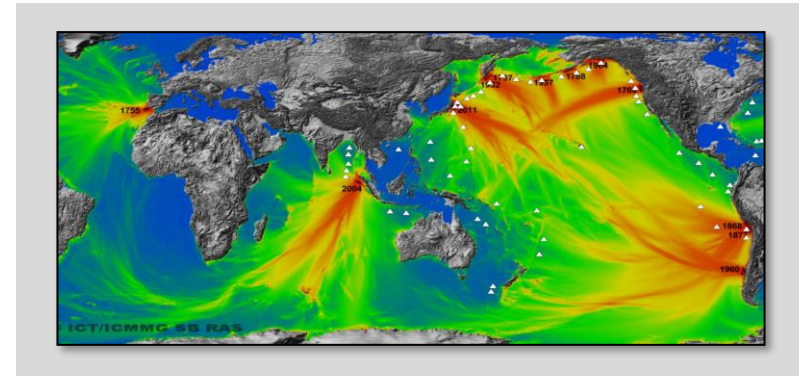
Ocean general circulation – all scales



Climate Change



Ocean heat and circulation



Earthquakes and Tsunamis



Sea Level Rise

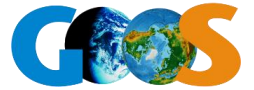
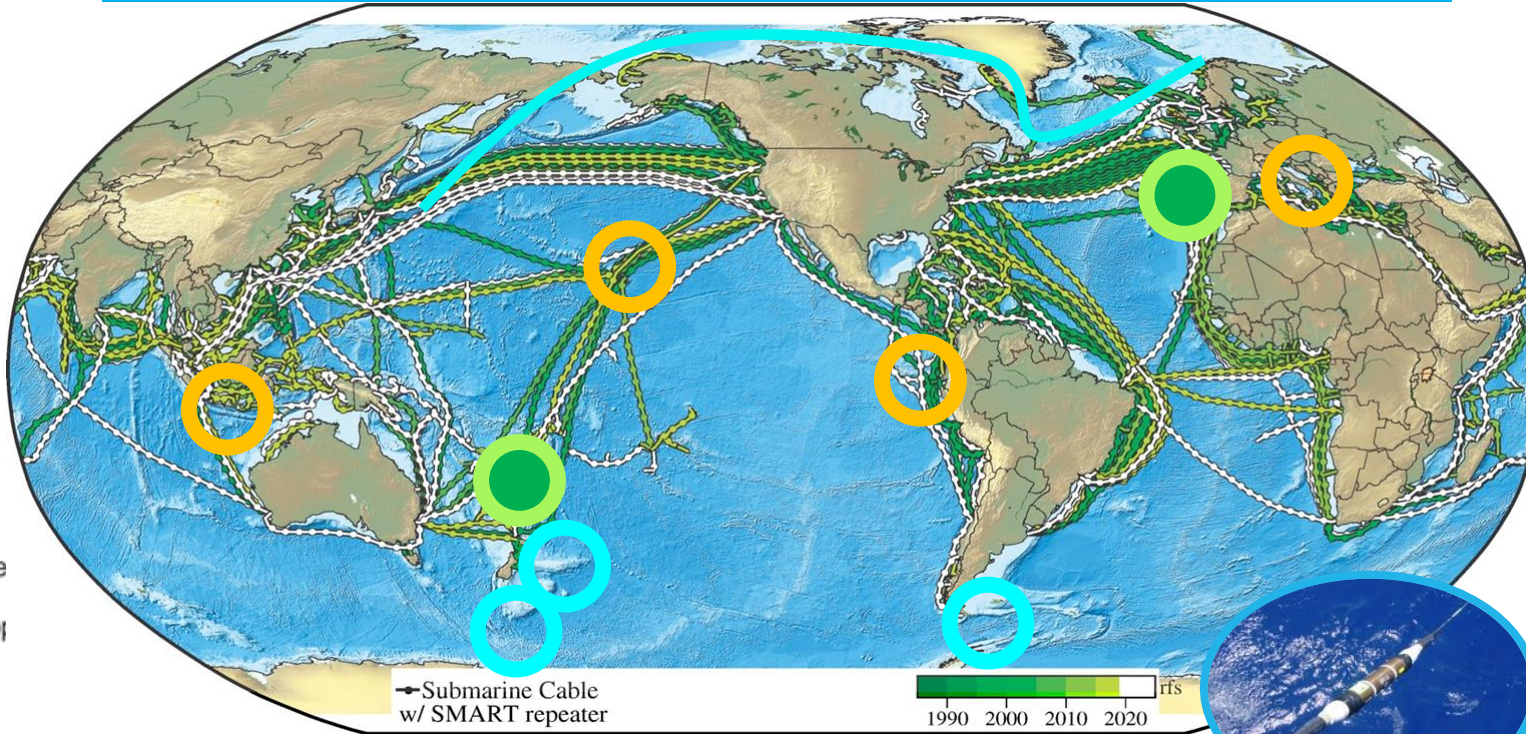
Global Array for Climate, Oceans, Sea Level, Earthquakes, Tsunamis

Create a Planetary sensor, power, Internet network

1st order addition to Ocean-Earth observing system



2021
2030 United Nations Decade of Ocean Science for Sustainable Development



Share submarine cable infrastructure
Telecom + science
↓€\$

NO Interference

1.4+ GM
~20,000 repeaters
20 year refresh

repeaters ~100 km

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 +



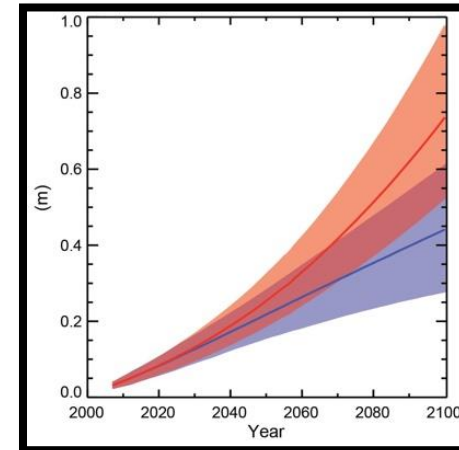
- **Climate change** – ocean temperature and heat content, circulation
- **Sea level rise** – hazard for coasts, islands, cities
- **Disaster Risk Reduction** – tsunami and earthquake monitoring
- **Societal Connectivity** – Resilient and sustainable telecom infrastructure



2021
2030 United Nations Decade
of Ocean Science
for Sustainable Development

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

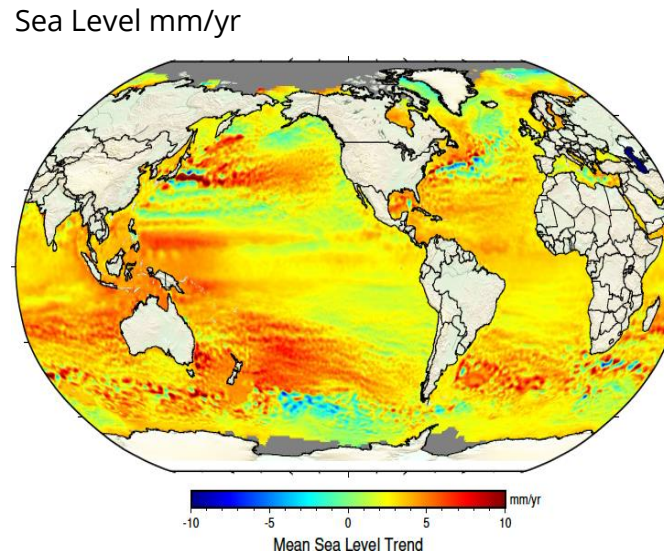
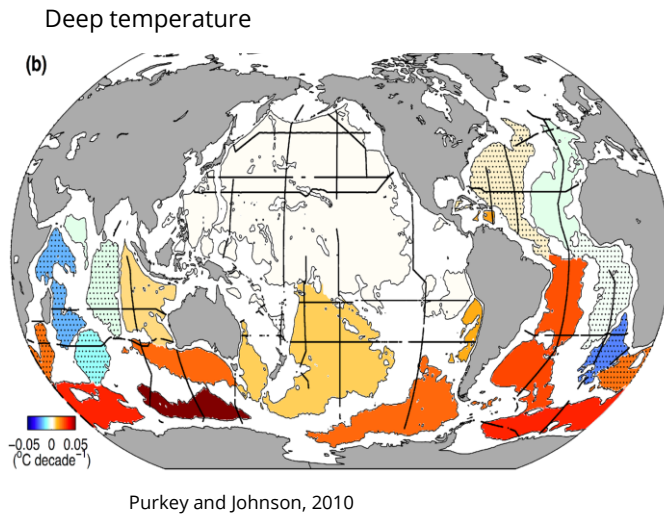
Sea Level Rise



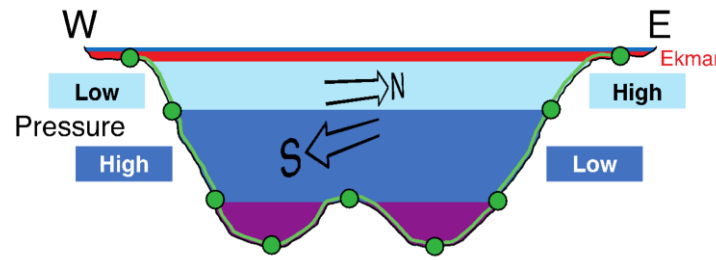
Tsunami



Climate and Oceans: Temperature, Pressure and Sea Level



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

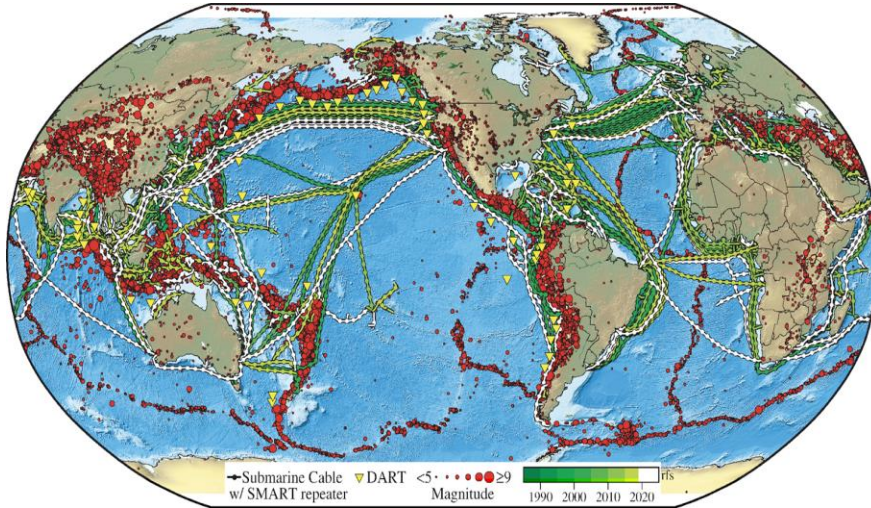


- SMART Ocean bottom pressure (OBP, EOVS) → added mass of melting ice → sea level change (x,t)
- Δx between OBP → depth-averaged currents and ocean circulation

70 % ocean

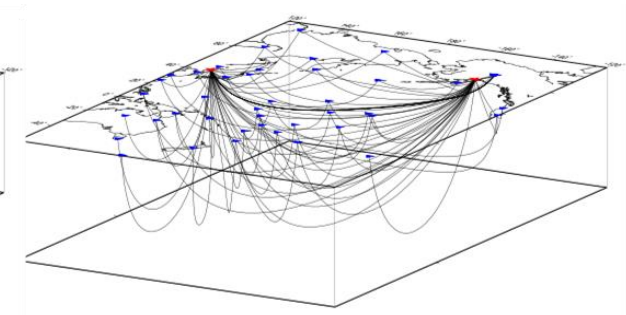
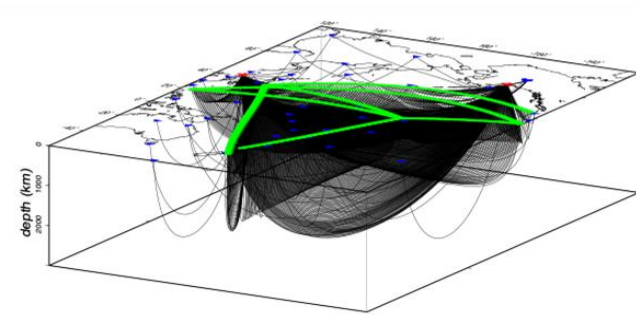
70 % ocean

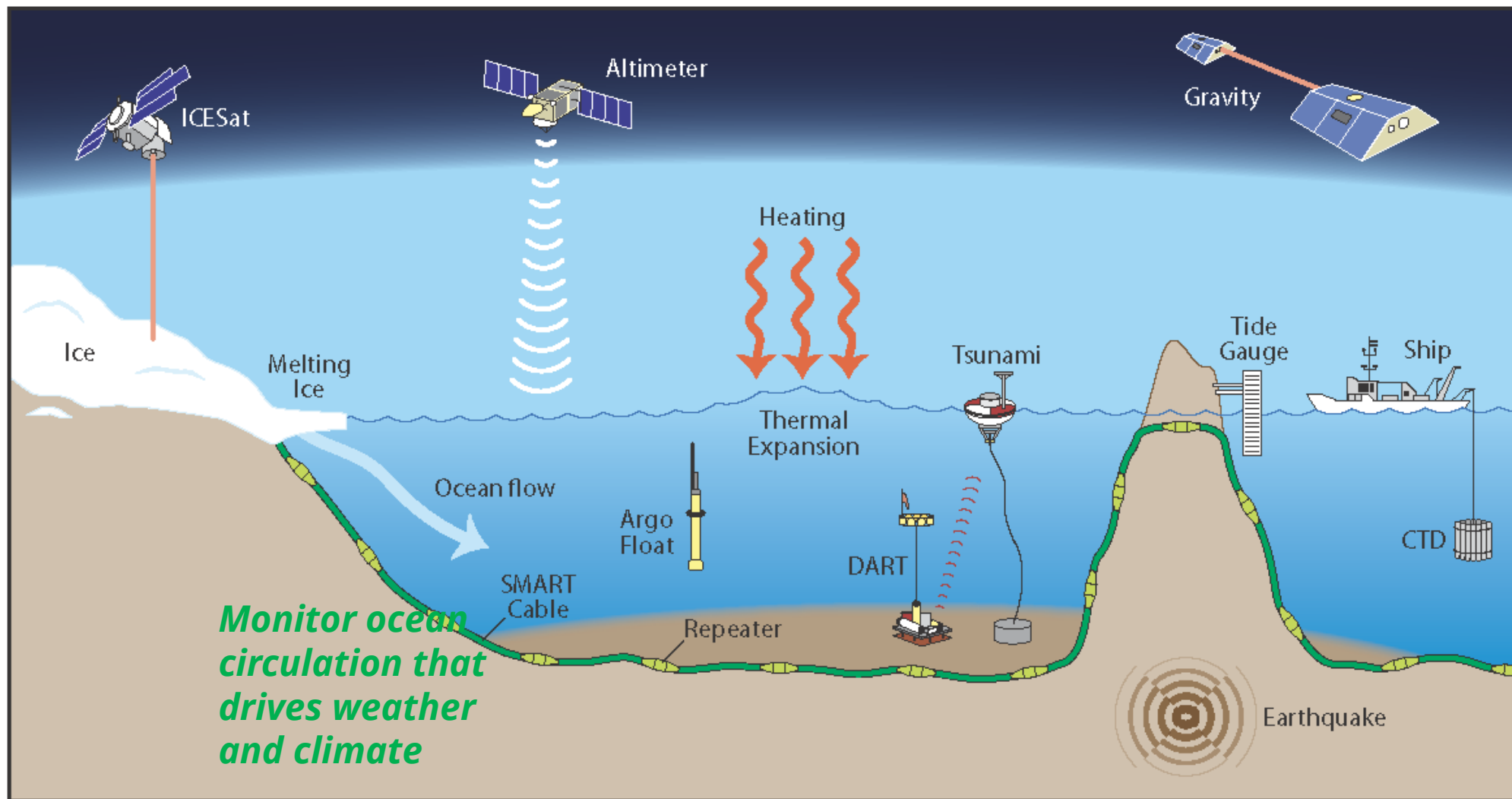
Hazards: Earthquakes and Tsunamis



- 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 + ...

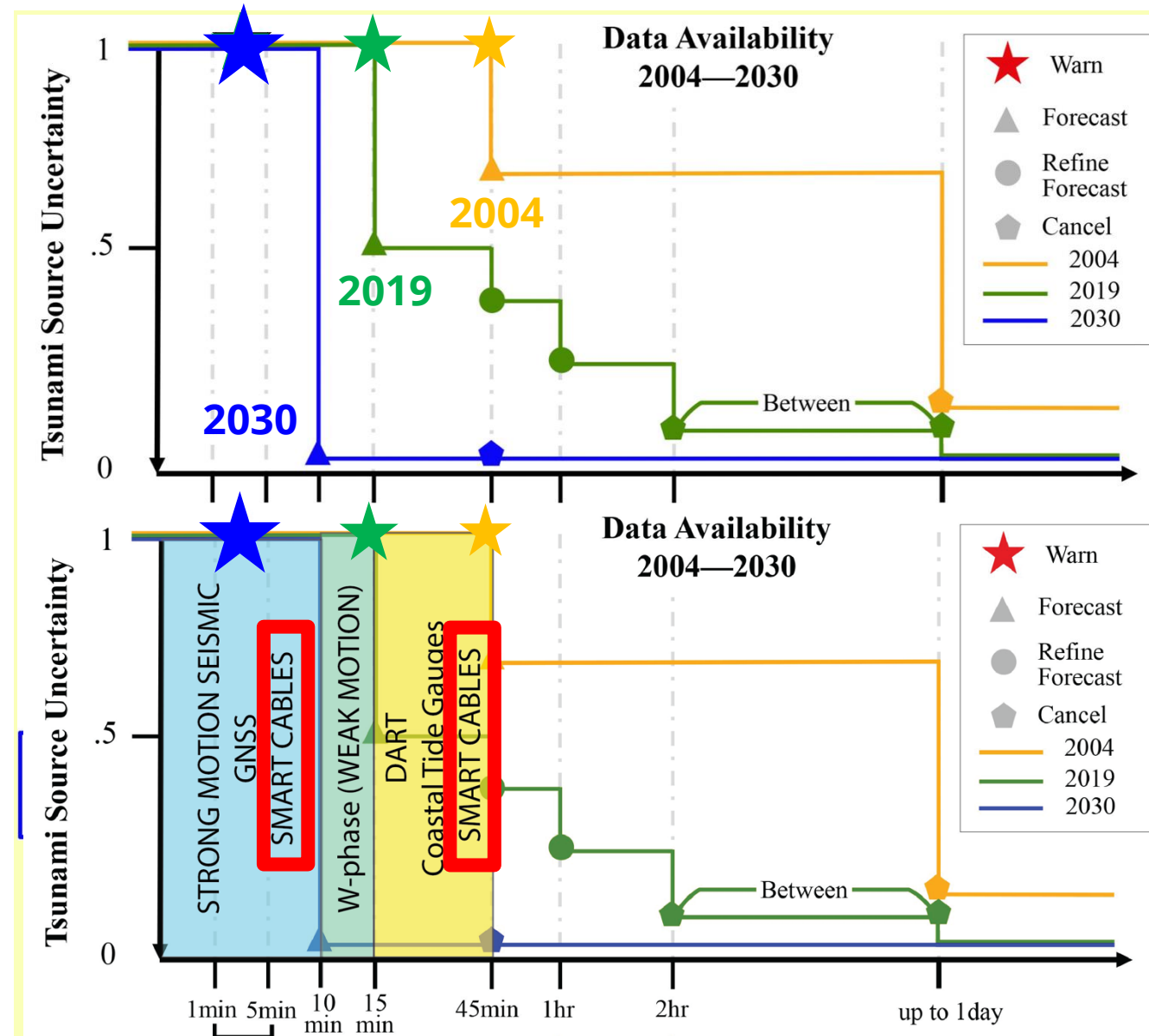
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UN Ocean Decade Goal

Integrate SMART Capability into innovative early warning systems

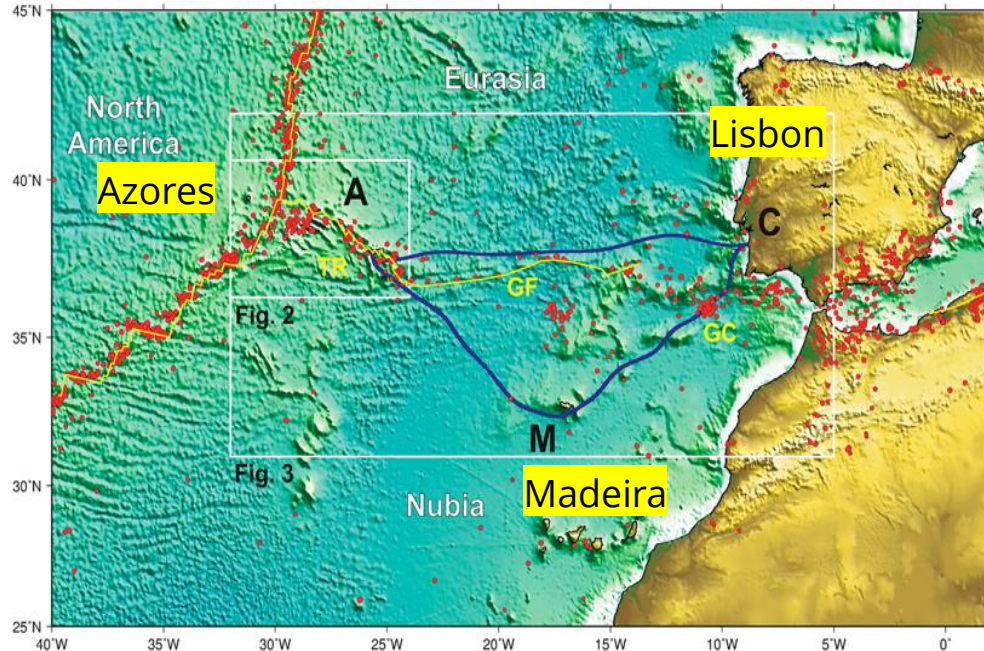


**2021
2030** United Nations Decade
of Ocean Science
for Sustainable Development





Portugal SMART Atlantic CAM



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

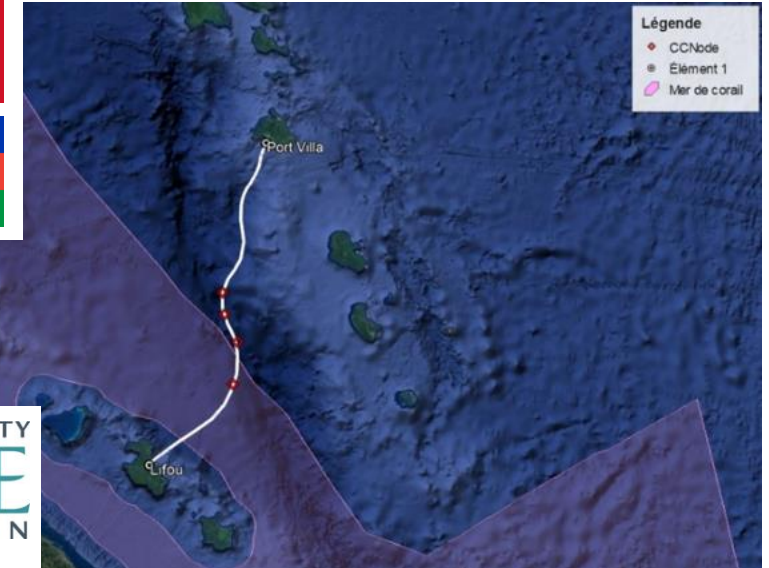
TAMTAM SMART Cable System



Contracts
signed
ASN
RFS 2026



GORDON AND BETTY
MOORE
FOUNDATION

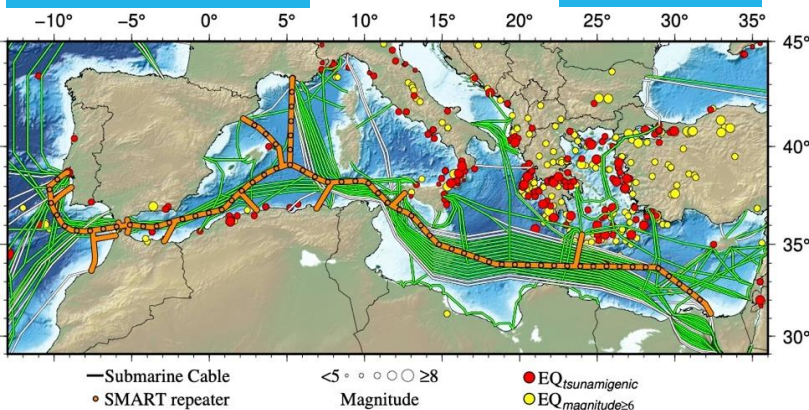


- 450 km long, 4 SMART modules
- France funding SMART (telecom: AFD, ADB)

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

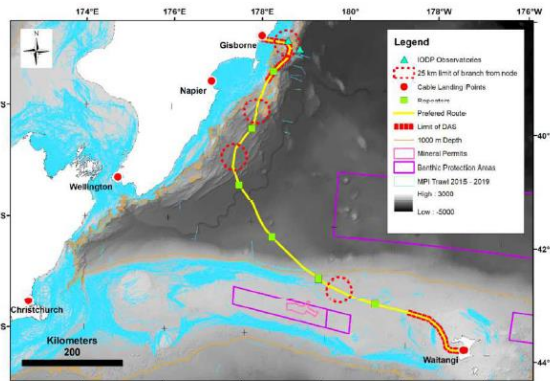
Optical Fiber Sensing in both

Medusa



MISTS

NZ - Chathams

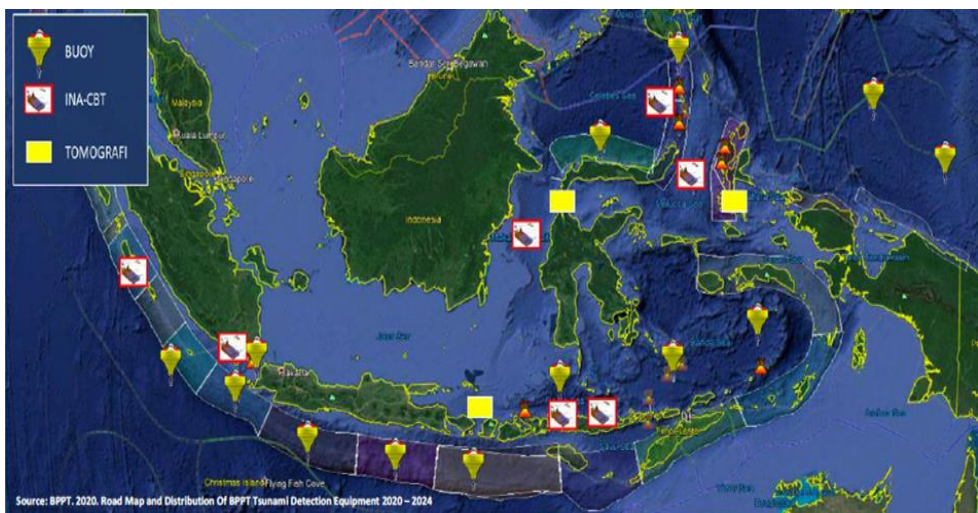


Polar Connect Far North Fiber

Tusass
Pisces
CAM



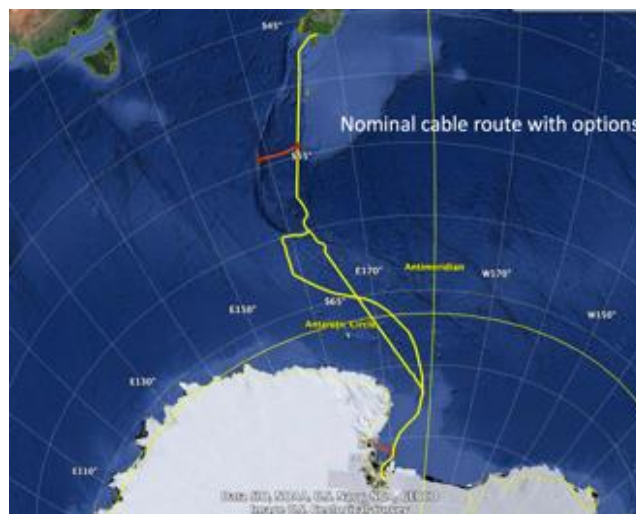
Indonesia



Antarctica

US

Chile



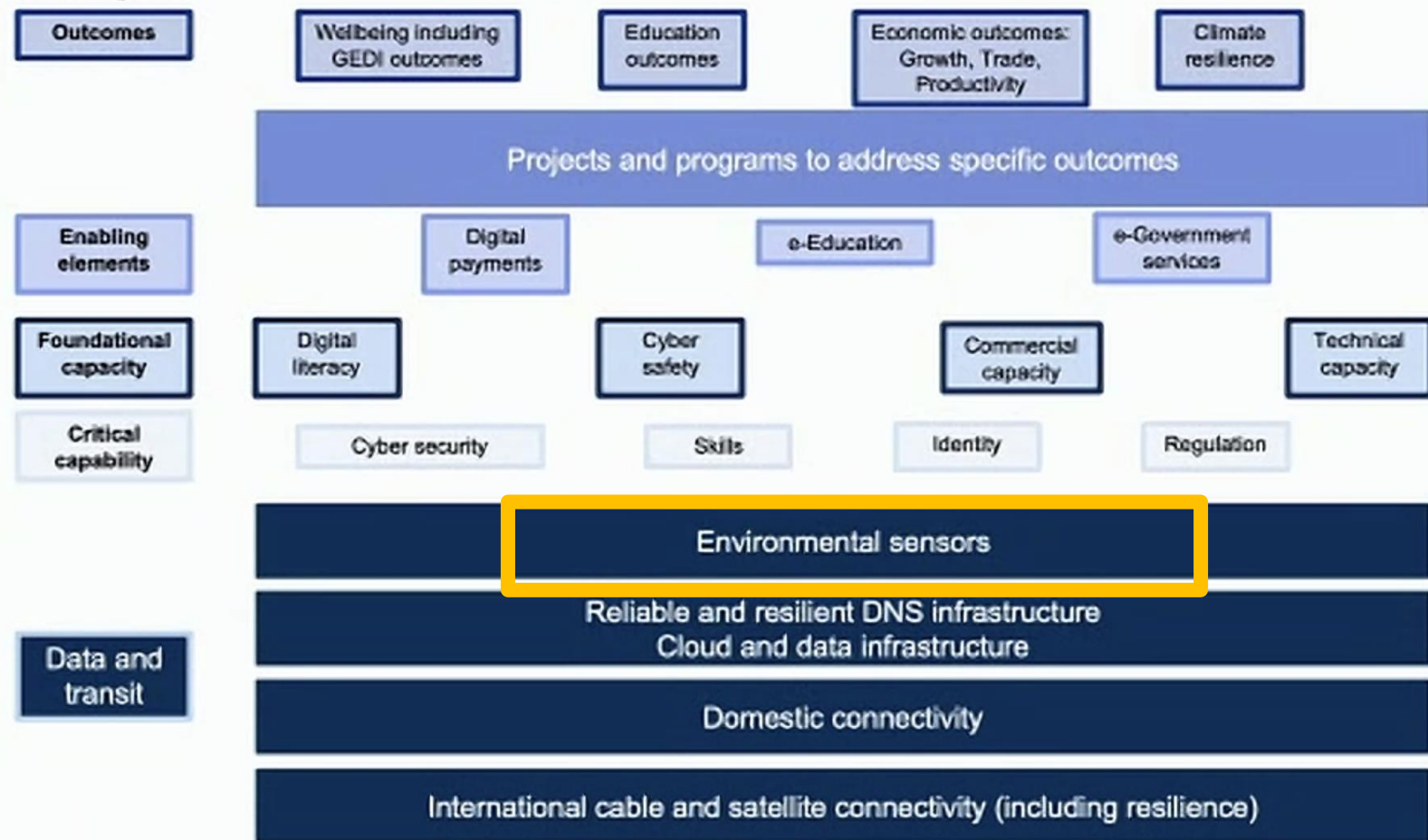
50 km, 2 module test system installed off Labuan Bajo

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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



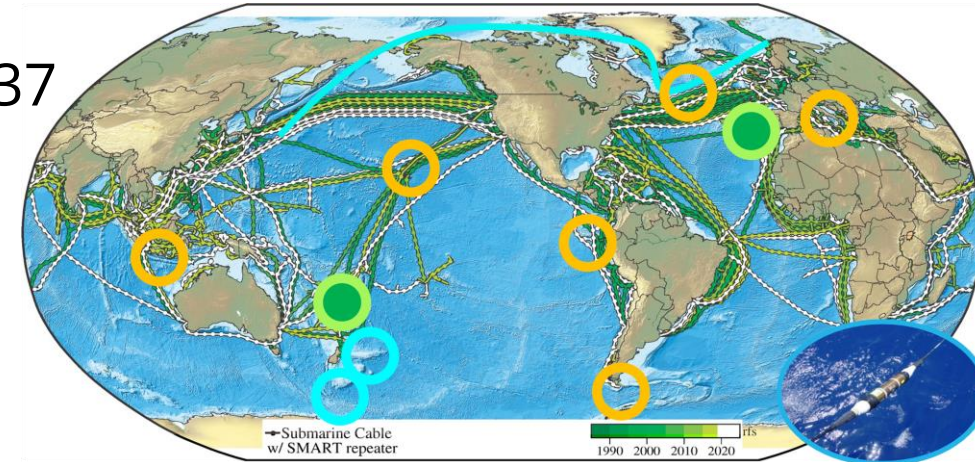
From Paul Twomey yesterday

- **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





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 Salammat 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

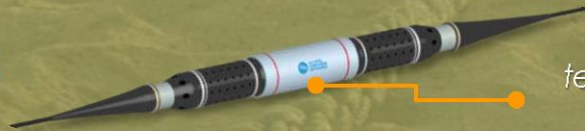
Scientific observation

- ⌘ 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
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**First SMART projects
planned for 2025 / 2026**

- ⌘ South Pacific
- ⌘ Atlantic
- ⌘ Asia

* Scientific Monitoring And Reliable Telecommunications