



# ASN SMART solutions

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# Climate Change – Why SMART cables ?



Oceans play a crucial role in understanding major environmental and societal challenges, such as climate change, sea level rise, ocean warming, tsunamis, earthquakes ...

To address these threats effectively, it is vital to obtain accurate and comprehensive data.

## Key areas of focus

- **Monitoring earthquakes and tsunamis**
  - 72% of tsunamis are caused by seafloor displacement from large submarine earthquakes
  - Until recently, the Pacific Tsunami Warning Center (PTWC) based warnings solely on earthquake location and magnitude
  - Improved data and modeling are needed to accurately assess impact of tsunamis
- **Observing global warming and sea level rise**
  - Current global warming trends are irreversible, with a projected increase of 1.5°C this century; this could reach 5°C without a reduction in CO<sub>2</sub> emissions
  - Sea level projections estimate a rise of around 65cm by 2100

# SMART cable – JTF initiative and concept



## The SMART cable initiative: **bridging Telecom & Science**

2021 United Nations Decade  
2030 of Ocean Science  
for Sustainable Development

The Science Monitoring And Reliable Telecommunications (SMART) initiative is a Joint Task Force led by ITU, WMO, and UNESCO-IOC, working for more than 10 years to enhance global ocean observation by integrating SMART cable sensors into the Global Ocean Observing System.

### Key features of SMART cables:

- Initially, sensors to measure **temperature**, **pressure**, and **seismic acceleration**
- Fill critical gaps in existing monitoring systems, such as buoy systems
- Enhance the Global Seismic Network (GSN) with **accelerometers** along cable routes
- Provide sustained and recurrent climate-quality data from under-sampled ocean areas (e.g., deep ocean temperature, sea level, and circulation)

*For more information, visit: <https://www.frontiersin.org/articles/10.3389/fmars.2019.00424/full>*

# Climate Change solution (SMART\* technology)



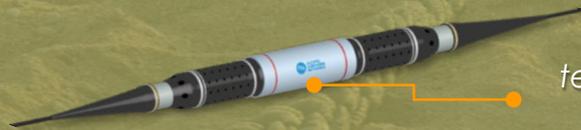
ASN, the key partner for  
**undersea data acquisition**

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  
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for Sustainable Development

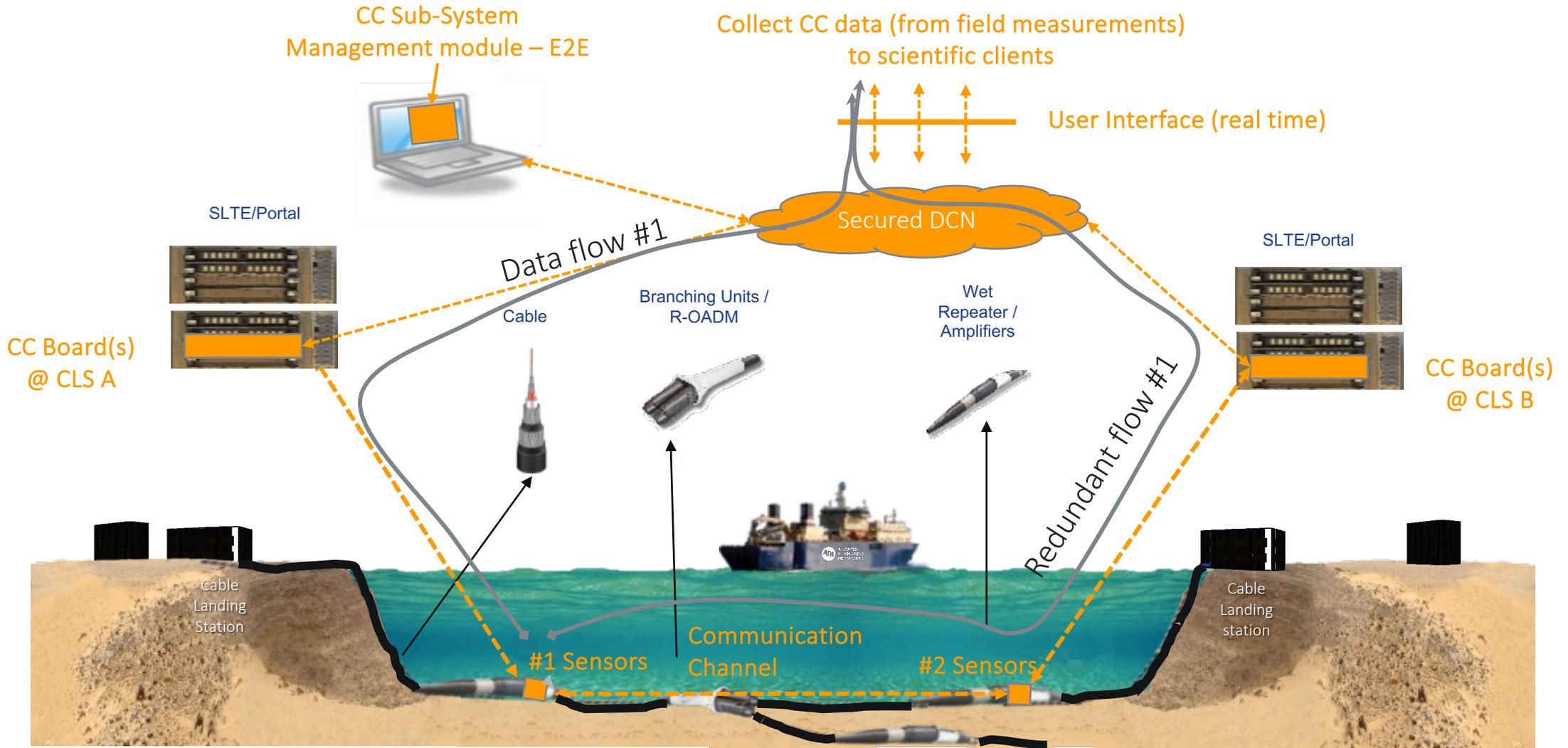


**First SMART projects  
planned for 2025 / 2026**

- ⌘ South Pacific
- ⌘ Atlantic
- ⌘ Asia

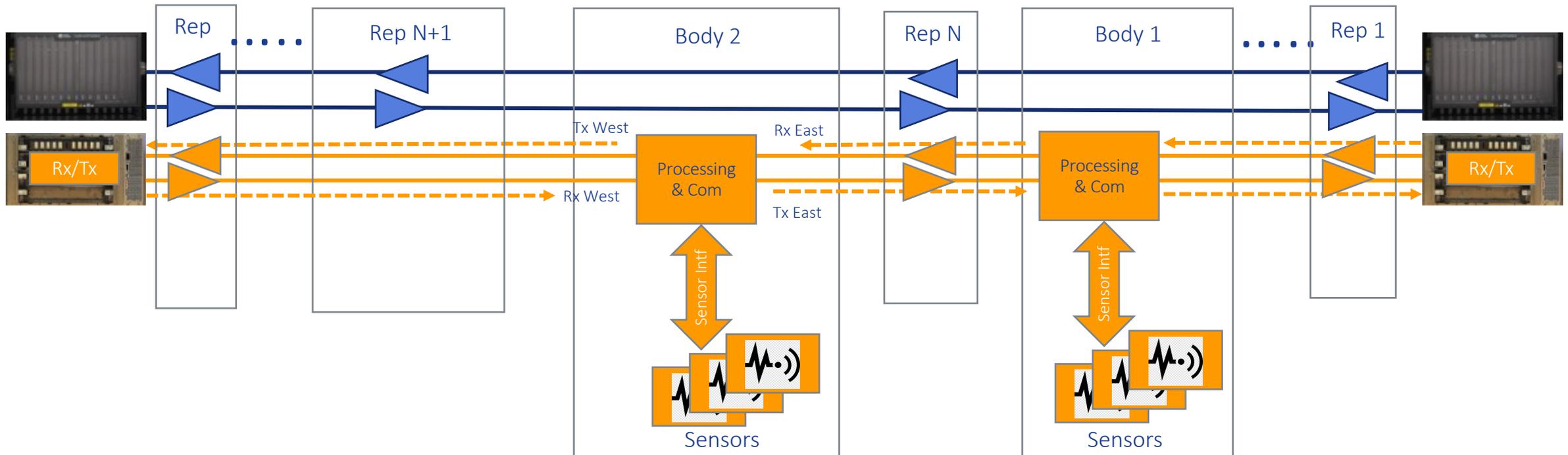
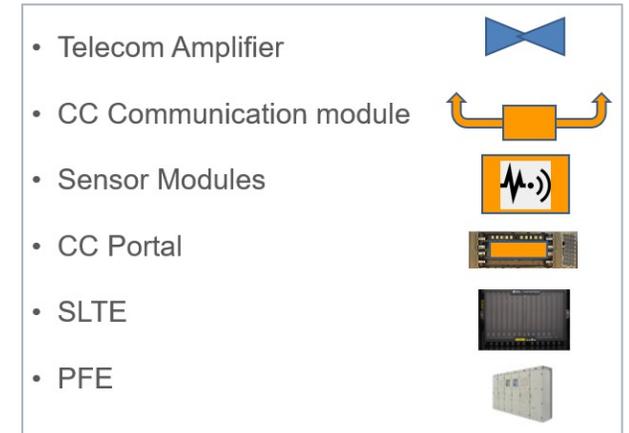
\* Scientific Monitoring And Reliable Telecommunications

# SMART cables: integrating End-to-End Climate Change monitoring with telecommunication systems



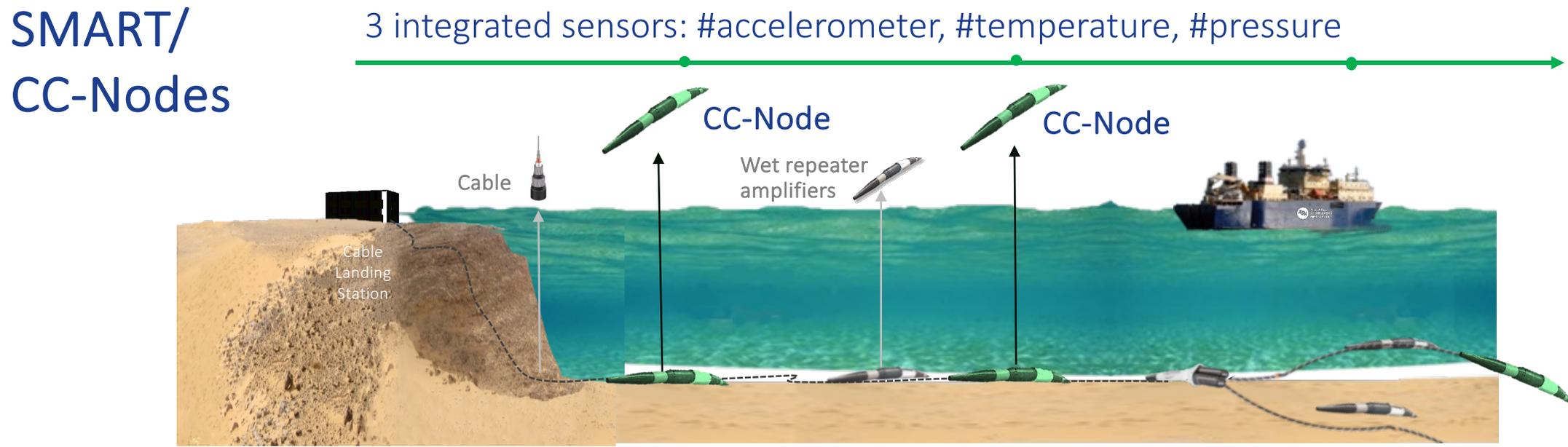
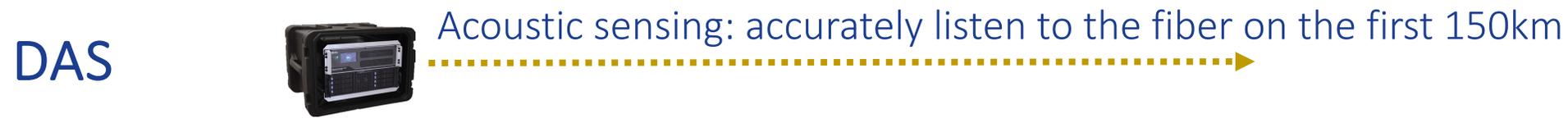
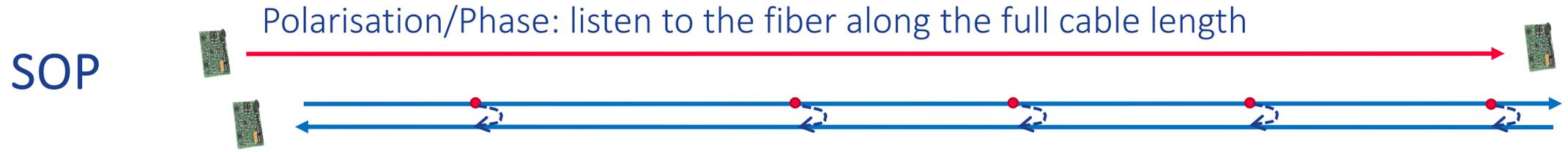
# Principle of communication

- Blue = Telecom
- Orange = Climate Change (CC)



# ASN sensing technologies toolbox – 3 different technologies

All using strain-induced changes in optical properties of optical fiber



# Applications and positioning of technologies

This table is a summary of ASN current view, to be consolidated with most recent experiments and papers

Technology	Parameters	Spatial resolution	Maximum range	Sensitivity	Key applications / remarks
SOP (straight)	Polarisation	None - integrated signal	1000's of km	Low sensitivity to environmental events	<ul style="list-style-type: none"> <li>• <b>Very low cost</b> – generic transm. eqpt</li> <li>• Seismic data collection (not localized)</li> <li>• Deep sea data collection</li> </ul>
Polarisation or Phase loopback	Phase delay	= span between repeaters	<b>1000's of km</b>	Low sensitivity to environmental events	<ul style="list-style-type: none"> <li>• Cable monitoring</li> <li>• Seismic data collection</li> <li>• Deep sea data collection</li> </ul>
DAS	Dynamic fibre strain	2-40m	<b>150km</b>	High	<ul style="list-style-type: none"> <li>• Subsea asset protection</li> <li>• Geophysics</li> <li>• Mammals monitoring</li> </ul>
SMART cable	Temperature Acceleration Pressure	Point sensor	Not relevant	<b>Very high</b>	<ul style="list-style-type: none"> <li>• Tsunami warning</li> <li>• Geophysics</li> <li>• Global warming</li> </ul>

# Expanding submarine cable applications beyond Telecom



Submarine cables are being enhanced for new applications that contribute to a better understanding of the earth and its natural processes

- **Seismic activity and geophysics:** enhanced monitoring of tectonic movements and earthquakes
- **Tsunami detection:** improved warning systems for vulnerable populations
- **Global warming monitoring:** continuous tracking of ocean warming trends
- **Sea level rise monitoring:** accurate measurement of rising sea levels over time
- **Listening to oceans:** detection/study of marine mammal communication and other oceanic sounds

A toolkit of monitoring technologies is available and under development.

The appropriate tool(s) can be selected based on key parameters to be monitored, required range and sensitivity.



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We connect people

