

Harnessing future sub-sea communications cables for ocean observation and disaster warning

POTENTIAL LINKS WITH, AND OPPORTUNITIES FOR, EMSO



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KEY ISSUES FACING THE PLANET: GLOBAL OCEAN HEALTH AND SOCIETAL SECURITY

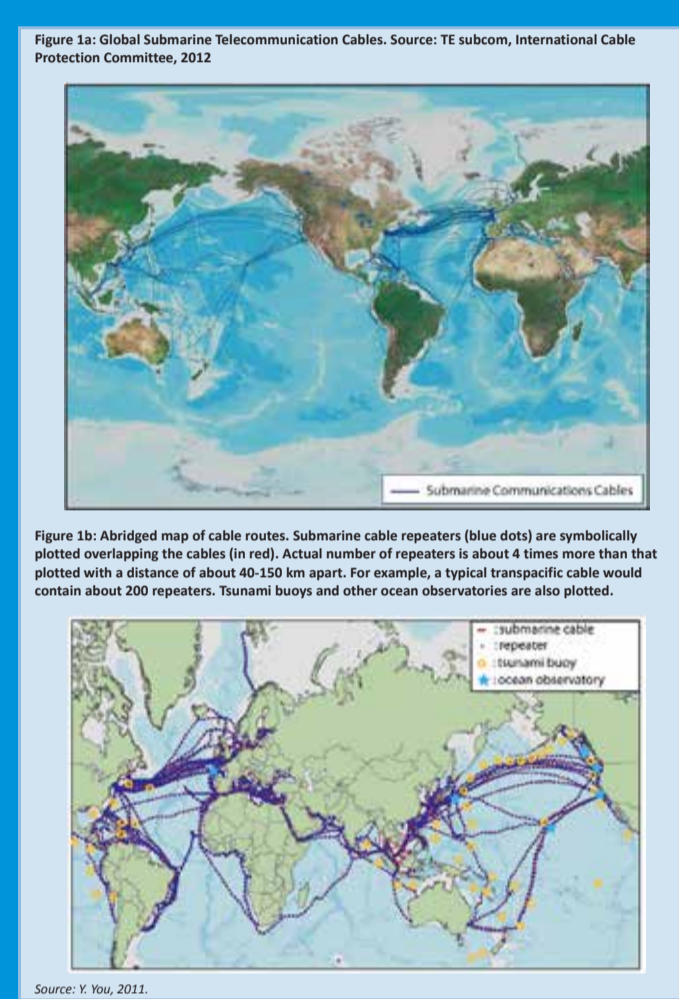
- Key ocean health issues:** Include global warming, acidification, extinctions and loss of biodiversity
- Long-term disruptions:** Changes in ocean temperature, with global warming and sea level rise
- Short-term disruptions:** Impact of periodic seabed and coastal destruction, and ecosystem modification, by tsunamis and slope failures
- Monitoring:** Health of marine environment could be monitored globally in real-time through a new generation of ocean mini-observatories

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JOINT TASK FORCE (JTF) ESTABLISHED BY ITU-WMO-UNESCO IOC TO MONITOR OCEAN CLIMATE AND TSUNAMI HAZARD

The JTF, established in 2012, by the International Telecommunication Union (ITU), the World Meteorological Organization (WMO) and the Intergovernmental Oceanographic Commission (IOC) of UNESCO, is examining novel uses for submarine telecommunication cables

THE GREEN CABLE INITIATIVE



The JTF's Green Cable Initiative proposes to develop a network of sensor packages (pressure, temperature, acceleration) hosted on trans-ocean telecommunication cables forming mini-observatories to monitor changing seafloor temperatures and hazards over several decades. It addresses two main societal needs for a) sustained climate-quality data from sparsely observed deep oceans and continental slopes, and b) increased reliability and integrity of the global tsunami warning networks. Plans are being developed to launch a pilot project (wet demonstrator) involving the cable industry and ocean observatory researchers

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BACKGROUND STUDIES:

Three background documents were commissioned in 2012 to guide and substantiate the future work of the JTF.



SHORT-TERM DISRUPTIONS: SEABED DESTRUCTION AND ECOSYSTEM MODIFICATION BY TSUNAMIS AND ASSOCIATED SLOPE FAILURES

Major tsunamis occurred several times in last decade, associated with megathrust earthquakes between M_w 7.7 and 9.1 in Sumatra (2004), Java (2006), US Samoa (2009), Mantawai (2010), Chile (2010) and Japan (2011) resulting in severe loss of life and billions of dollars in damage to coastal properties. Reducing such losses and mitigating damage is key to improving tsunami warning systems

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SPECIFIC THREATS TO SOCIETY AND THE NEED FOR IMPROVED SCIENTIFIC DATA

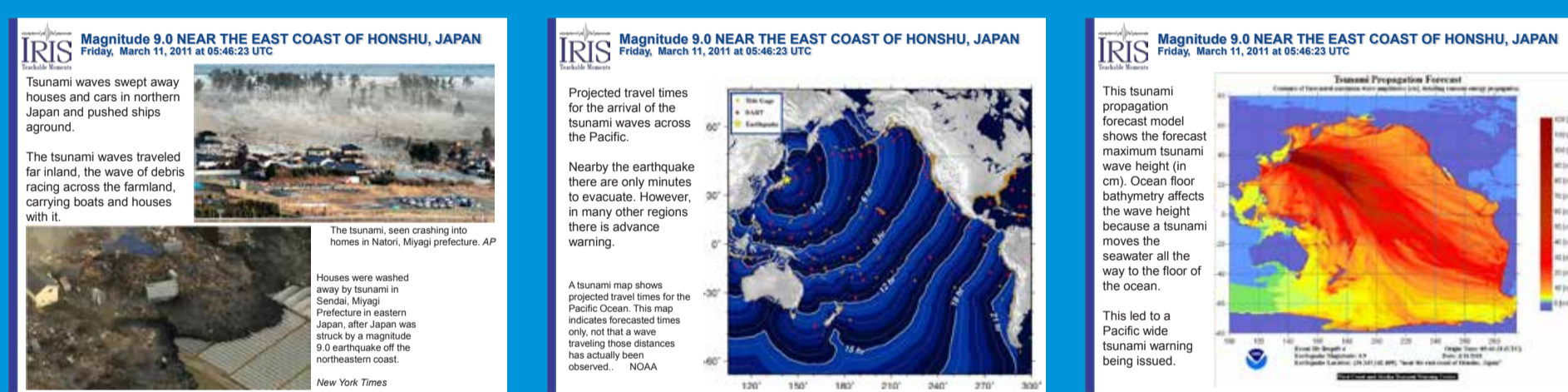
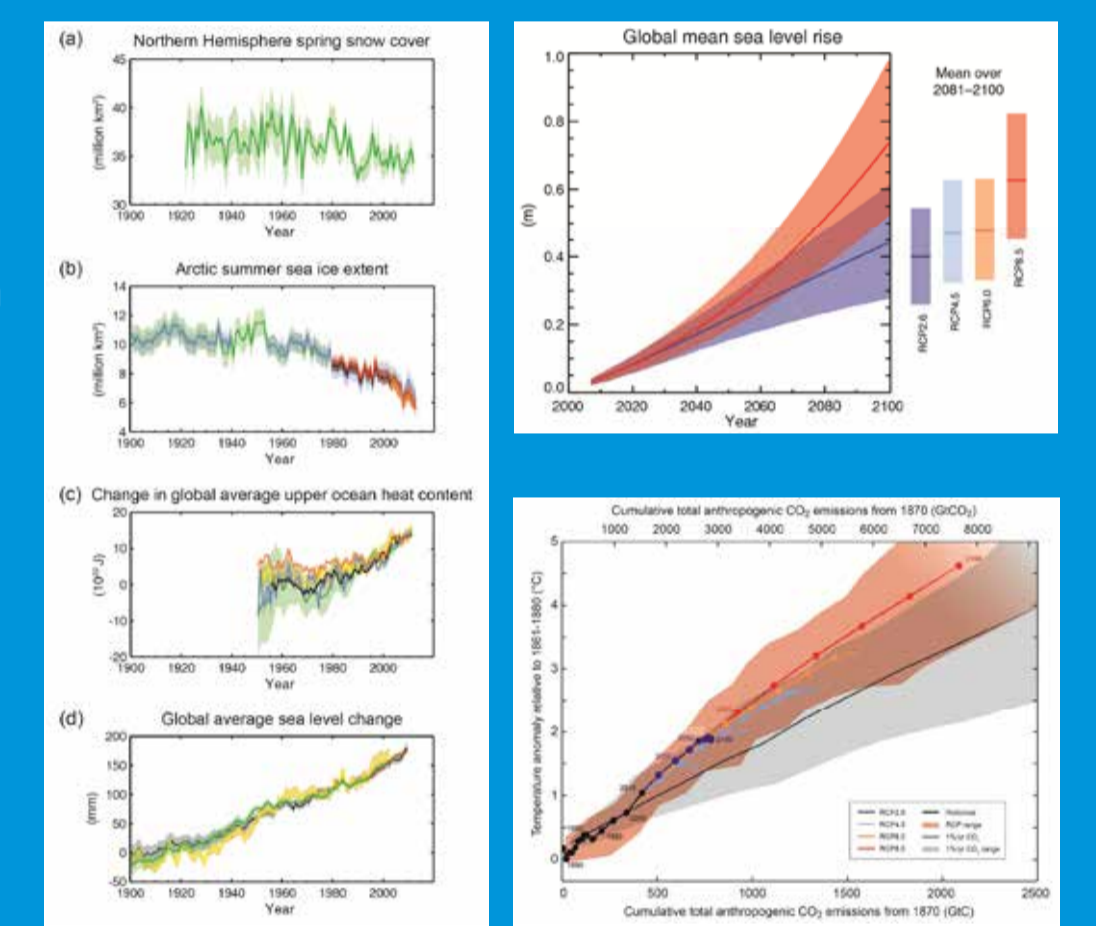
Anthropogenic forcing and earth system response (World petroleum use set a new record in 2012 of 88.9 million barrels/day), with resulting:

- Global temperature increase
- Polar ice cap melting
- Ocean circulation change
- Sea level rise

Natural threats and hazards:

- Tsunamis; slope failures

What effects are reversible, over what timeframe, and what is sustainable and affordable?



Source: IRIS Consortium - Teachable Moments Presentation.

THE BUSINESS PLAN (COSTS)

Project costs main assumptions:

- Marine Installation and Marine Maintenance costs are not affected by adding sensors:
 - Sensors do not affect sensibly repeater reliability
 - Repeaters with faulty sensors will not be replaced

Project maintenance costs are similar to non Green Cables over the 25 year design life

Construction costs will increase slightly:

- Depending on requirements and associated solution complexity, additional costs could be 5-10 % of a transoceanic system
- With sensors in every repeater
- Without NRE amortization
- Based on industry rules-of-thumb

Source: http://itu.int/en/ITU-T/Workshops-and-Seminars/gsw/201309/Documents/SBP1_Antoine_Lecroart.pptx

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ATTAINING THE GOALS OF THE JTF

Macro Needs and Solutions are now well known:

- Permit challenges could be overcome
- Strategy, Legal & Engineering papers are clear
- Sensor Design is showing convergence
- Vendors can develop, manufacture and deploy
- Design, Development and Deployment achievable

All have a common issue: "Show me the money" – Funding

Source: Huawei Marine Networks

EVALUATION OF THE GREEN CABLE INITIATIVE

Benefits:

- Distributed seabed sensors across oceans have unique value
- Without such sensors we cannot fully understand ocean processes
- Submarine telecommunications systems offer a platform for these sensors; dual conductor cables already being developed
- Supporting such sensors would be a positive gesture by system owners and suppliers

Challenges:

- Changes to repeaters are a serious issue
- Commercial and legal issues will be system specific
- Who pays is unresolved

TECHNICAL FEASIBILITY

Appears technically feasible at this stage

More iterations required to match science goals with telecom requirements

Next steps:

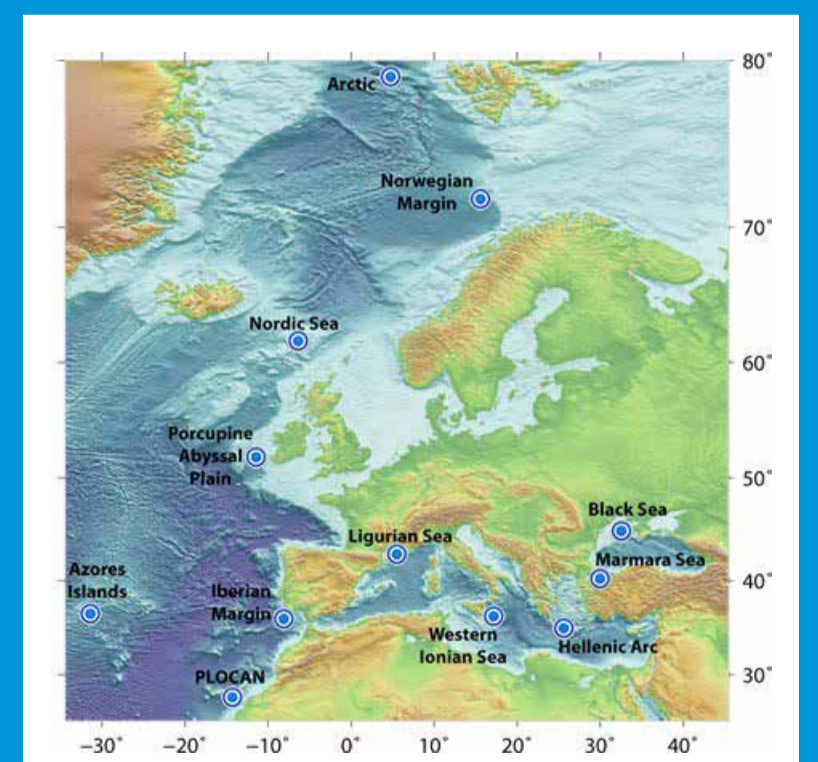
- Detailed technical requirement document to be produced
- Continue ongoing improvements in sensors
- Trial deployment required to demonstrate feasibility and value of data through a Pilot Project

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RELATIONSHIP OF JTF TO EMSO

There are several potential links to EMSO:

- Many telecommunication cables do and will cross European seas and bordering oceans
- Scientific and technology issues and real-time databases are complementary
- Potential to test systems/pilots/sensors at European observatories or industry facilities



A pilot project is being planned with the active involvement of cable industry owners and suppliers and ocean observatory researchers; expressions of interest or in JTF membership are invited. <http://www.itu.int/en/ITU-T/climatechange/task-force-sc>

Conclusions

This JTF initiative has real merit, responding to urgent societal needs

To be successful it requires:

- Technical support from industry
- Cooperation from owners and suppliers
- Iteration between scientists and industry
- Initial funding for proof of concept (pilot project)
- Operational business model once concept is proven and costs are better known

Science and society are looking to industry to make these ideas a reality; opportunities exist for links with EMSO

New global data are critical for understanding and managing ocean health, ecosystems, and for mitigation strategies for future climate change and natural hazards

