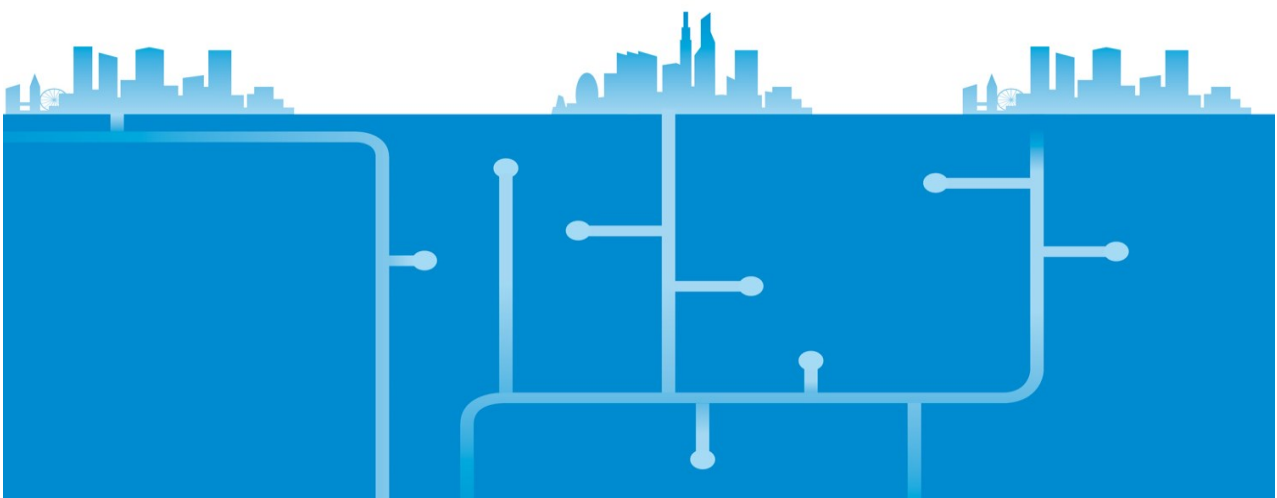




ITU-WMO-UNESCO IOC Joint Task Force

2013 Annual Report

Joint Task Force to investigate the potential of using submarine telecommunication cables for ocean and climate monitoring and disaster warning



ACKNOWLEDGEMENT

This report was prepared on behalf of the ITU-WMO-UNESCO IOC Joint Task Force (JTF) by Christopher R. Barnes (JTF Chair), with the support of Erica Campilongo (ITU) and with the contributions of the JTF Executive Committee.

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1. Introduction and background

The extent and impact of periodic seabed destruction and ecosystem and coastal modification by tsunamis and associated slope failures is a major mitigation issue. Ocean temperature is a critical variable, particularly regarding climate change, sea level rise and ecosystem stress. These aspects of the health and status of marine environments could be monitored globally in real-time through a new generation of ocean mini-observatories hosted on telecommunication cables.

Three UN specialized agencies (**International Telecommunication Union (ITU)**, **World Meteorological Organization (WMO)** and **Intergovernmental Oceanographic Commission (IOC) of UNESCO**) have jointly proposed the development of mini-observatories on trans-ocean submarine cables to measure key ocean seafloor observables, with the concept and applications being developed further through a **Joint Task Force (JTF)**. The latter was established in 2012 with a wide membership including scientists, engineers, cable owners and operators, regulators and legal experts.

Initial exploratory discussions were held at workshops in Rome (2011) and Paris (2012). Through a recent workshop (Madrid, 19-20 September 2013) and ITU secretariat support, the JTF is developing a **strategy and roadmap** with the aim of supporting industry to deploy modified “green” submarine cable systems equipped with environmental sensors (temperature, pressure and acceleration) for climate monitoring and disaster risk reduction (particularly tsunamis). If successful in gaining sustained and tangible support from industry and regulatory bodies, a network of mini-observatories could be established progressively across the world's ocean floors and continental slopes, accurately measuring these important parameters over several decades.

Following the Rome (2011) workshop, **three key reports** were commissioned by the agencies to provide a baseline of information from which to develop future plans. These 30-page reports, published by ITU in 2012, are available on the JTF website¹:

- Rhett Butler (University of Hawaii) “*Using submarine cables for climate monitoring and disaster warning: strategy and roadmap*”
- Kent Bressie (Wiltshire & Grannis LLP) “*Using submarine cables for climate monitoring and disaster warning: opportunities and legal challenges*”
- Stephen Lentz and Peter Phibbs (Mallin Consultants) “*Using submarine cables for climate monitoring and disaster warning: engineering feasibility study*”

The JTF initiative addresses two main needs: **a) increased reliability and integrity of the global tsunami warning network, and b) sustained climate-quality data from the sparsely observed deep oceans**. There are several potential links to new cabled observatories (such as ONC/Canada, OOI/US, DONET/Japan, and EMSO/Europe): many telecommunication cables do and will cross bordering oceans; the scientific and technology issues and real-time databases are complementary; and there is a potential to test systems/demonstrations/sensors on cabled observatories or industry facilities. A wet demonstrator project is being planned with the active involvement of cable industry owners and suppliers and ocean observatory researchers, which was the theme of the Madrid (2013) workshop.

The activities and documents produced by the JTF, and other material referred to in this **JTF Annual Report for 2013**, are available on the JTF website¹.

¹ The JTF website can be found at: <http://www.itu.int/go/ITU-T/greencable>.

2. Objectives

The JTF is tasked with developing a strategy and roadmap that could lead to enabling the availability of submarine repeaters equipped with scientific sensors for ocean and climate monitoring and disaster risk reduction (tsunamis). It will also analyze the potential renovation and relocation of retired out-of-service cables in this realm. With the installation of new trans-ocean and regional telecommunication cable systems equipped with sensors, a global network could be established providing decadal real-time data for ocean climate monitoring and disaster mitigation (particularly from tsunamis).

The discussions at the Rome (2011) workshop resulted in the following **Call to Action** statement that frames the current objectives of the JTF:

We, the participants at the ITU, UNESCO/IOC, WMO workshop on “Submarine Cables for Ocean/Climate Monitoring and Disaster Warning: Science, Engineering, Business and Law” in Rome, Italy from 8 to 9 September 2011 call upon the International Telecommunication Union (ITU), the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (UNESCO/IOC) and the World Meteorological Organization (WMO) to establish and coordinate a joint task force composed of world-renowned experts from science, engineering, business and law, which will:

- Study and evaluate scientific, engineering, business, and societal benefits, opportunities, challenges and risks associated to the use of submarine telecommunication cables for ocean and climate monitoring and disaster warning, as well as legal aspects of such use;
- Develop a strategy and roadmap that could lead to enabling the availability of submarine repeaters equipped with scientific sensors for climate monitoring and disaster risk reduction such as pressure, temperature, salinity/conductivity, seismic, hydroacoustic and cable voltage in the near future;
- Analyze the development of projects that could include renovation and relocation of retired out-of-service cables for disaster warning, ocean and climate monitoring;
- Cooperate closely with the International Cable Protection Committee (ICPC) to investigate and report on the technical feasibility of incorporating the required scientific sensors into the design, manufacture, installation and operation of submarine repeaters in a safe manner without affecting cable systems and telecommunication signals, and avoiding risks that could affect the normal operation of the cables;
- Consider a business model of how sensor data from submarine cables could be provided and could be made available for scientific purposes and societal benefit;
- Identify financing models and opportunities to promote the development of ocean climate monitoring and disaster warning systems by the use of submarine cables;
- Consider ways to further promote the implementation of the legal regime, as reflected in the United Nations Convention on the Law of the Sea

(UNCLOS) and other instruments, for the protection of submarine cables, including awareness building and mobilization of support at the national and global levels;

- Organize similar workshops to report on the progress;
- Ensure that the outcomes of the above efforts/activities take into account and are consistent with international law, as reflected in UNCLOS;
- Invite ITU to consider providing secretariat support for the joint task force.

We encourage ITU, UNESCO/IOC and WMO to bring this Call to Action to the attention of the United Nations Framework Convention on Climate Change (UNFCCC), the States Parties to UNCLOS and the United Nations Secretariat.

3. Organizational structure and meetings held in 2013

In early 2013, the JTF established a committee structure appropriate to address its objectives in an effective and timely manner. Membership in the JTF is open to persons, or persons representing companies/agencies/institutions who are interested in the work and objectives of the JTF. Interested persons may contact the ITU Secretariat (greenstandard@itu.int), after consideration the new members are reported internally and added to the list of members that currently stands at 88².

The JTF's **Executive committee** includes the Chair, Vice Chair and Committee Chairs, as well as representatives from the three UN agencies and supported by the ITU Secretariat staff. In late 2013 and after great contributions, Cristina Bueti was assigned other responsibilities at ITU and was replaced by Hiroshi Ota within the Secretariat team. For 2013, the Executive committee and Secretariat support comprised the following members:

Executive committee

Chair of the JTF	BARNES	Christopher R.
Vice-Chair of the JTF	MELDRUM	David
Chair of Science and Society committee	BUTLER	Rhett
Chair of Engineering committee	MEINIG	Christian
Chair and Co-Chair of Business Model committee	COSTIN	Michael
	LECROART	Antoine
Chair of Legal committee	BRESSIE	Kent
Chair and Co-Chair of Publicity, Outreach and Marketing committee	BAYLIFF	Nigel
	PHIBBS	Peter

Secretariat

BUETI	Cristina	International Telecommunication Union (ITU)
CAMPILONGO	Erica	International Telecommunication Union (ITU)
OTA	Hiroshi	International Telecommunication Union (ITU)

² The list of JTF members is available at: itu.int/en/ITU-T/climatechange/task-force-sc/Documents/JTF_Members.pdf.

Staff

AARUP	Thorkild	Intergovernmental Oceanographic Commission of UNESCO
CABRERA	Edgar	World Meteorological Organization (WMO)
DELJU	Amir H.	World Meteorological Organization (WMO)
FISCHER	Albert	Intergovernmental Oceanographic Commission of UNESCO
GROSS	Tom	Intergovernmental Oceanographic Commission of UNESCO
SCHOLL	Reinhard	International Telecommunication Union (ITU)

The JTF established the following other committees: **Science and Society, Engineering, Legal, Business Model, and Publicity, Outreach and Marketing committees.**

Executive teleconferences are held approximately monthly usually alternating with the **JTF Plenary teleconferences**, open to all members, every 1-2 months. Documents for discussion or consideration at such meetings are made available on an **internal SharePoint site**.

Presentations are made at relevant industry and science conferences; major workshops are arranged at least annually. For 2013, the following Executive and Plenary **teleconferences** were arranged:

Plenary meetings/calls	Executive meetings/calls
4 March	5 February
3 June	16 May
9 July	24 June
29 August	6 August
20 September	15 October
29 October	26 November
17 December	

4. Committee reports

4.1 Science and Society committee (Rhett Butler, Chair)

The JTF Science and Society committee began teleconferences in early 2013 to reach a consensus on the framework for a white paper advising the community about the scientific and societal needs for integrating sensors into submarine telecommunication cables. The focus of the science was on the outstanding issues of robust tsunami warning and monitoring of global climate/ocean change, both of which have a substantial long-term impact on society. The initial sensor focus is on temperature, pressure, and acceleration as key measurements that might be simply incorporated into submarine cable repeaters. This is proposed to create a straightforward path to success that may lead to additional capabilities in the future, e.g., inverted echo sounders, carbon sensors, acoustic

modems. Three subcommittees met via teleconference: climate/ocean monitoring using pressure and temperature, tsunami monitoring using pressure and acceleration, and earthquake/cable-fault monitoring using acceleration sensors. Although not widely publicized, breaks and cable faults in submarine telecommunication cables have been a major contributor to Internet outages following large earthquakes and submarine landslides.

The focus of the white paper is directed toward the educated leaders of telecommunication companies, government and international agencies, foundations, and the public in order to clearly underscore the merits and needs for sensor integration. Initial outlines and edits were broadly circulated to the committee and JTF Plenary. Additional committee members were enlisted to broaden the focus, expand the international perspective, and enhance the scientific expertise of the group. Cross-fertilizing discussions with the JTF Engineering committee have aided framing the engineering specifications necessary to meet the science objectives. A preliminary introduction of the material was presented at the Madrid (2013) workshop. Discussions and exchanges of ideas with the scientific community took place at the San Francisco meeting of the American Geophysical Union in December of 2013. The white paper is currently undergoing editing, and is expected to be available in mid-2014. In the longer term the committee will be considering ocean observing system simulations, both for climate change and tsunami warnings, to further validate the scientific scope of the proposed sea floor network.

4.2 Engineering committee (Christian Meinig, Chair)

The Engineering committee's 2013 work was focused on developing a white paper on the functional requirements for supporting sensors on submarine telecommunication cables. Members of the Engineering committee participated on conference calls with the Science and Society committee as the "*Science and societal requirements for sensors in submarine telecommunication cables*" document was being developed. Once this paper was in advanced draft form the Engineering committee convened via conference calls and a draft outline was written and reviewed within the Engineering committee and then circulated to the JTF prior to the Madrid (2013) workshop and plenary meeting. The scope and purpose of the JTF "*Functional requirements document*" is to translate the requirements for ocean sensing developed by the Science and Society committee into functional engineering requirements and specifications for specific sensors, sensor spacing, and engineering interface requirements to commercial telecommunication cable systems. The purpose of the document is to facilitate the development of system architectures and physical, optical, and power systems design and allow trade studies to be conducted, the results of which can be fed back to the Science and Society committee to iterate on the high level sensing requirements as necessary. Chris Meinig presented key aspects of the outline at the Madrid (2013) workshop in a talk titled: "*Preliminary ideas on sensor configurations and challenges for the Green Cables*".

Additional work of the Engineering committee included discussions of testing requirements for repeaters qualifications and circulating those specifications to sensor manufacturers for comment on shock and vibration qualification and incorporation on Green Cables.

Presentations on the JTF work were made at annual Data Buoy Cooperation Panel Meeting (DBCP) and the International Tsunameter Partnership (ITP) meeting in Paris on 24 September 2013 and to the National Oceanic and Atmospheric Administration (NOAA) tsunami program leadership on 17 May 2013. In general there was broad support for the concept, but also large concerns on the ultimate cost of getting high accuracy sensors on board Green Cables.

4.3 Publicity, Outreach and Marketing committee (Nigel Bayliff and Peter Phibbs, Co-chairs)

This committee was fully formed following the Madrid (2013) workshop and has held three committee meetings by teleconference to date along with a number of side discussions and

conversations. The principal activities have been to conclude the statement of requirements for the “*Functional requirements study*” and the “*Marketing and business plan study for the wet demonstrator*”, as long as to assist with solicitation of funds from the vendor community. Additionally, the committee has developed, edited and facilitated a number of presentations and paper submissions for a variety of industry events, including the Pacific Telecommunications Council annual conference and Oceanology International in early 2015.

Some work has begun on refining the web and internet presence, to create “teachables” and encapsulated video segments narrated by JTF members, such that the message may be promulgated to a much more diverse audience.

Given the wide range of activities and geographical spread of events, the committee is very keen to establish a wider membership and share the workload. Representation from vendors and the scientific/academic groups in the JTF would be particularly welcome. Many thanks are extended to all those who were able to stand up and promote the workings of the JTF in the various events this past year.

4.4 Business Model committee (Michael Costin and Antoine Lecroart, Co-Chairs)

The initial focus of the Business Model committee involved the Co-Chairs exploring the boundaries of the business model issue, supported by discussion and presentations provided at the Madrid (2013) workshop. Since Madrid, it has been determined that the most expedient way of developing a generic approach may be achieved through approaching the principals of prospective new cable project(s) that are understood to intend applying sensor technologies and providing data to relevant environmental and other organizations. One particular project has been identified and interaction with that project is pending resolution of some issues with possible conflicts of interest. It is anticipated that these issues will be resolved by mid-2014.

4.5 Legal Committee (Kent Bressie, Chair)

In 2013, the Legal committee focused principally on supporting the tasks of the JTF’s other committees. Given the unsettled nature of the law regarding hybrid telecom-marine data cables, the JTF had agreed that the Legal committee could best serve the JTF by addressing particular legal questions or issues arising from the work of those other committees. The Science and Society Committee expressed an interest in having the Legal committee develop a guidance document identifying legal and regulatory considerations that potential telecom-marine data cables will likely need to address with the relevant governments during the project development and project implementation phases. The Legal committee also consulted with the Engineering and Science and Society committees to identify the technical capabilities and limitations of sensors for telecom-marine data cables. Given the security- and energy-related sensitivities about sensors, potential telecom-marine data cable projects will need to address the limitations of their sensors as part of any discussions with the relevant governments. In 2014, the Legal committee will focus on the development of such a guidance document on legal and regulatory considerations.

5. External communications, presentations, publications and activities held in 2013

A major successful **JTF Workshop** was organized on 19-20 September as part of the ITU Green Standards Week at Telefónica’s Headquarters in Madrid, Spain. The dedicated and professional organizational work of staff at both the ITU and the host Telefónica were greatly appreciated. The theme of the workshop was “**Propelling a Pilot Project on Green Cables**” and the details of the

nine sessions in the programme, brief biographies on the speakers and most of the PowerPoint presentations are provided on the event website³.

In addition to all the talks at the Madrid (2013) workshop, the following relevant **conference or workshop presentations** were given as either oral or poster contributions in 2013:

- Barnes, C.R., Bueti, M.C., and Meldrum, D.T. 2013. *The health and status of marine ecosystems potentially monitored in real-time through new mini-observatories along repeatered telecommunication cables*. Aquatic Ecosystem Health and Management Society 11 (AEHMS). Program with Abstracts, Victoria, BC, 17-20 June 2013.
- Barnes, C.R., Bueti, M.C., and Meldrum, D.T. 2013. *Harnessing future sub-sea communications cables for ocean observation and disaster warning: potential links with, and opportunities*. European Multidisciplinary Seafloor and water column Observatories (EMSO): Challenges and Progress Workshop, Rome, 13-15 November 2013, Programme with Abstracts (poster).
- Barnes, C.R., Butler, R., Howe, B.M., and Bueti, M.C. 2013. *“Green” Submarine Cable Systems for Ocean/Climate Monitoring and Disaster Warning*. American Geophysical Union, Annual Meeting, San Francisco, 9-12 December 2013, Programme with Abstracts (poster).
- Bueti, C., Barnes, C. and Meldrum, D. 2013. *Submarine cables for ocean/climate monitoring and disaster warning*. Geophysical Research Abstracts, v. 15, EGU2013-PREVIEW, European Geophysical Union, General Assembly 2013, 7-12 April 2013, Vienna, Programme with abstracts.
- Phibbs, P. 2013. *The Green Repeater*. SubOptic 2013, Paris, 22-25 April 2013, Programme with abstracts.
- Meinig, C. presented three talks as noted in the paragraph 4.2.
- Meldrum, D. attended the OOPC and JCOMM OCG joint meeting, Silver Spring, US, 5 September 2013 in his role as JCOMM OPA vice chair, and used the opportunity to present the JTF to this joint assembly. The meeting received the presentation with considerable interest, the OOPC in particular recognizing the possibility to better measure deep ocean heat content and its response to climate change. A number of actions were agreed to support the JTF, including the endorsement of its SCOR submission, and the recruitment of OOPC and JCOMM office bearers to the JTF.

Formal links were established with **two other ITU groups**. David Faulkner is the Liaison Rapporteur from ITU-T Study Group 5 to JTF (ITU-T Study Group 5 is responsible for studying ICT environmental aspects of electromagnetic phenomena and climate change.). Sang Ziqin was appointed as Liaison Rapporteur for the JTF and the ITU Focus Group on Smart Sustainable Cities (FG-SSC) to share information on disaster warning activities.

Input was made into the **65th WMO Executive Council**: A joint statement was accepted from ITU, WMO, UNESCO IOC as Document 4.7(1) – Partnership: 4.1 (4) 14. The Council noted the establishment by the International Telecommunication Union (ITU), the UNESCO/IOC and the WMO, of a Joint Task Force to *inter alia*, develop a roadmap that could lead to enabling the availability of submarine repeaters equipped with scientific sensors for disaster warning system (tsunamis), and the monitoring of some essential climate variables. The Council requested the

³ Please visit: itu.int/en/ITU-T/Workshops-and-Seminars/gsw/201309/Pages/programme-19-20-Sep.aspx.

Secretary General to facilitate the work of the Joint Task Force and encouraged JCOMM to an active contribution by providing the corresponding technical advice and expertise.

Several other initiatives were undertaken by ITU staff with the JTF Executive committee to improve external communications. A JTF **logo** was developed together with a new **pull-up display unit**. The latter was displayed at the Madrid (2013) workshop and is available for deployment at conferences and workshops. A **fold-out JTF flyer**⁴ was produced for distribution at such meetings and for responding to general inquiries. A **JTF website**⁵ was established and translated in all ITU official languages.

6. Funding support and initiatives

The UN agencies (ITU-WMO-UNESCO IOC) supporting JTF provide some financial and in-kind support for operational activities, although their own budgets have little flexibility to support such new initiatives.

As noted above, ITU made a solicitation to six companies to support the cost of conducting the two studies by consultants in 2014 (Functional Requirements for the green cable sensors; Marketing and Business Plan for the Wet Demonstrator Project). ITU is anticipating responses in early 2014.

A proposal was submitted to fund a Working Group (Climate and tsunami science with green repeaters on submarine cable systems) under the Scientific Committee on Oceanic Research (SCOR) of the International Council for Science. SCOR has limited funds and only supported two new Working Groups, the JTF proposal unfortunately not being one of them.

⁴ Please visit: itu.int/en/ITU-T/climatechange/task-force-sc/Documents/JTF-flyer.pdf.

⁵ The JTF website can be found at: <http://www.itu.int/go/ITU-T/greencable>.