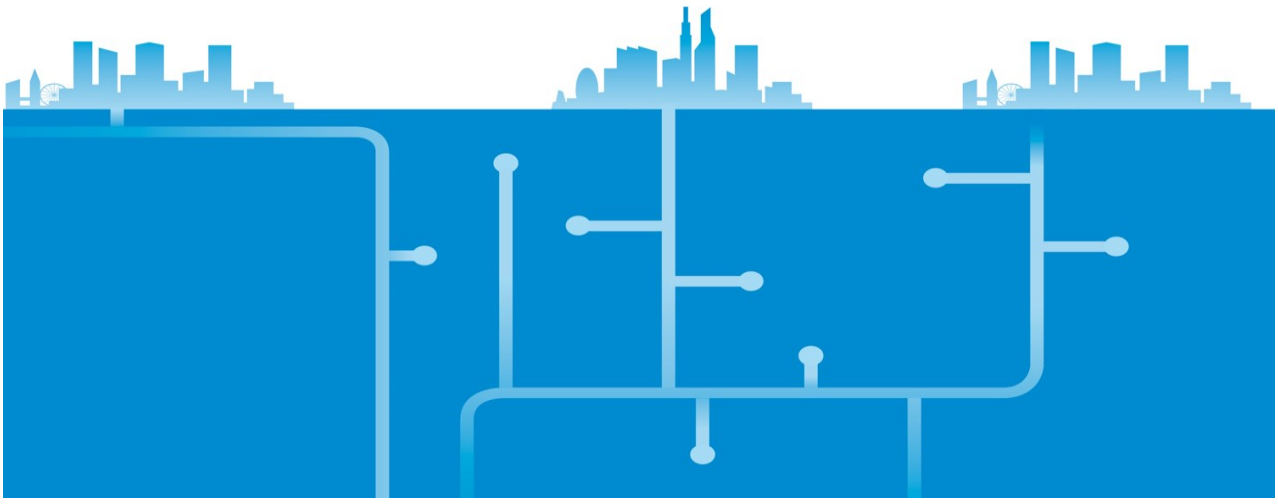
# ITU-WMO-UNESCO IOC Joint Task Force

## 2014 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 contributions from the JTF Executive Committee members and Hiroshi Ota (ITU).

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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 mini-observatories hosted on submarine telecommunication cables.

Three UN specialized agencies **(International Telecommunication Union (ITU), World Meteorological Organization (WMO) and Intergovernmental Oceanographic Commission (IOC) of UNESCO)** 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 now including about 100 scientists, engineers, cable owners and operators, regulators and legal experts.

Initial exploratory discussions were held at workshops in Rome (2011) and Paris (2012). Through subsequent annual workshops (Madrid, 19-20 September 2013 and Singapore, 16-17 October 2014) and with ITU secretariat support, the JTF is developing a **strategy, roadmap and demonstrator project** with the aim of supporting industry to deploy modified "green" submarine cable systems equipped with environmental sensors (temperature, pressure and three-axis 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 website[1]:

- 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, Aloha/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 main theme of the Madrid (2013) and Singapore (2014) workshops.

The activities and documents produced by the JTF, and other material referred to in this **JTF Annual Report for 2014**, are available on the **JTF website**[1].

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

## 2. JTF 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 2014

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 about 100[2].

The JTF has a committee structure appropriate to address its objectives in an effective and timely manner. 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 2014 and after substantial contributions, Erica Campilongo was assigned other responsibilities at ITU and was replaced by Hiroshi Ota within the Secretariat team. For 2014, the Executive Committee and Secretariat support were composed of the following members:

**Executive Committee**

| | | |
|---|---|---|
| Chair of the JTF | BARNES | Christopher |
| Vice-Chair of the JTF | MELDRUM | David |
| Chair of Science and Society Committee | BUTLER | Rhett |
| Chair of Engineering Committee | HOWE | Bruce |
| Co-Chairs of Business Model Committee | COSTIN | Michael |
| | LECROART | Antoine |
| | MARIANO | John |
| Chair of Legal Committee | BRESSIE | Kent |
| Co-Chairs of Publicity, Outreach and Marketing Committee | BAYLIFF | Nigel |
| | PHIBBS | Peter |

**Secretariat**

| | | |
|---|---|---|
| CAMPILONGO | Erica | International Telecommunication Union (ITU) |
| OTA | Hiroshi | International Telecommunication Union (ITU) |

[2] The list of JTF members is available at: http://www.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 other JTF committees are: **Science and Society, Engineering, Publicity, Outreach and Marketing, Business Model, and Legal committees**.

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

For 2014, the following Executive and Plenary **teleconferences** were arranged:

| Plenary meetings/calls | Executive Committee meetings/calls |
|---|---|
| 17 February | 28 January |
| 7 April | 29 April |
| 3 June | 29 July |
| 12 August | 9 September |
| 17 October | 13 November |
| 24 November | 16 December |

Presentations are made at relevant industry and science conferences; major workshops are organized annually.

## 4. Committee reports

### 4.1 Science and Society Committee (Rhett Butler, Chair)

The Science and Society Committee's 2014 work brought to completion the first of several white papers being prepared by JTF: "The Scientific and Societal Case for the Integration of Environmental Sensors into New Submarine Telecommunication Cables." (October 2014, ITU, 34p)[3]. This report was jointly authored by 37 scientists from 11 nations (Australia, Canada, France, Italy, Japan, New Caledonia, New Zealand, Norway, Spain, UK, USA) and UNESCO/IOC. The publication of this work was picked up and highlighted by newsprint and television.

[3] Please visit: http://www.itu.int/dms_pub/itu-t/opb/tut/T-TUT-ICT-2014-03-PDF-E.pdf

At the ASLO/AGU/TOS Ocean Sciences Meeting, February 2014, Honolulu, Hawaii, a paper was presented on "Green Submarine telecommunications cables to monitor global change and tsunamis in the deep ocean". The S&S Committee participated in the NASA-sponsored workshop at the California Institute of Technology, "From Space to the Deep Seafloor" in October, which was led by the JTF Engineering Committee. Immediately following this in October, the S&S Chair spoke with other members of the JTF Executive at a dedicated session on "Building cables of the future" at the Submarine Networks World conference in Singapore. Subsequently, at the JTF 4th Workshop, "Green Cable Systems: New Developments and Demonstrator Project," held at the Singapore Centre for Climate Research, the S&S Committee presented its new white paper. In late 2014, the Committee initiated a review of its membership to both re-vitalize its momentum, and link to global monitoring agencies that have use for the seafloor data.

### 4.2 Engineering Committee (Bruce Howe, Chair)

The Engineering Committee's 2014 work was focused on developing two documents. The first document, Functional Requirements of "green" submarine cable systems, translates the requirements for ocean sensing developed by the Science and Society Committee into functional engineering requirements and specifications for specific sensors, senor spacing, and engineering interface requirements to commercial telecommunication cable systems. The sensors are to measure temperature, pressure and acceleration in real-time, over decades; they are small, robust, reliable and are already operational on observatory systems. This will 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.

The second document, Scope document and budgetary cost estimate for a wet test, described a "Wet Demonstrator". The key objective of the Wet Demonstrator is to establish the accuracy and usefulness of data from sensors attached to a green system repeater when those sensors are deployed in a realistic manner.

Both of these documents will become publicly available in May 2015. These documents were prepared by Mallin Consultants (undertaken by Stephen Lentz and Peter Phibbs) in consultation with the committee.

As mentioned in Section 4.1 above, the chair obtained NASA funding to hold a workshop at the California Institute of Technology, "From Space to the Deep Seafloor." This addressed scientific synergies between satellite inferred bottom pressure observations and in situ measurements from "green" cables of the same (and of temperature), as they relate to climate variability and ocean circulation. Some of the discussion provided valuable feedback to engineering (e.g., the need to consider other sensors); a report is forthcoming. A second workshop is scheduled in Honolulu for late May 2015. Similar such workshop(s) are necessary to address seismic and tsunami science and applications.

A presentation on the JTF work was made at the 2014 annual meeting of the International Cable Protection Committee (ICPC) in Dubai. As before, there was broad support for the concept, together with concerns about the business model for "green" cable systems.

Activities in 2015 are expected to include: summarizing the two documents in the form of a new white paper, with inclusion of new material from the workshops; presentations at meetings and workshops; and facilitating engineering related to the implementation of the wet demonstrator.

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

The specifications of the three contracted reports were concluded early in the year, the resulting studies were awarded to two separate consulting groups and these were completed by the third quarter. Embargoes for six months are in place on the content to allow the financial contributors to review the content prior to public release.

A number of high-profile events were held during the year, with the POM team negotiating a dedicated speaking programme at Submarine Networks World in Singapore in October.

The website was re-launched this year with useful content added and references to all major works of the JTF. Further enhancements are planned for 2015 to include more detail on the speaking programme and individual committee structures and schedules, and also organizing a LinkedIn discussion group.

The POM Committee is in the process of re-forming and aiming to encourage a wider participation from the joint task force members, to include additional representatives from all the academic, industry, government, and scientific communities represented.

### 4.4 Business Model Committee (Michael Costin and Antoine Lecroart/John Mariano, Co-Chairs)

Whilst the Business Model Committee has continued exploring the boundaries of the business model issue, it has also attempted to expediently develop a generic approach 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 (SubPartners APX East) has been identified and whilst some basic parameters were provided for consideration, the project is still in a developmental phase and some elements require further progress in order to be more materially useful.

Antoine Lecroart has had to attend to other duties at Alcatel-Lucent Submarine Networks and was succeeded as committee co-chair in October 2014 by John Mariano (David Ross Group). John brings a new energy to the Committee's work, having regard for the study by David Ross Group on the Marketing and Business Plan for the Wet Demonstrator Project, as referred in Section 6 of this Annual Report.

### 4.5 Legal Committee (Kent Bressie, Chair)

In 2014, the Legal Committee continued to focus 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 continues to believe that the Legal Committee best serves the JTF by addressing particular legal questions or issues arising from the work of those other committees. At the request of the Science and Society Committee, the Legal Committee continues to 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. In doing so, the Legal Committee consults with both the Engineering and Science and Society committees. The Committee's chair also continues to engage in various public fora, such as the Submarine Networks World conference, with interested parties expressing views and concerns about legal and regulatory issues with the JTF's work and green cables generally.

## 5. External communications, presentations, publications and activities held in 2014

The JTF is preparing new or updated publications (or White Papers), building on the three earlier publications referred to in Section 1 of this Annual Report. One that was completed in 2014 was

from the Science and Society Committee, with able and diligent leadership from the Chair, Rhett Butler. This publication, noted also in Section 4.1 of this Annual Report, titled **"The scientific and societal case for the integration of environmental sensors into new submarine telecommunication cables" by Butler et al.**, October 2014, ITU, 34p. (24 co-authors and twelve other contributors) is available on the website[4].

JTF made a significant contribution to the Submarine Networks World 2014 (SNW) conference, 14-15 October, Singapore with a dedicated final session on **"Building cables of the future"** comprising a keynote talk by the JTF Chair followed by a Panel Q&A comprising nine specialists including most members of the Executive Committee. A short summary White Paper prepared by Chris Barnes is posted on the JTF website[5].

A major successful JTF Workshop was strategically arranged to follow this SNW conference, with several senior members of the submarine telecommunications industry agreeing to stay on and attend all or part of the Workshop, 16-17 October. It was held at the facilities of the Centre for Climate Research Singapore; the dedicated and professional organizational work of staff of CCRS and ITU was greatly appreciated. The theme of this **4th JTF Workshop was "Green Cable Systems: new developments and demonstrator project".** Details of the programme's summary and eight sessions, brief biographies on the speakers, and many of the PowerPoint presentations are provided on the JTF website[6].

In addition to all the talks at the Singapore (2014) workshop, the following relevant **conference or workshop presentations** were given as either oral or poster contributions in 2014:

- Barnes, C.R. 2014. What does the submarine cable of the future look like? The new business case, innovations and social benefits for climate and disaster sensors. Submarine Networks World 2014 Conference, Singapore, 14-15 October 2014. Keynote address and White Paper (both on JTF website).
- Barnes, C.R. 2014. Summary of the objectives, activities and future plans of the ITU/UNESCO-IOC/WMO Joint Task Force on Green Cable Systems (JTF). ITU-WMO-UNESCO IOC Joint Task Force Workshop. 4th Workshop: Green Cable Systems: new developments and demonstrator projec**t,** Singapore, 16-17 October 2014 (PPT on JTF website).
- Barnes, C.R. 2014. Potential applications of the JTF concept. Member of Ministerial Panel Session on ICT for Development and Saving Lives. ITU Telecom World 2014 conference, Doha, Qatar, 7-10 December 2014.
- Bayliff, N. 2014. Sensing the Oceans: Practical & operational considerations of adding sensors to submarine telecommunications cables. Executive Council of the Intergovernmental Oceanographic Commission, UNESCO, Paris, 2 July, PPT on JTF website. NEXANS kindly sponsored a reception after the presentation by Nigel Bayliff.
- Butler, R., Howe, B.M, and Science and Society Committee. 2014. "Green" submarine telecommunication cables to monitor global change and tsunamis in the deep ocean. ASLO/AGU/TOS Ocean sciences 2014 conference, Honolulu, 23-28 February 2014. Abstract 15949 on ASLO website.

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4 Please visit: http://www.itu.int/dms_pub/itu-t/opb/tut/T-TUT-ICT-2014-03-PDF-E.pdf

5 Please visit: http://www.itu.int/en/ITU-T/climatechange/task-force-sc/Documents/SNW14/SNW%20White%20Paper_Barnes_Building%20cables%20of%20the%20future.pdf

6 Please visit: http://www.itu.int/en/ITU-T/Workshops-and-Seminars/jtf-itu-wmo-unesco-ioc/Pages/default.aspx

- Campilongo, E. Green Cables for Climate/Ocean Monitoring and Disaster Warning. ICTs and Climate Data (WMO, ITU) session at the WSIS+10 High-Level Event 2014, Geneva Switzerland, 10-13 June 2014.
- Howe, B.M. 2014. 'Green' submarine telecommunication cables to monitor global change and tsunamis in the deep ocean. International Cable Protection Committee, 47th Plenary Meeting, Dubai, 18-20 March 2014.
- Howe, B. 2014, organized a NASA Workshop on "From space to the deep seafloor: Using 'Green' submarine cable systems in the ocean observing system" on 9-11 October at Caltech, Pasadena, California with about 30 attendees supported in part by NASA funding. A second companion workshop will follow in late May 2015 at the University of Hawaii at Manoa, Honolulu, Hawaii.

Formal links continued with **two other ITU groups**. David Faulkner is the Liaison Rapporteur from ITU-T Study Group 5 to JTF (ITU-T SG5 is responsible for studying ICT environmental aspects of electromagnetic phenomena and climate change.). Sang Ziqin is the Liaison Rapporteur for the JTF and the ITU Focus Group on Smart Sustainable Cities (FG-SSC) to share information on disaster warning activities.

Several other initiatives were undertaken by ITU staff with the JTF Executive committee to improve external communications. A variety of media were further developed including a **pull-up display unit**, a **fold-out JTF flyer**[7], a **JTF Blog**[8], **FAQs**[9], and substantial improvements were made to the format and content of the **JTF website**[10] which is available 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.

ITU made a solicitation to six companies to support the cost of conducting the three studies by consultants in 2014 (**Functional Requirements for the green cable sensors; Technical Specifications for the Wet Demonstrator; Marketing and Business Plan for the Wet Demonstrator Project**). Three companies kindly provided the support requested and UNESCO's Intergovernmental Oceanographic Commission (IOC) also contributed some funding. The three studies were contracted by ITU to consultants: the first two studies to Mallin Consultants (undertaken by Stephen Lentz and Peter Phibbs) and the third to the David Ross Group (undertaken by John Mariano and Jerry Tourgee). All three studies were received and then sent out to groups of specialists for external review, followed by some revisions to produce the final documents. The latter, by contractual agreement with the three supporting companies, are under a six-month embargo before being made publically available on the website in mid-2015. JTF gratefully acknowledges the financial support provided by the three companies: Huawei Marine Networks, Nexus, and Xtera.

JTF plans to use the publications, White Papers, and the three study documents, to move forward with the Wet Demonstrator Project in 2015 and beyond. A letter seeking an Expression of Interest

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

8 Please visit: https://itu4u.wordpress.com/2014/07/01/green-cables-for-climate-monitoring-and-disaster-warning

9 Please visit: http://www.itu.int/en/ITU-T/climatechange/task-force-sc/Documents/JTF_FAQs.pdf

10 Please visit: http://www.itu.int/en/ITU-T/climatechange/task-force-sc/Pages/default.aspx

will be sent to CEOs of submarine telecommunication and supply companies and research cabled ocean observatories in early 2015 to help develop an industry-academia-JTF/agencies partnership for the project.