SUSTAINABLE SUBSEA NETWORKS

Monday January 16
1515-1615

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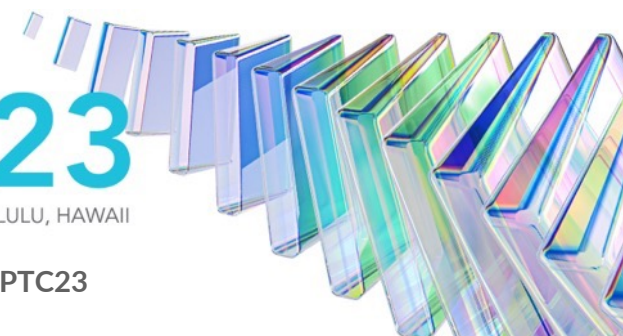@PTCouncil #PTC23
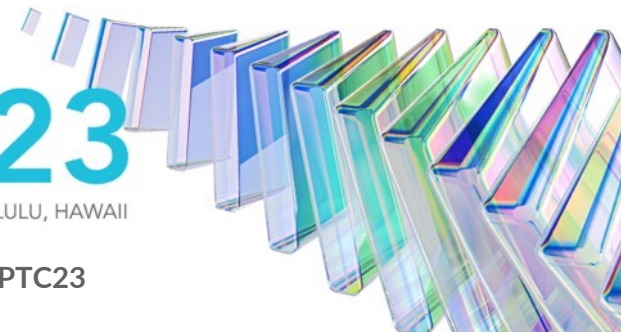
WHO WE ARE:

Nicole Starosielski

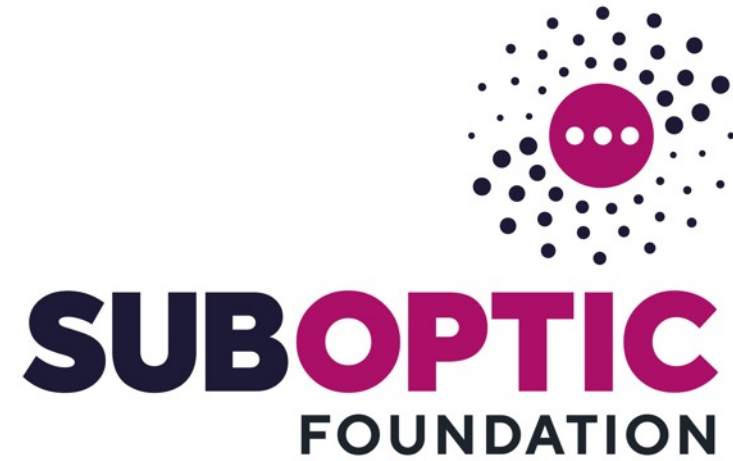Associate Professor

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WHO WE ARE:

SUSTAINABLE SUBSEA NETWORKS

Enhancing the environmental sustainability of subsea telecommunication networks—the global links of our digital world

CABLE

SUBOPTIC FOUNDATION

Internet Society Foundation

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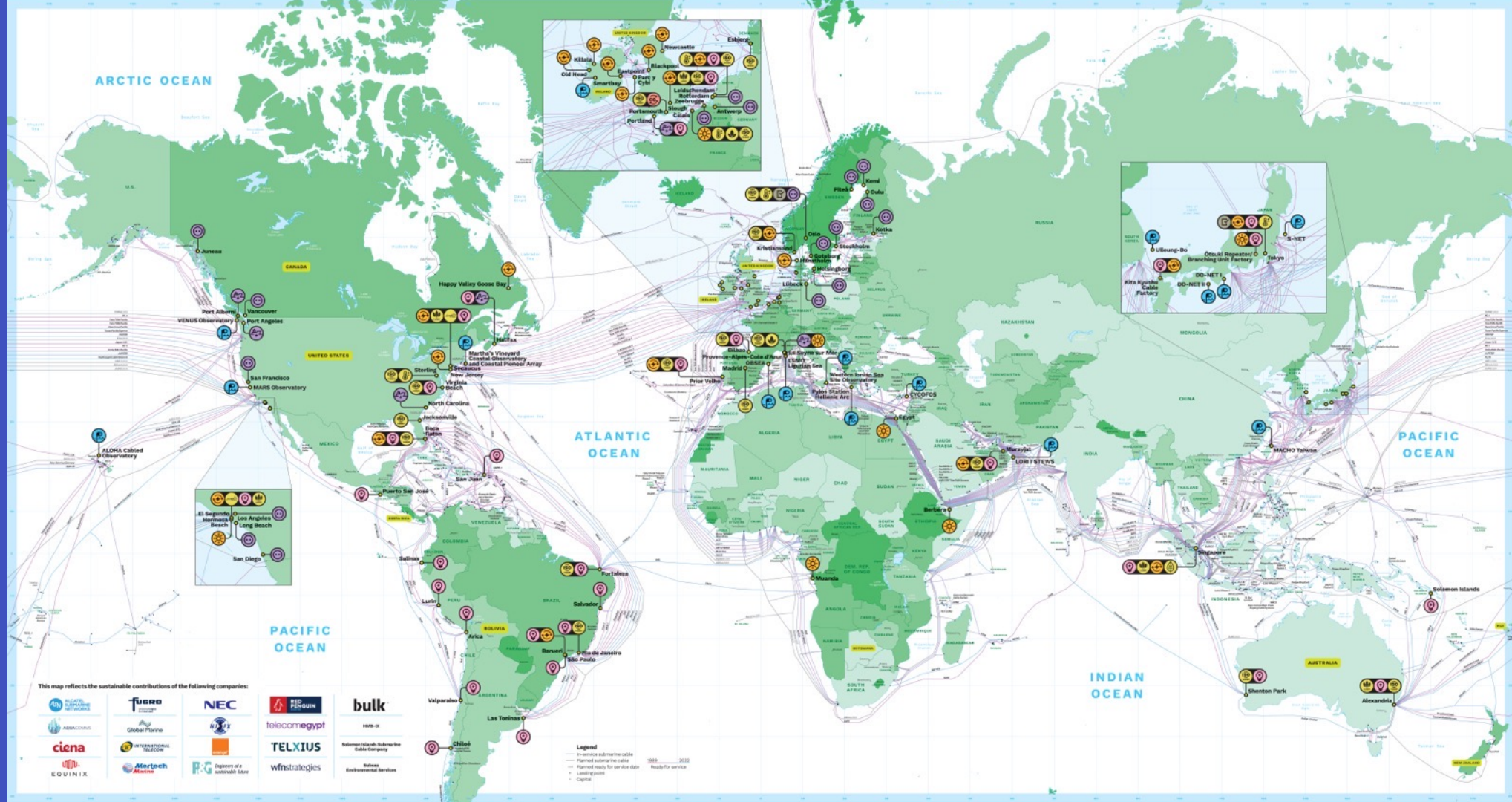
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OUR ACTIVITIES

- Catalogue **best practices** in the subsea industry

- Calculate the **carbon footprint** of a subsea cable

- Conduct site-specific **renewable energy feasibility studies**

- Investigate **prospects for policy**

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Sustainable Subsea Networks Map

This map reflects the sustainable contributions of the following companies:

ALCATEL SUBMARINE NETWORKS · FUGRO · NEC · RED PENGUIN · bulk
AQUA COMMS · Global Marine · RJFX · telecomegypt · HMN-OE
ciena · INTERNATIONAL TELECOM · orange · TELXIUS · Solomon Islands Submarine Cable Company
EQUINIX · Mertech Marine · R·G Engineers of a sustainable future · wfnstrategies · Subsea Environmental Services

Legend

- — In-service submarine cable
- — Planned submarine cable
- --- Planned ready for service date   Ready for service
- Landing point
- Capital

What makes a network sustainable?

Extend Lifetime
The more years a cable is in operation, the more sustainable it generally is.

Sustainability Award
AC-4, PC-1, and FEA are a few of the oldest cables on major routes.

Increase Bandwidth
The more capacity, the more sustainable the network.

Upgrading capacity, as Ciena has with WaveLogic 5, means avoiding the construction of new cables.

Max capacity: 382,000 Gbps

From 2012–2021 Ciena's WaveLogic technology allowed operators to avoid over 4.6 million metric tons of CO2 emissions. This is equivalent to:

2,371,824,751 kilograms of coal NOT burned

Connect to Green Energy
Locating data centers and cable landings on green grids, purchasing carbon neutral power, and building renewable installations all reduce carbon emissions.

Cable landing stations that are carbon neutral or serviced by 100% renewable power.

Solar energy installation

Wind energy installation

Carbon Intensity of Grid Energy (g CO2e/kWh)

Lend Cables to Science
Scientists use ocean observatories and SMART cables to monitor ocean and climate conditions.

Ocean Observatory

Plug into Shore Power
When shore-side electric power is available for cable ships, they do not have to burn CO2 emitting-fuel.

Shore power is available at port.

Cable ships regularly access shore power in these locations.

Be Regulation-Conscious
These countries have established environmental regulation for data centers and/or landing stations.

Meet Standards, Obtain Certifications, Commit to Targets

LEED Certification

Green Marine environmental certification

Green Data Center Standard

Energy Star Certification

ISO 14001 Standard for Environmental Management

Commitment to environmental targets, such as the Climate Pledge, Science Based Target 1.5, and RE 100.

Offset Emissions
Companies can offset their emissions and should favor durable carbon removals over tree planting and conservation offset efforts.

Companies engaged in carbon offsetting.

Account and Disclose
Companies can track their carbon emissions and disclose them to the public.

Companies that account and disclose CO2 emissions.

Be Energy Efficient
Owners of cable landing stations, factories, and ships have all pursued energy efficiency upgrades to reduce both CO2 impact and cost of electricity.

Facilities and ships that have undertaken energy efficient initiatives and upgrades.

Protect Cables
A well-protected cable, and regulations that restrict cable damaging activities, leads to fewer repairs and less CO2 emissions.

Recycle Cables
Recycling returns cable materials to the circular economy and saves CO2 emissions.

Material	Amount (MT)	GHG emissions avoided (MT-CO2e)*
Copper	22,648	71,048
Steel	95,838	133,856
Polyethylene	28,111	105,240
Aluminum	3,060	43,171
Total	**130,150**	**307,014**

Recycling cables' materials is the equivalent of taking 77,033 gas-powered cars off the road for a year.

*Figures represent the embodied CO2e involved in material extraction and manufacturing, but does not include emissions associated with recovery and reprocessing.

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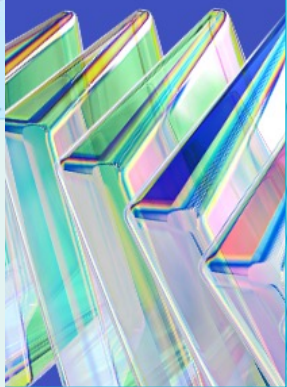
BEST PRACTICES IN SUBSEA

- **Extend Lifetime**
  - The more years a cable is in operation, the more sustainable it generally is

- **Increase Bandwidth**
  - The more capacity, the more sustainable the network

With increasing traffic demands, early adoption of new technology results in material improvement towards sustainable outcomes.

From 2012 through the end of fiscal 2021, Ciena's WaveLogic modem technology— which now includes WL5e 800G—allowed network operators to **avoid over 4.5 million metric tons of CO2 emissions** while still meeting capacity demands.

This is equivalent to²:

Which is equal to the carbon sequestered by:

2,013,070,657
liters of gasoline
NOT consumed

or

2,371,824,751
kilograms of coal
NOT burned

78,146,139
tree seedlings
grown for 10 years

or

2,263,411
hectares of forests
in one year

Within just 18 months of shipping, **WL5e contributed to an additional 50 percent reduction in carbon dioxide emissions** within an equivalent ten-year period.
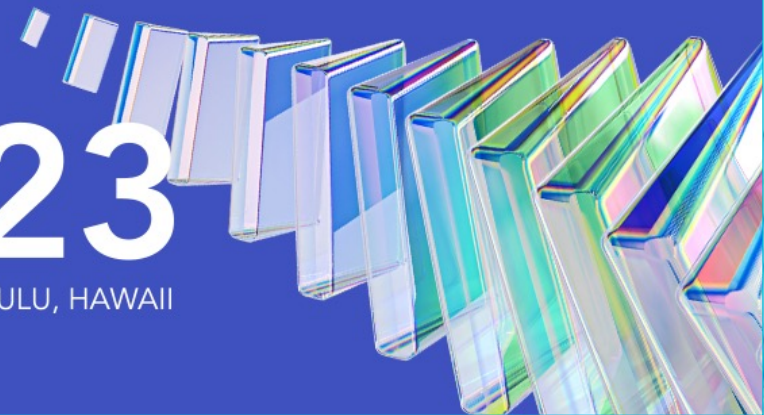
Graphic courtesy of Ciena

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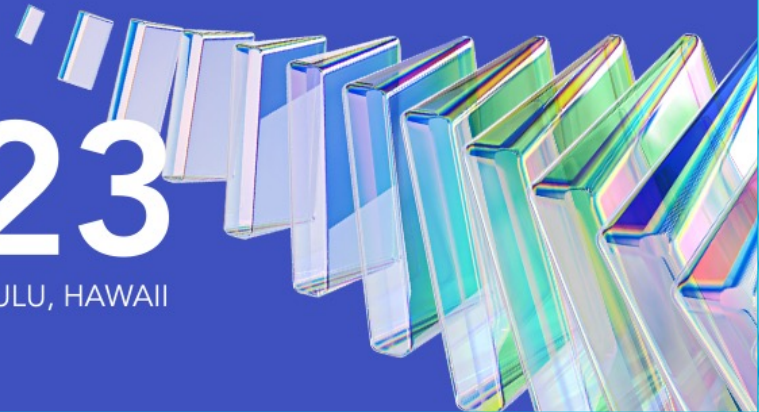🐦 @PTCouncil #PTC23

BEST PRACTICES IN SUBSEA

- **Connect to Green Energy** ♻️ ☀️
  - Data centers and cable landings on green grids, purchasing carbon neutral power, and building renewable installations reduce carbon emissions
  - **Aqua Comms**: Renewable energy powered in many locations
  - **BT**: Network powered by 100% renewable
  - **Bulk Infrastructure**: Renewable powered CLS (hydropower)
  - **HMB-IX**: Worked with community partners toward local solar installation
  - **Telecom Egypt**: Solar powered installations
  - **NJFX**: Carbon neutral power
  - **ASN & NEC**: Solar power at facilities

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BEST PRACTICES IN SUBSEA

- **Energy Efficiency** ⚡
  - Owners of cable landing stations, factories, and ships have pursued energy efficiency to reduce both CO_2 impact & electric costs
  - **Telxius**: Energy efficiency projects in 13 cable landing stations
  - **BT**: Improvements made at cable landing stations
  - **Solomon Islands Submarine Cable Company**: Developed an internal plan to act responsibly and save energy
  - **R&G Telecom**: Consultants for energy efficiency projects at CLS
  - **Global Marine** & **IT International Telecom**: Energy efficiency projects onboard and shoreside

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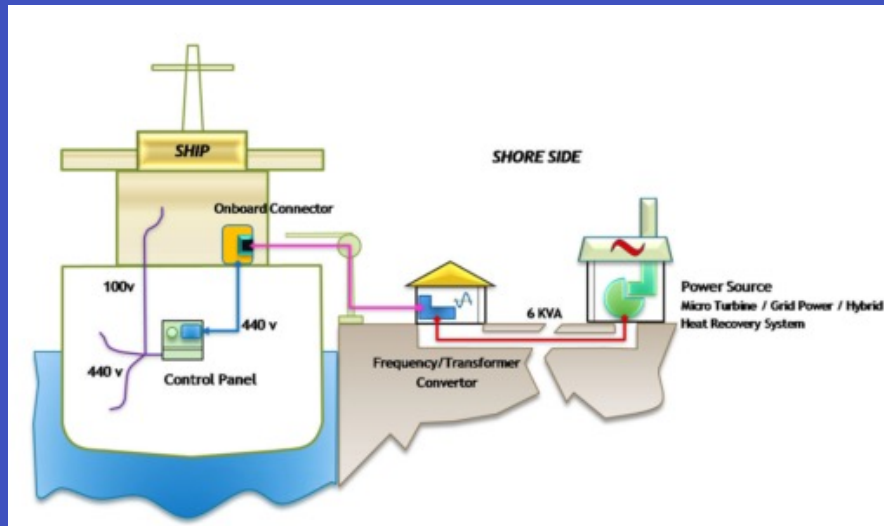
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BEST PRACTICES IN SUBSEA

- **Plug into Shore Power**
    - When cable ships plug into shore-side electric power, they do not have to burn CO2 emitting-fuel.
    - Global Marine, IT International Telecom, Orange Marine: Plugged into shore power at various ports.

BEST PRACTICES IN SUBSEA

- **Offset emissions** 🔄CO_2
  - **Red Penguin Marine**: Has developed a carbon offset program which will begin in 2023

- **Account and Disclose** ☑
  - Companies track carbon emissions and disclose them to the public
  - **Bulk Infrastructure**: Measured emissions since 2020, publishing beginning 2022
  - **NEC**: Discloses environment-related information

TCFD TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES

CDP DISCLOSURE INSIGHT ACTION — A LIST 2022 — CLIMATE WATER

Dow Jones Sustainability Indexes

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BEST PRACTICES IN SUBSEA

- **Meet Standards, Obtain Certifications, Commit to Targets**

ISO 14001 Standard for Environmental Management
- ASN, Bulk Infrastructure, Fugro, Red Penguin Marine, Telxius, WFN Strategies

Commitment to environmental targets, such as the Climate Pledge, Science Based Target 1.5, and RE 100.
- ASN, Bulk Infrastructure, Fugro, NEC, WFN Strategies

Green Data Center Standard, Energy Star Certification, LEED Certification
- Equinix

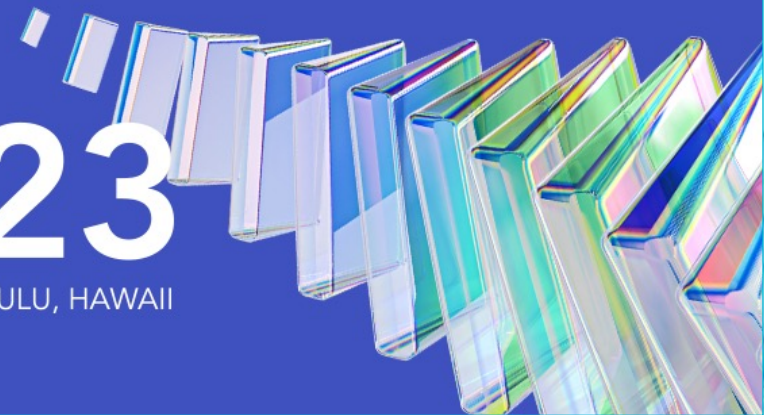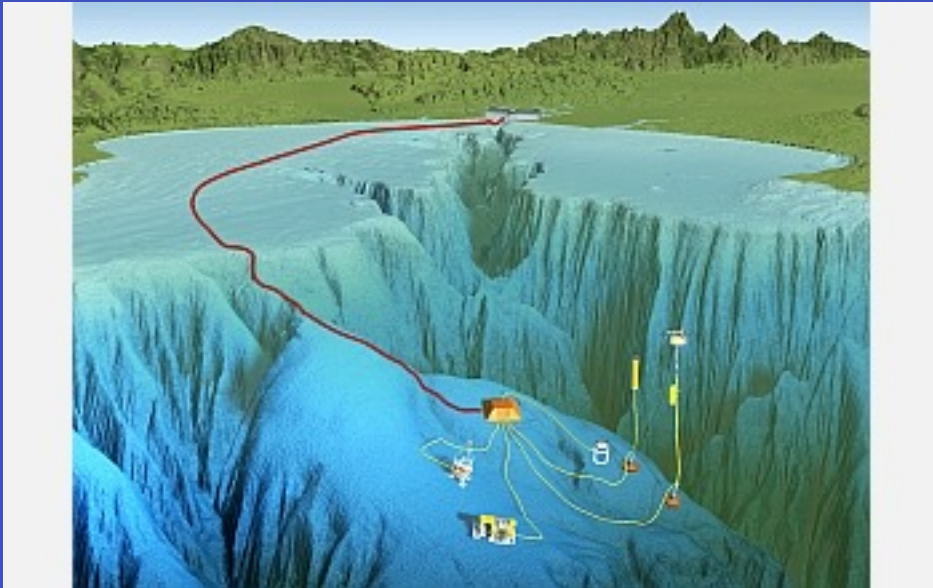Green Marine environmental certification
- ASN, Orange Marine

BEST PRACTICES IN SUBSEA

- **Lend Cables to Science**
  - Scientists use ocean observatories and SMART cables to monitor ocean and climate conditions

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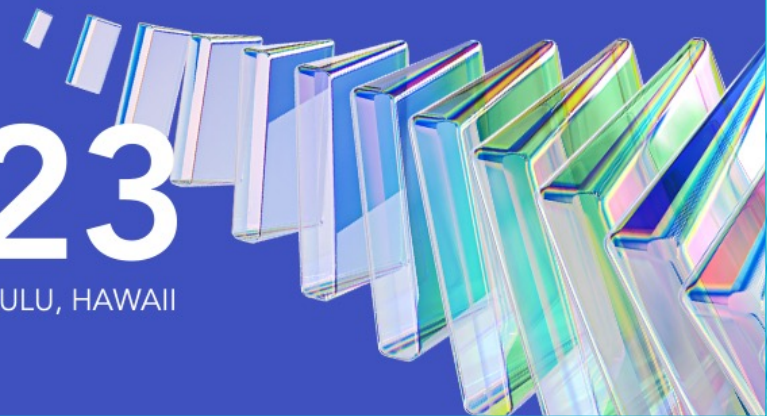
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BEST PRACTICES IN SUBSEA

- **Recycle Cables**
  - **Mertech Marine** and **Subsea Environmental Services** return materials to the circular economy

Material	Mt	GHG Emissions Avoided (MtCO2e)
Copper	22648	75049
Steel	55435	133814
Polyethylene	39011	105280
Aluminum	3062	43371
Total	**120156**	**357514**

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BEST PRACTICES IN SUBSEA

- **Protect Cables**
  - More repairs = More fuel burned
  - A well-protected cable leads to fewer repairs and less CO2 burned

- **The Question of Armor?**
  - Armor is a crucial component of cable protection, yet it is a substantial contributor to the cable's carbon footprint
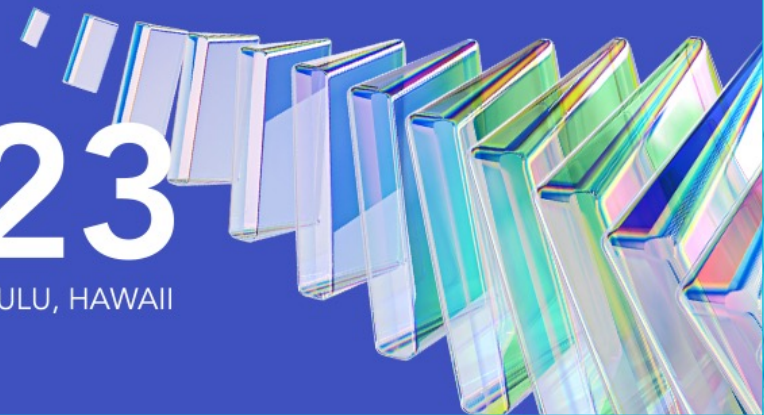
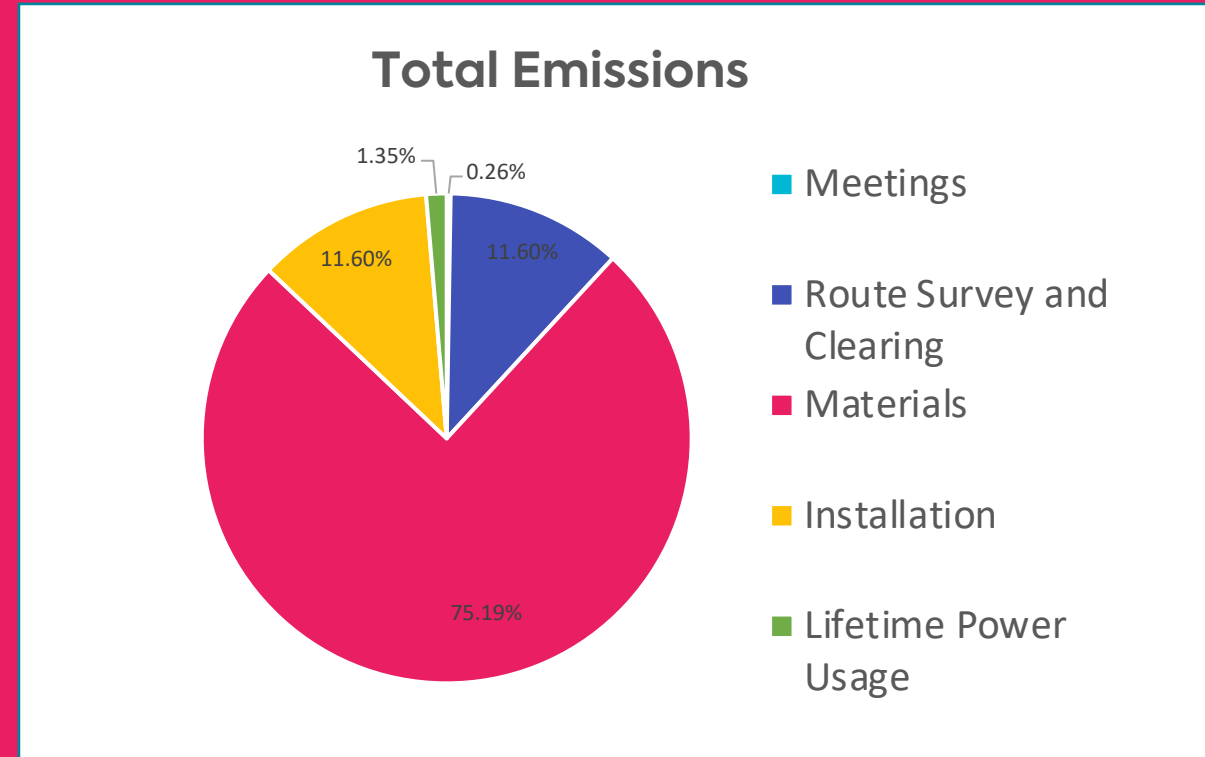PACIFIC TELECOMMUNICATIONS COUNCIL

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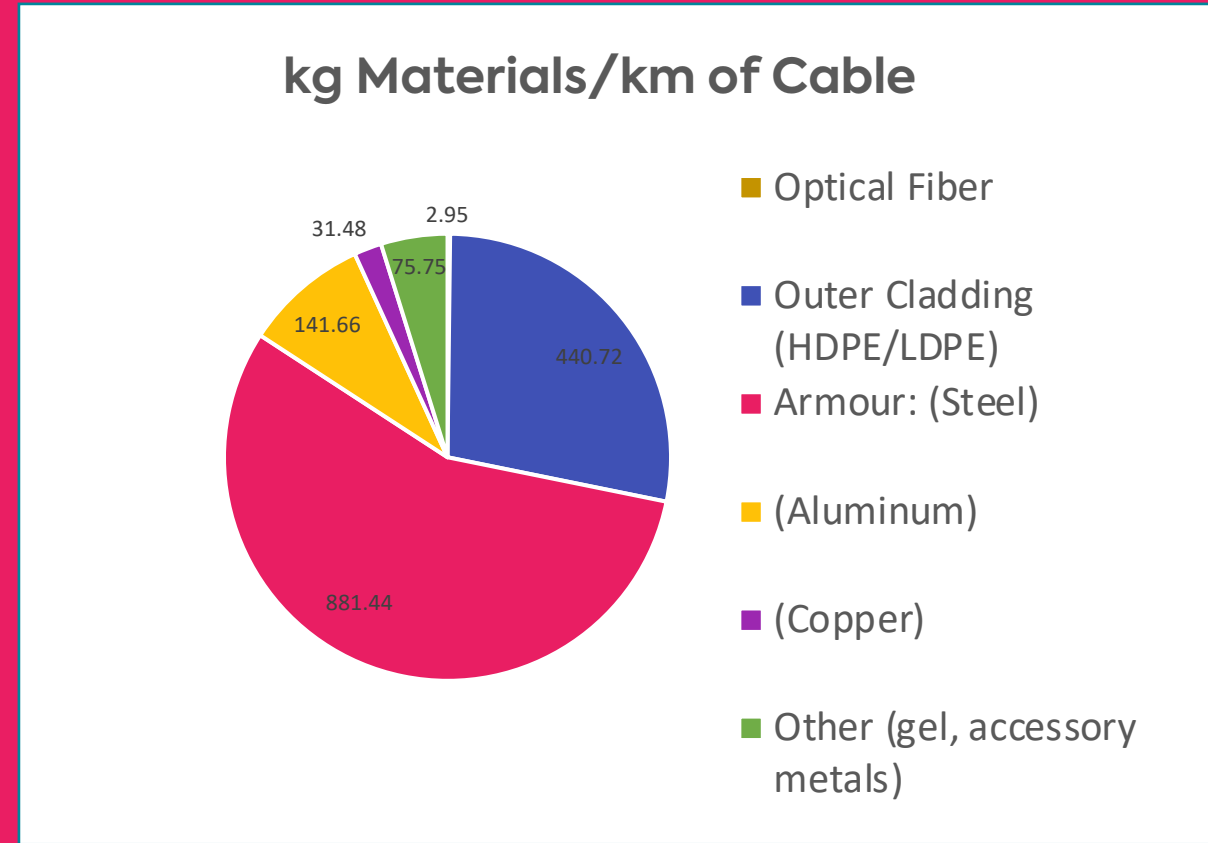# CARBON FOOTPRINT OF A SUBSEA CABLE

- **Relative Impact of Different Stages of Life Cycle**

    - Our research suggests that cable materials represent the largest source of emissions in the system lifetime.

Total Emissions

- Meetings
- Route Survey and Clearing
- Materials
- Installation
- Lifetime Power Usage

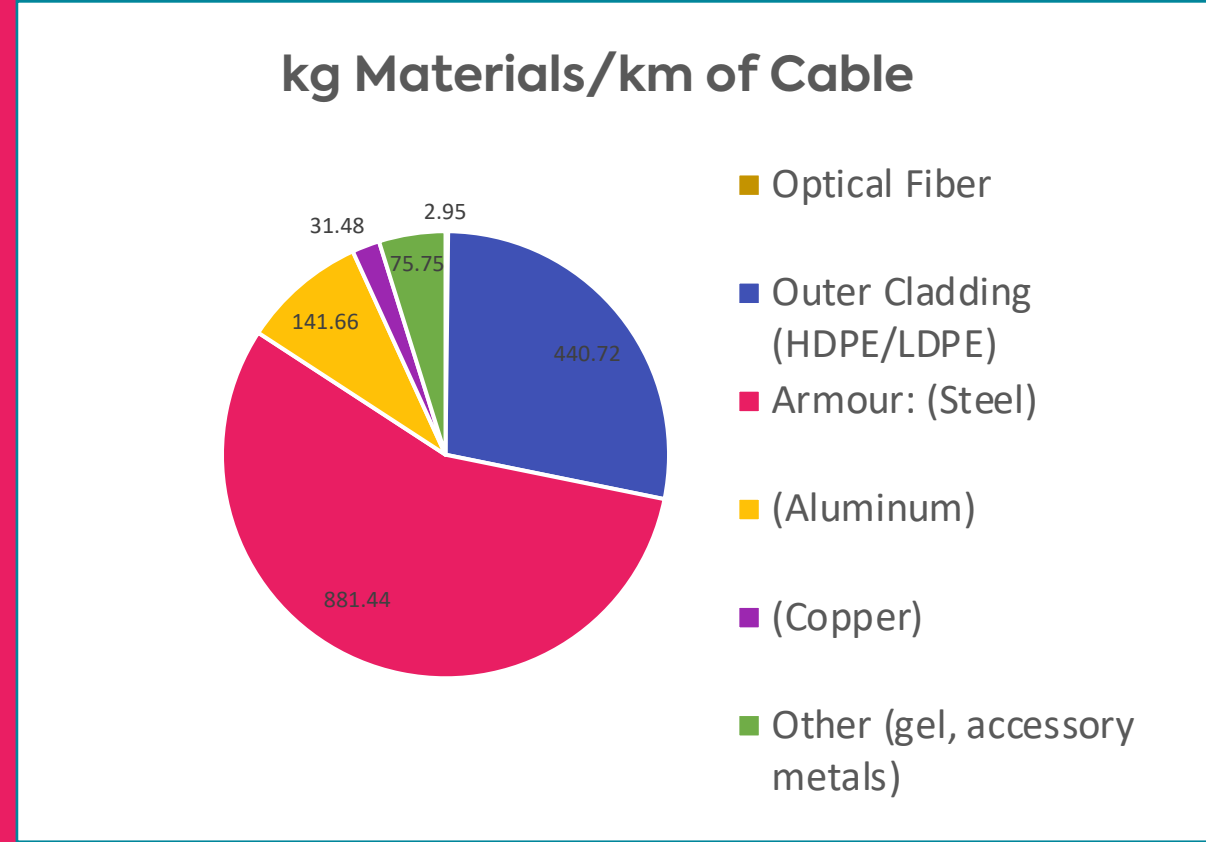1.35% 0.26% 11.60% 11.60% 11.60% 75.19%

CARBON FOOTPRINT OF A SUBSEA CABLE

- **Key Findings**
  - We estimate the overall carbon footprint of a typical cable system to be roughly **9.5 tonnes of CO_2e per km/year**, equivalent to 85,192 tonnes for a 9,000 km system. This is comparable with private industry assessments that run as high as 11 tonnes CO_2e/km/year.

kg Materials/km of Cable

Pie chart values: 31.48, 2.95, 75.75, 141.66, 440.72, 881.44

Legend:
- Optical Fiber
- Outer Cladding (HDPE/LDPE)
- Armour: (Steel)
- (Aluminum)
- (Copper)
- Other (gel, accessory metals)

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CARBON FOOTPRINT OF A SUBSEA CABLE

kg of Embodied CO_2e/ km of Cable Materials

kg Materials/km of Cable

- Optical Fiber
- Outer Cladding (HDPE/LDPE)
- Armour: (Steel)
- (Aluminum)
- (Copper)
- Other (gel, accessory metals)

Pie chart values: 2.95, 31.48, 75.75, 141.66, 440.72, 881.44

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RENEWABLE ENERGY FEASIBILITY STUDY

- Multi-dimensional **Renewable Energy Feasibility Study** assesses:

  - Economic benefits of different models of installation
  - History of energy developments
  - Social context and local community responses
  - Policy context
  - Incentives

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CONTRIBUTE TO SUSTAINABLE SUBSEA NETWORKS

- We gladly welcome:
  - Feedback
  - Information about your sustainable practices
  - Data for our carbon footprint model
  - Partnerships
  - Advisory members

- CONTACT US: **nicole.starosielski@nyu.edu** and **hv281@cam.ac.uk**