Sustainable subsea networks: Connecting ports, ships, and cables

by George N. Ramírez

Ports are infrastructures of the global internet. This might seem counterintuitive, as most people imagine the internet as a wireless and aerial phenomenon. Today, however, 99% of transoceanic data traffic runs through subsea telecommunications cables. These cables are in turn installed and maintained by a fuel-intensive fleet of ships. Ports are the support infrastructure for this fleet, and as a result the capacities of ports shape the potential of the internet, especially its potential sustainability.

The environmental impact of the internet continues to be a concern for scholars, companies, and users around the world.[6] Many studies of information and communications technologies (ICT) and the environment attend to the impacts of particular infrastructures: data centers, terrestrial networks, end-user-devices, and satellites.[7] Data centers have been given a sustained focus because of their significant electricity consumption.[8] The internet has become essential to connect a globalised society, and it is

imperative for ICT industries to consider sustainability in their business models.

Sustainable Subsea Networks is a research initiative of the SubOptic Foundation and funded by the Internet Society Foundation. Our main goal is to study the sustainability of the network of subsea cables through partnerships with industry members and academic researchers. To do so, we are cataloguing best practices within the industry, assembling a carbon footprint of a cable system, and documenting the role of policy and regulation. As the internet dependency deepens and the planet continues to experience climate change, it is critical to understand how these networks impact our environment. This entails recognising how to enhance the sustainable operations of all elements of the network.

Subsea cables have been largely left out of carbon footprinting studies because of their relatively small electricity usage compared to data centers and last mile infrastructures.[9] However, when we consider subsea cables and their environmental effects, it becomes evident that their impacts are not solely a product of their ongoing electrical usage, but of their dependence on marine vessels, which also contributes to their

carbon emissions. Part of the project of decarbonising the internet is making this fleet more sustainable. But this is hard because of the significant financial investment it would take to replace a full line of ships.

Marine technologies have changed quickly over the past decades, and outdated infrastructure is not as energy efficient. Even if subsea cable companies had the capital expenditure to replace a fleet, carriers would have to find a way to dispose or recycle the ships, which would also have an impact on the environment. Part of what the Sustainable Subsea Networks team aims to accomplish is to map the enabling and constraining factors for sustainability. In addition, although sustainability work is already being undertaken, this work is not shared widely. As companies continue to focus and invest on sustainability, we want to share their strategies and generate new knowledge about enabling and constraining factors, in turn facilitating this sustainable transition.

One of the difficulties in decarbonising marine vessels is that this also requires upgrades in port infrastructure. Alongside the ICT industry, port authorities have been encouraged to reduce their emissions because of ships' negative environmental effects. Collaboration between

port authorities and industries dependent on marine vessels can help reduce emissions through mutual investment in sustainable technologies. For instance, the cable company Global Marine's fleet is shore power compatible, meaning their vessels can plug into the landside electric grid at Port Washington, US and Portland, UK while at berth. However, our research has shown that this kind of technological upgrade is only possible around the world because of mutual investments and long-standing relationships between ship carriers and port terminal operators. Through our work, we have found that many ports have begun investing in shore power because of its significant contribution to reducing emissions. For the subsea cable industry, shore power has been of great interest because many existing vessels can be retrofitted to use this resource.

Also known as onshore power supply (OPS), shore power has been suggested as a sustainable technology for decades. In my interviews with port authorities around the world, I learned that there is no single solution to decarbonise marine transport – vessel owners are investing in a range of technologies to maximise their emissions reduction. In order to encourage the subsea cable industry to consider as

many strategies as possible, our research team developed the Sustainable Subsea Networks Map (Figure 6). A product of interviews with industry experts and analyses of company reports, the map recommends strategies such as extending the lifetime of cables, meeting international standards, and deploying energy efficiency technologies. Given the impact of shore power and port infrastructures in reducing emissions, the map also demarcates ports where shore-side power is available for cable ships as well as ports that are regularly used by cable ships for this very resource.

Developing collaborative relationships between ports and ICT can enable these industries to work together to decarbonise the internet. By publishing and sharing our work, the Sustainable Subsea Networks project enables the development of these mutually beneficial relationships. In addition to shore power, many ports have researched and adapted new energy sources such as hydrogen, ammonia, and methanol. Although fuel transition is further away on the horizon, there is still coordination needed with ship owners as parallel investments are required. Sustainable Subsea Networks encourages us to think about these industries and their developments together, especially the role of marine vessels and ports in subsea cable maintenance. Doing so,

and positioning ports as part of the global internet telecommunications network, will open up new pathways for collaboration and change.

This article is an output from a SubOptic Foundation project funded by the Internet Society Foundation.

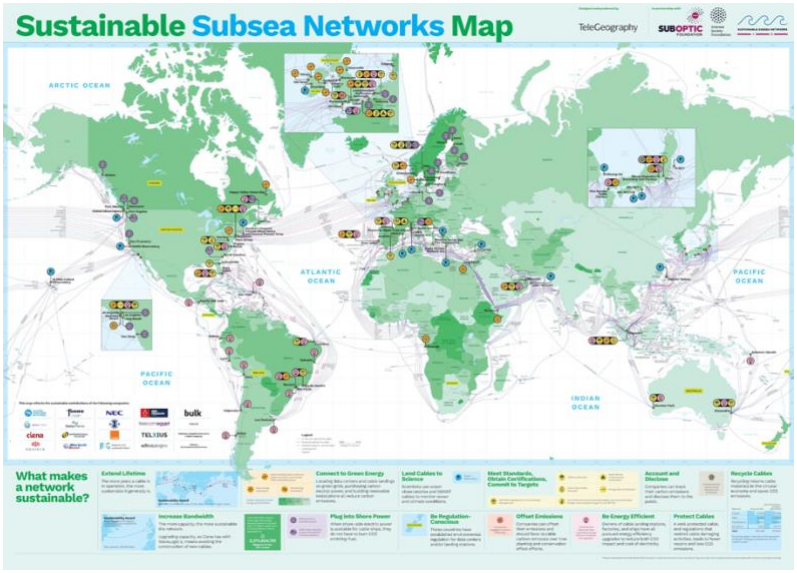

Fig. 5: The Sustainable Subsea Networks map documents a range of sustainability initiatives across the subsea industry. Along with other best practices, the map highlights ports around the world that offer shore power, as well as ports that cable ships frequently stop at to access onshore power. Designed and produced by TeleGeography, in partnership with the SubOptic Foundation's Sustainable Subsea Networks research initiative and funded by an Internet Society Foundation grant.

Screening the port city

by Wyatt Moss-Wellington, Ming-yeh T. Rawnsley, and Yat Ming Loo