Submarine Cable Networks; the Geospatial Context

INTERNATIONAL SEMINAR ON
UNITED NATIONS GLOBAL GEOSPATIAL INFORMATION MANAGEMENT
Nusa Dua Bali 4 – 8 March 2024

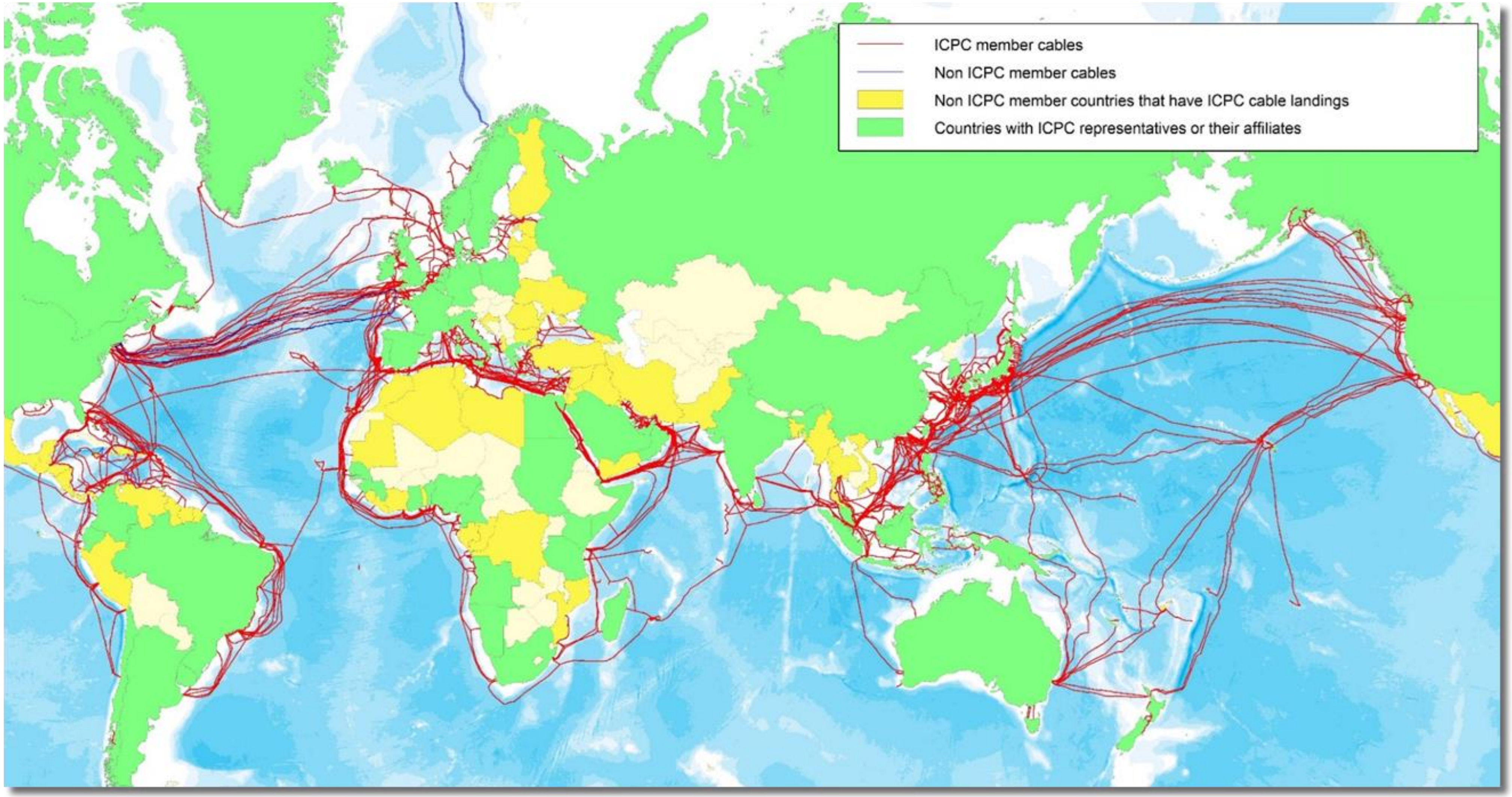
Graham Evans (ICPC Chairman)
Managing Director, Global Subsea Business
EGS Survey Group

Issue Date: 29 February 2024

What is the ICPC – An Overview

- Established in 1958 the ICPC is a neutral, international, professional, non-profit, cross-sectoral community of interest regarding inter-state boundaries
- The ICPC represents all those involved with submarine cables and has United Nations Observer Status
- ICPC membership represent 98% of the world's subsea telecom cable ownership
- The ICPC has more than 215 members from more than 70 countries
- Membership is drawn from Governments, Carriers, Suppliers, installers, maintainers, academia, the legal community and indeed is open to all with an interest in submarine cables
- The ICPC and its members act to protect submarine cables
- The ICPC and its members act to raise awareness about submarine cables wherever they are in international waters
- As well as a meeting point, the ICPC develops and provides recommendations that have been adopted globally; and has published the freely available *Government Best Practices for Protecting and Promoting Resilience of Submarine Telecommunications Cables*
- The primary purpose of the ICPC is to help its Members to improve the security of undersea cables by providing a forum in which relevant technical, legal and environmental information can be exchanged.

www.iscpc.org



Coverage map showing ICPC member ownership

www.iscpc.org

Submarine Cables – The Global Critical Infrastructure

- Submarine Cables are among the world's most vital infrastructure serving socio-economic development and inter-country trade
- 99% of all international voice, data, video, and internet traffic is carried on submarine cables comprising ≈ 275 systems ≈ 1.6 million Kms
- Each day the Society for Worldwide Interbank Financial Telecommunications (SWIFT) transmits ≈ 15 million messages to more than 8300 banking organizations, securities intuitions, and corporate customers in 208 countries
- The United States Clearing House for Interbank Payment System (CHIPS) process over US$ 1 Trillion per day to more than 22 countries for all manner of commodity exchanges, investments, and securities
- Recent World Bank study indicated a 10% increase in broadband penetration results in a 1.38% increase in GDP growth in low and middle income countries
- Submarine cables ensure access to Facebook, Instagram photos, YouTube videos, Google search results, and Office365 documents and email, whether from a laptop computer, tablet or mobile phone.
- The criticality of this global infrastructure to world finance, socio-economic development, defense, and the internet itself is therefore inescapable

We all use submarine cables every day!

www.iscpc.org

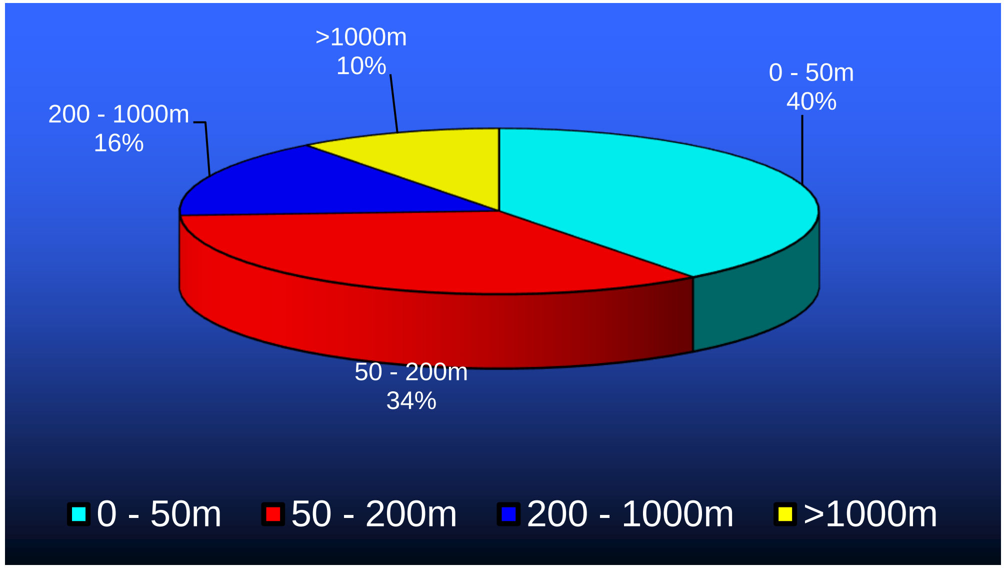
International Cable Protection Committee 1958 • 2018

Submarine Cables – The Geospatial Context

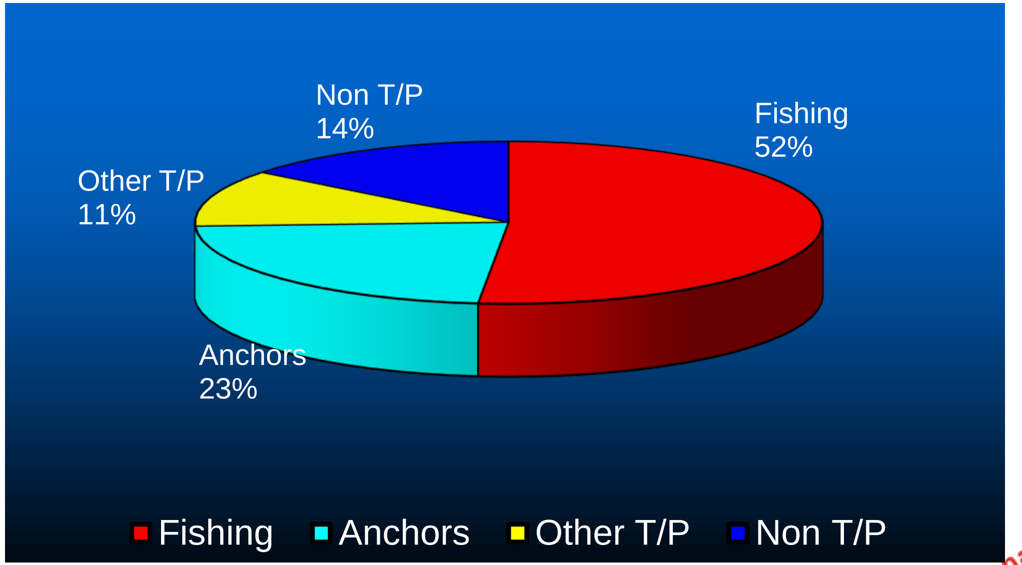
- Geospatial planning is appropriate at a high level and is an important tool to protect the interests of various stakeholders; this is particularly the case within the Indonesian Archipelago and similar environments
- The detailed engineering is often the difference between success and failure when it comes to submarine cables; *therefore*:
- Discretion to utilize the full corridor width that has been surveyed may be needed for installation and maintenance purposes, this is best left to the cable route engineers; not regulators
- Flexibility to decide on the appropriate engineering solutions depending on budget and cable protection requirements is critical in attracting investment in highly resilient networks. If over regulation were to detract from this principle, it would not be in the national interest
- Acceptance that cable corridors and or protection zones will be/are being adopted in some jurisdictions; these need to be guided by industry standard desktop study principles to ensure they are optimally planned and positioned

Risks to Submarine Cables

- Given the economic and national-security importance of submarine cables, it is critical to protect cables from physical damage
- Fishing practices and patterns continue to be a primary consideration in undersea cable projects and design
- >90% of cable faults are caused by external aggression; of this percentage, ~75% are attributed to fishing or anchoring



Worldwide Cable Faults by Water Depth



Total Faults <1,000m by Cause

www.iscpc.org

Risks to Submarine Cables

- Regional variation in fishing and anchoring risks are analyzed during route planning to tailor route engineering & design, determine best cable protection measures and strategies
- An undersea cable repair can cost in excess of US $1 million and typically takes 2+ weeks to return the cable to service—or more, depending on permitting requirements, weather, and other factors.
- In some regions Cabotage Law & Permit constraints increase this to >3 months
- Submarine cables are exposed to natural hazards in all water depths.
- In depths up to ~ 1000 m (or more in some regions), the main hazards are human activities, with natural effects causing under 10% of cable damage incidents.
- Recent geopolitical events have turned media interest towards the threat of sabotage to submarine cables
- Whilst the potential for this type of threat should not be dismissed; it is important to note that statistically, fishing and anchoring remain the principle cause of damage to submarine cables
- Although malicious threats currently receive most attention, coordinated efforts between the cable industry and governments should still devote resources to ensure the maximum protection during cable route design at the early stages of a project to reduce primary risks, as all cable damage regardless of cause can impact countries adversely

Mitigating Risks to Submarine Cables – Cable Spacing

- To install and maintain submarine cables and minimize outage time in connection with repairs, submarine cable operators need unfettered access to the ocean surface, water column, and seabed around a submarine cable by a cable ship and associated equipment.
- The physical characteristics of submarine cables and the mechanical characteristics of the installation vessels and tools, establish the spatial requirements for submarine cable repair activities.
- In general, these recommendations provide for spacing of three times the depth of water
- The very minimum separation distance required between adjacent cables, assuming modern cable laying and positioning techniques is 50m or 2 times water depth, whichever is greater.
- The preferred separation distance is greater than 3 times the depth of water, to allow for more flexibility when planning repairs and deploying repair bights in adverse conditions such as strong winds or currents
- In areas where the cable is buried, telecommunications industry practice is to maintain at least 500m separation (or 3 times water depth whichever is greater) to prevent accidental damage to the adjacent cable

Risks to Submarine Cables – Cable Spacing & Crossings Angles

- Telecommunications cable systems also include wet plant units like repeaters, branching units, equalizers and joints. Repeaters aid optical signal amplification along the cable route, typically installed every 50-100km of cable route length
- It is recommended that a clearance of at least 3 times the depth of water should be allowed between a crossing point and a repeater in the crossed system. This will ensure that the repeater can be recovered and replaced, without endangering the crossing cable.
- Branching units are used to connect branch landing locations to the main “trunk” system. For branching units, a clearance of at least 4 times depth of water should be allowed along the main trunk of a branching unit to allow it to be recovered and replaced without endangering the crossing cable. On the legs of a branching unit, the clearance recommended is 5 times depth of water to allow safe recovery and replacement
- Where submarine telecommunications cables cross, the cable crossing angles should be as close to 90° as possible but not less than 45°
- In the case of power cable crossing, the crossing angle should be 90°

ICPC Best Practices

General Principles

- Focus on statistically-significant risks where government action could have the greatest impact on risk reduction;
- Promote commercial and regulatory environments that encourage multiple and diverse (both with domestic and foreign landings) submarine cable landings within the state's territory;
- Observe and implement treaty obligations (particularly under the United Nations Convention on the Law of the Sea ("UNCLOS")) and customary international law defining state jurisdiction over, and protection of, submarine cables;
- Promote transparent regulatory regimes that expedite cable deployment and repair according to well-established timeframes;
- Consult closely with industry to understand industry technology and operating parameters and to share data regarding risks;
- Complement existing industry best practices;
- Recognize that laws and government policies themselves can sometimes exacerbate risks of damage and reduce resilience; and
- Engage with other states on a global and regional basis, as other states' actions can greatly affect an individual state's own connectivity.

ICPC Best Practices

Fishing and Anchoring Risks

- Prohibit fishing in close proximity to submarine cables—including deployment of drift nets, gill nets, fish aggregation devices, and vessel anchors—consistent with default and minimum separation distances discussed below;
- Require use of designated anchorages and establish and prosecute legal offenses for anchoring outside of designated anchorages;
- Promote the distribution and use of cable awareness charts (prepared by submarine cable operators) to fishermen;
- Promote direct engagement between submarine cable operators, including establishment of fishing-cable committees that can compensate fishermen for snagged and lost gear in exchange for not risking cable damage through gear retrieval efforts;
- Require use of automated identification systems ("AIS") and vessel monitoring systems ("VMS") on vessels at all times and establish and prosecute legal offenses where vessel operators turn off or disable AIS or VMS;
- Require that vessel operators carry appropriate insurance;
- Require use of AIS or VMS by even the smallest of vessels

ICPC Best Practices

Fishing and Anchoring Risks

- Direct the coast guard to issue local notices to mariners regarding submarine cable protection and to communicate with vessels operating or drifting near submarine cables.
- Limit deployment of FADs proximate to installed and planned submarine cables.
- Establish a FAD registry, requiring FAD owners to identify and update FAD locations, and make such registry available to submarine cable operators during the route planning process for new cables.
- Require removal of ropes and ghost gear in the water column and consider removal requirements for end-of-life disposition of FADs.

ICPC Best Practices

Spatial separation

- Adopt and enforce the following recommended separation distances between cable ships and other vessels in the exclusive economic zone ("EEZ," extending 200 nautical miles seaward from the shore) and the territorial sea (extending 12 nautical miles seaward from the shore):
  - In shallow water with a depth of 75 meters or less: 500 meters; and
  - In greater depts of water: the greater of 500 meters or two times the depth of water;
- Implement on nautical charts the text box specified in International Hydrographic Organization ("IHO") Resolution 4/1967 (amended April 2017), as discussed below;
- Ensure that any cable protection zones are adopted with consultation and support of cable operators; and
- Maintain flexibility with the number and size of cable protection zones.

ICPC Best Practices

Charting

- Update nautical charts regularly and in near-real-time;
- Show all submarine cables on nautical charts, distinguishing between in-service and out-of-service cables; showing submarine cables on charts is fundamental to providing cable awareness and cable protection
- Show on nautical charts all other human activities that could pose risks to submarine cables, including but not limited to mining areas (including sand and gravel borrow areas), renewable energy facilities, traffic separation schemes, munitions dumps, and military test areas;
- Ensure that national and regional charting authorities implement amended IHO Resolution 4/1967, which requires that charting authorities include a text box in publications such as mariners' handbooks and notices to mariners:
  - Directing vessels to avoid anchoring, fishing, mining, dredging, or engaging in underwater operations near cables at a minimum distance of 0.25-nautical mile on either side of a cable, and
  - Recognizing submarine cables as critical infrastructure, noting that damage to a submarine cable can constitute a national disaster.
- Show submarine cables to full ocean depth and not as currently specified in IHO Charting Specifications S4 to 2,000m to protect cables from uncoordinated deep seabed mining activity

ICPC Best Practices

Marine spatial planning and inter-industry coordination

- Include and consult with submarine cable operators as stakeholders in such processes;
- Identify submarine cables in their mapping resources and tools (not just on nautical charts);
- Identify and include submarine cable operators as critical stakeholders in marine spatial planning and policymaking;
- Adopt regulatory frameworks for other marine activities, such as oil and gas development and renewable energy installations, deep seabed mining, to require coordination with submarine cables at the earliest stage of planning and development of those other projects; and
- Ensure that planning and leasing documents for oil, gas, and renewables, and deep seabed mining specifically reference submarine cable protection and coordination

ICPC Best Practices

Route and landing optimization; geographic diversity

- Economic need (for connections between data centers and points of presence, and on highly-trafficked routes);
- Economic opportunity (in the case of wholesale capacity sales);
- Seafloor topography (seeking flat and uninteresting seabed that avoids geographic features with steep gradients, seamounts, vents, or fracture zones);
- Geographic diversity (to minimize the impact of a single event causing damage to multiple cables);
- Proximity to other marine activities and infrastructure (which pose risks of damage);
- Access to terrestrial networks (to ensure secure, diverse, and low-cost connectivity between submarine and terrestrial networks);
- Environmental restrictions (such as marine protected areas); and
- Regulatory considerations (including length and expense of permitting)
- Adopt and implement regulatory frameworks to optimize routes and landings, including geographic diversity of routes and landings;

ICPC Best Practices

Route and landing optimization; geographic diversity

- Recognize that diversity can be impaired by government shore-end permitting, marine protected areas, and marine spatial planning (or lack thereof) that results in clustering of cables, magnifying risk that a single incident will damage multiple cables and impair connectivity; and
- Recognize that submarine cables cannot be hidden or armored and buried to guard against all malicious and non-malicious sources of cable damage.

Availability & Accessibility of Subsea Cable Geospatial Information

- The ICPC does not hold submarine cable geospatial information; however, the ICPC may be able to assist in coordinating between submarine cable owners and offshore marine activity stakeholders
- Submarine cable geospatial information for as-laid (installed) submarine cables is submitted to hydrographic offices by either the cable installation contractor or cable owners for inclusion on navigational chart products
- Submarine cable awareness charts are made available to other marine stakeholders including the KIS-ORCA charts in Europe and North America Cable Association cable awareness charts
- Submarine cable geospatial information is also available via a subscription service by a commercial organization which includes both in-service and out of service submarine cables

Thank you

Questions to Graham Evans

gevans@egssurvey.com

Sharing the seabed and oceans in harmony

www.iscpc.org