INTRODUCTION

WHY SUBMARINE CABLES?

Douglas Burnett, Tara Davenport and Robert Beckman

"Cyberspace, in the physical form of undersea fiber-optic cables, carries an even greater value for trade [than shipping goods] through financial transactions and information".
Greenleaf, J. and Amos, J., "A New Naval Era" U.S. Naval Institute Proceedings, June 2013, at 17.

Submarine Cables: The Handbook of Law and Policy has been a project long under discussion between the Editors, and after a year of hard work it has finally come to fruition. Before delving into individual chapters, the Editors believe it is important to explain why they felt that there was a need for a book on submarine cables, and what they hope the Handbook will achieve.

The Importance of Submarine Cables as Critical Infrastructure

Submarine fiber optic cables are the foundation of the world's telecommunications systems. They are laid on the seabed, are often no bigger than a garden hose, and transmit huge amounts of data across oceans. The world's reliance on submarine cables cannot be underestimated. Facebook, Twitter and other social media all utilize submarine cables. Each day, the Society for Worldwide Interbank Financial Telecommunications (SWIFT) transmits 15 million messages via submarine cables to more than 8300 banking organizations, securities institutions and corporate customers in 208 countries and/or entities. The Continuous Linked Settlement Bank located in the United Kingdom is just one of the critical market infrastructures that rely on SWIFT as it provides global settlement of 17 currencies with an average daily US dollar equivalent of approximately USD3.9 trillion. The United States Clearing House Interbank Payment System (CHIPS) is another system that processes over USD1 trillion per day to more than 22 countries for investment companies, securities and commodities exchange organizations, banks and other financial institutions.[1] It is not surprising, therefore,

[1] S. Malphrus, "Undersea Cables and International Telecommunications Resiliency" 34th Annual Law of the Sea Conference, Center for Ocean Law and Policy, University of Vir-

that the Staff Director for Management of the Federal Reserve observed in relation to submarine cable networks that "when the communication networks go down, the financial sector does not grind to a halt, it snaps to a halt".[2] The same can be said for most industries enmeshed in the global economy through the Internet including shipping companies, airlines, banks, supply chain, and manufacturing industries.

The global cable network is composed of approximately 213 or so separate, diverse, and independent cable systems totaling about 877,122 km of fiber optic cables.[3] Indeed, one only has to refer to the maps of different regions in the world in the beginning pages of this Handbook to see how extensive the submarine cable network has become. The majority of countries now rely on submarine cables for their telecommunication needs. Australia and Singapore for example, each rely on several cables landing on their shores for over 99 per cent of their international communications. It has been reported that the indirect economic costs of a fault in all the landing points in Australia would amount to USD3,169 million, mostly due to the loss of international internet traffic.[4] Similarly, the indirect economic costs of a fault in all the landing stations in the Republic of Korea would be approximately USD1,230 million.[5] The same would be true of Japan, which has approximately 20 international cable systems. The list goes on.[6] With the laying of submarine cables along the east coast of Africa in 2009 to 2010, this last major group of States now has access to the world's submarine cable network. As of mid-2012, only 21 nations and territories remain isolated from fiber connectivity and many of these have connecting cable projects underway.[7]

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ginia, 20 May 2010, available at http://www.virginia.edu/colp/pdf/Malphrus-Presentation.pdf (last accessed 14 June 2013).

[2] S. Malphrus, Board of Governors of the Federal Reserve System, First Worldwide Cyber Security Summit, EastWest Institute, Dallas, Texas, 3–5 May 2010.

[3] See, International Cable Protection Committee Ltd, ICPC International Telecommunications Cables database. An interactive world submarine cable map showing these systems (last updated October 2012) can be viewed at www.iscpc.org by accessing the Cable Data Base button on the website.

[4] See APEC Policy Support Unit, "Economic Impact of Submarine Cable Disruptions" December 2012 at 42 available online at http://www.suboptic.org/uploads/Economic%20Impact%20of%20Submarine%20Cable%20Disruptions.pdf (last accessed 9 June 2013).

[5] *Ibid.*

[6] For a detailed list of major international submarine cable systems, please see *Submarine Cable Almanac* Issue 5 (Submarine Telecoms Forum, February 2013) available at http://www.subtelforum.com/Almanac-Issue5.pdf (last accessed 9 June 2013).

[7] Submarine Telecoms Forum Inc, *Telecoms Industry Report 2012* at 14–15. Inhabited sovereign States and territories without fiber optic connectivity include: Somalia, Saint Helena, Ascension, and Tristan da Cunha (British Overseas Territory); Christmas Island (Australian External Territory), Montserrat (British Overseas Territory); Saint Pierre and Miquelon (French Collecivité d' Outre-mer); Easter Island (Chilean Special Territory), Falkland (Malvinas) Islands (British Overseas Territory), Cook Islands (Self-Governing State in Free Association with New Zealand), Kiribati, Nauru, Niue (Self-Governing State

Despite the widespread reliance on submarine cables for our every day needs, it is remarkable to note that when most people think about international communications they mistakenly assume that satellites are the primary medium of modern international communications. While it is true that satellites were predominantly used up until the first trans-Atlantic fiber optic cable was laid in 1988, submarine cables have now overtaken satellites. Presently, 97 per cent of international communications are carried on a relatively small number of fiber optic submarine cables. Satellites are still responsible for some data traffic but the tremendous volume of data carried on lower cost modern fiber optic submarine cables dwarfs the limited capacity of higher cost satellites. Additionally, the technical transmission delays and other quality limitations inherent in satellites make them comparatively marginal for continuous transmission of high-speed voice, video, and data traffic. For example, if the cables (which are approximately 40 mm, i.e. the diameter of a beer bottle cap) connecting the United States to the world are cut, it is estimated that only 7 per cent of the total United States traffic volume could be carried to its destination using every single satellite in the sky.[8] There is no doubt that "these unseen and unsung cables are the true skeleton and nerve of our world, linking our countries together in a fiber-optic web".[9]

Telecommunications represent only part of the value of modern submarine cables, and submarine cables are increasingly being used for other purposes. International submarine *power* cables are growing in importance.[10] With improved technology which reduces power loss, high voltage direct current (HVDC) submarine cables, such as the 370 km Basslink interconnector linking mainland Australia with the state of Tasmania, and the 580 km NorNed cable between Norway and the Netherlands, have been successfully operating for a number of years. The United Kingdom and Iceland governments are presently in talks to lay the foundation for a 1500 km submarine HVDC power cable between the two countries. A 900 km HVDC cable between the United Kingdom and Norway is also under discussion.[11] Many coastal States also use submarine cables to operate offshore

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in Free Association with New Zealand), Norfolk Island (Australian External Territory), Palau, Pitcairn Islands (British Overseas Territory), Solomon Islands, Tokelau (New Zealand Dependent Territory), Tonga, Vanuatu, Wallis and Futuna (French Collecivité d' Outre-mer).

8 The testimony of D. Burnett before the Senate Foreign Relations Committee on the United Nations Convention on the Law of the Sea (Treaty Doc. 103-39), 4 October 2007, S. Hrg. 110-592, pp. 143–144, available through link at http://www.access.gpo.gov/congress/senate/senate11sh110.html (accessed 14 June 1013).

9 Statement of Ambassador Vanu Gopala Menon in "General Assembly Concludes Annual Debate on Law of the Sea Adopting Two Texts Bolstering United Nations Regime Governing Ocean Space, its Resources, Uses" Press Release, 7 December 2010, available online at http://www.un.org/News/Press/docs/2010/ga11031.doc.htm (last accessed 10 June 2013).

10 Chapter 13 of the Handbook deals with power cables.

11 See "UK in Talks with Iceland over "volcanic power link" BBC News, 12 April 2012, available online at www.bbc.co.uk/news/uk-politics-17694215 (last accessed 9 June 2013).

wind farms, utilizing both array cables to interconnect offshore wind turbines and export cables to channel the collected electrical power from the wind farm to shore.[12] Denmark, Germany and the United Kingdom have well established offshore wind farms as a result of the utility of submarine cables. Tidal, wave and subsea current generators tied by cables to shore are also being trialed in various locations in the Pacific northwest of the United States and Canada.[13] In addition, coastal States have also seen offshore energy exploitation of oil and gas improved by the efficiencies introduced when offshore exploration platforms are linked to each other by undersea fiber optic cables.[14] Norway and the United States are examples where this cable use is operational. Norway's Statoil uses an array of fiber optic cables to connect floating oil platforms to shore for data transfer.[15] BP's 1216 km Gulf Fiber system, largely impervious to hurricanes and operational since 2008, connects seven fixed platforms to a central shore control center with nodes available for adding additional platforms in the future.[16]

Finally, submarine cables are being used in growing numbers for scientific purposes.[17] In a 2009 survey, the International Cable Protection Committee (ICPC) identified 193 ocean observation sites and areas worldwide, including at least 34 that plan to or are currently using submarine cables for data transmission and power in the world's oceans.[18] The 500 mile Neptune system with multiple scientific nodes off of British Columbia is a standout operational example, and a planned US cabled observatory system is intended to link to this system.[19] Japan has pioneered the use of submarine cable systems to monitor and detect tsunamis.[20]

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[12] Chapter 16 of the Handbook examines submarine cables used for offshore energy including wind farms.

[13] See Renewable Northwest Project, available online at http://www.rnp.org/node/wave-tidal-energy-technology and Natural Resources Canada available online at http://www.retscreen.net/ang/power_projects_ocean_current_power.php (last accessed 9 June 2013).

[14] Chapter 16 of the Handbook discusses submarine cables used for offshore oil and gas platforms.

[15] See "European Drilling Outlook," *Drilling Contractor*, July/August 2007, at 25, available online at http://www.drillingcontractor.org/dcpi/dc-julyaug07/DC_July07_Statoil_revised.pdf (last accessed 8 June 2013).

[16] See BP Gulf of Mexico Fiber Optic Network, available online at http://www.gomfiber.com/ (last accessed 8 June 2013).

[17] This is discussed in Chapter 14 of the Handbook.

[18] ICPC Ocean Observation Sites and Areas, 2009, see www.iscpc.org. The survey results were compiled by Professor Lionel Carter, Victoria University, Wellington, New Zealand, the ICPC International Marine Environmental Advisor (IMEA).

[19] See Neptune Canada, available online at http://www.neptunecanada.ca/about-neptune-canada/neptune-canada-101/ and Interactive Oceans, available online at http://www.neptune.washington.edu/index.jsp (last accessed 8 June 2013).

[20] C. Manoj *et al.*, "Can undersea voltage measurements detect Tsunamis?" (2006) *Earth Planets Space* 58, 1–11; R. Monastersky, "The Next Wave" 2012 *Nature* 483, 144–146.

It is evident from the above discussion that from the time that the first submarine telegraph cable was laid in 1850 between Dover and Calais to the present day, the many astonishing uses of submarine cables has far exceeded anyone's expectations. It is fair to say that they have now emerged as one of the most important uses of the oceans. However, as with every ocean activity, the critical issue is how submarine cables can co-exist with other competing uses of the ocean, of which there are many. In this regard, international law, and in particular, the law of the sea, plays a crucial role.

Submarine Cables and International Law[21]

From time immemorial, the oceans have been claimed for the exclusive use of a small number of States. However, such notions of exclusivity were inexorably weakened by the idea that the ocean was *res communis* and that freedom of the seas was in the general community interest.[22] Over the years, the interaction between particular claims and the rejection or acceptance of such claims by the international community have refashioned and refined a body of rules and principles, known as the law of the sea. It has been said that the historic function of the law of the sea has been that of "protecting and balancing the common interests, inclusive and exclusive of all peoples in the use and enjoyment of the oceans, while rejecting all egocentric assertions of special interests in contravention of general community interest".[23]

The need for this balance between competing uses is no better illustrated than by submarine cables. Submarine cables have always faced challenges that are typical of the issues that the law of the sea aims to minimize, namely, the conflict between coastal States and non-coastal States over 'inclusive uses' of the ocean (such as navigation and submarine cables) which benefit the international community and 'exclusive uses' of the ocean by coastal States. Indeed, as early as 1884, States recognized the need to protect this infrastructure from other uses of the seas and adopted the Convention for the Protection of Submarine Telegraph Cables (1884 Cable Convention).[24] The provisions in the 1884 Cable Convention have

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[21] The international legal regime governing submarine cables is dealt with at various points in the Handbook, but Chapter 3 gives a comprehensive overview.

[22] For example, the seminal work of Dutch jurist and philosopher Hugo Grotius *Mare Liberum*, which advocated freedom of the seas particularly for maritime trade, was a response to the monopoly on trade in the Far East by the Kingdom of Portugal. See R.R. Churchill and A.V. Lowe, *The Law of the Sea* (3rd ed., Manchester University Press, 1999) at 203.

[23] M.S. McDougal and W.T. Burke, *The Public Order of the Oceans: A Contemporary International Law of the Sea* (Yale University Press, 1963), 1.

[24] Convention for the Protection of Submarine Telegraph Cables, adopted 14 March 1884, TS 380 (entered into force 1 May 1888) (1884 Cable Convention). The provisions of the

significantly shaped the rights and obligations of States *vis-à-vis* submarine cables set out in subsequent law of the sea conventions such as the 1958 Geneva Convention on the High Seas,[25] the 1958 Convention on the Continental Shelf,[26] and the 1982 United Nations Convention on the Law of Sea (UNCLOS).[27] The common thread running through these conventions was the desire to establish a

> legal order for the seas and oceans which will facilitate international communication, and will promote the peaceful uses of the seas and oceans, the equitable and efficient utilization of their resources, the conservation of their living resources, and the study, protection and preservation of the marine environment.[28]

To achieve this utopian idea of a legal order that accommodated the varied uses of the oceans, the Geneva Conventions and UNCLOS recognized that coastal States had certain rights and jurisdiction in specific areas, but these had to co-exist with traditional freedoms that all States were entitled to exercise, and vice versa. With regard to submarine cables, the Geneva Conventions and UNCLOS sought to strengthen the international communications regime by, *inter alia*, preserving the freedom to lay and repair submarine cables but at the same time requiring that these freedoms be exercised with due regard to the rights and jurisdiction of coastal States. Further, the Geneva Conventions and UNCLOS also oblige States to adopt legislation to protect submarine cables from other competing uses.

While the framework established by the above-mentioned conventions, for the most part,[29] adequately balances competing uses and interests in relation to submarine cables, it is just that—a framework. Its success depends on the effective interpretation and implementation by the relevant stakeholders, including international organizations, national governments and industry. Therein lies the

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Cable Convention are generally accepted as customary international law, see *Restatement of the Law* (*Third*)*: The Foreign Relations Law of the United States Vol 2* (American Law Institute Publishers, 1987) § 521, comment f (1986). As at 2 April 2013 there are 41 State parties to the 1884 Cable Convention. A complete copy of the 1884 Cable Convention is contained in Appendix 3.

25 1958 Convention on the High Seas, adopted 29 April 1958, 450 UNTS 11 (entered into force 30 September 1962). As at 2 April 2013 there are 63 State parties. The United Nations Convention on the Law of the Sea (see below note 27) supersedes this treaty for States that are parties to both.

26 1958 Convention on the Continental Shelf, adopted 29 April 1958, 499 UNTS 311 (entered into force 10 June 1964). As at 2 April 2013 there are 58 States parties. The United Nations Convention on the Law of the Sea (see below note 27) supersedes this treaty for States that are parties to both.

27 United Nations Convention on the Law of the Sea, adopted 10 December 1982, 1833 UNTS 397 (entered into force 16 November 1994) (UNCLOS). Select UNCLOS provisions are contained in Appendix 3.

28 Preamble to UNCLOS.

29 There are some gaps in the international legal regime governing submarine cables, which will be dealt with in Chapter 12 on Protecting Submarine Cables from Intentional Damage: The Security Gap.

problem—the interpretation and implementation of this framework has fallen short of what was envisaged by the drafters.

Global and National Policies on Submarine Cables

Not infrequently, States adopt policies and regulations that undercut the viability of submarine communication cables as critical international infrastructure upon which the internet and the global economy is based. For example, despite the fact that submarine cables are vulnerable to numerous threats, such as those presented by fishing, shipping, resource exploration and exploitation activities, as well as deliberate damage, many States have not adopted measures to ensure their protection.[30] For many States, negligent or deliberate damage to submarine cables in any maritime zone is not an offence under their national legislation. This is despite it being an obligation under UNCLOS to adopt such legislation if the damage occurs in the exclusive economic zone or high seas.[31]

Further, because cable operations, such as the laying, repair and maintenance of cables, are usually carried out by foreign vessels in maritime zones under national jurisdiction, many States have adopted laws and regulations which impede the effective laying, repair and maintenance of cables.[32] For example, repairs to damaged cables, essential to the integrity of a telecommunication system serving various States, are often subject to onerous permit requirements, delaying the repair of cables and costing millions of dollars to cable operators. The cost of chartering a cable repair ship can vary between USD45,000 and USD70,000 per day. The average cost of a repair is between USD1M and USD3M, depending upon the location of the fault and the cableship, the cableship costs, and other factors.[33] Prompt repair of cables is essential not only for business reasons but also because every cable is in effect a backup cable for a damaged cable waiting to be repaired. Such cables can be used to immediately restore communication traffic by rerouting it from the damaged cable to an undamaged cable in seconds. It is this feature that allows for the resiliency of modern cable systems that generally provides for continuous global communication by cables, notwithstanding the 200 or so cable faults that occur worldwide annually from contact by fishing gear, anchors, or natural hazards such as earthquakes.[34]

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30 This is more fully examined in Chapter 11 on the Protection of Submarine Cables from Competing Uses.

31 UNCLOS Art 113.

32 Chapters 4, 5 and 6 discuss the various challenges in law and policy in cable operations.

33 D. Burnett, "Recovery of Cable Ship Repair Cost Damages from Third Parties That Injure Submarine Cables" (2010) 35 *Tulane Maritime Law Journal* at 108.

34 *Ibid*., at 108.

International and regional organizations have also on occasion adopted policies that undermine the integrity of the international telecommunications systems. For example, the OSPAR Commission, established to protect the marine environment in the Northeast Atlantic Sea, has devised 'best practices' on cable operations that reflect little understanding of the processes involved in the laying and repairing of cables.[35] While such efforts are no doubt motivated by admirable intentions to protect the marine environment, they appear to overlook the fact that submarine cables have a negligible footprint on the seabed. As noted above, the diameter of a modern submarine fiber optic cable is about the diameter of garden hose[36] and the impact on the marine environment is benign.[37] Similarly, recent proposals of the International Telecommunications Union (ITU) to adapt telecommunication cables to a dual use climate monitoring application are another example of regulators acting with inadequate knowledge of the cable industry and the international law applicable to cables.[38] The dual use of submarine cables for both telecommunications and marine scientific research raises complex issues as to whether the laying and repair of such cables are subject to coastal State consent (all marine scientific research in zones under national jurisdiction is subject to coastal State consent) or is a freedom of the sea.[39]

The above discussion is a snapshot of some of the issues facing submarine cables. These issues, and other challenges (all of which are discussed in greater detail in the chapters of this Handbook) underscore the fact that, many a time, regulations or policies governing submarine cables are a consequence of mistaken beliefs and knowledge gaps regarding submarine cables. They are often promulgated with little or no understanding of submarine cables and cable operations, marine engineering, seamanship and international law. In circumstances such as these, the potential benefits that submarine cables can provide to the international community have been unnecessarily compromised.

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35 Guideline on Best Environmental Practice (BEP) in Cable Laying and Operation (Agreement 2012–2) (OSPAR 12/22/1, Annex 14). This is more fully explored in Chapter 7 on the Relationship between Submarine Cables and the Marine Environment.

36 A description of the physical characteristics of modern submarine cables can be viewed in the power point presentation 'About Submarine Cables' and a video which can be viewed at www.iscpc.org by accessing the Publications button on the website.

37 L. Carter *et al.*, "Submarine Cables and the Oceans: Connecting the World" Report of the United Nations Environment Program and the International Cable Protection Committee, 2009 at 26. Available online at http://www.unep-wcmc.org/medialibrary/2010/09/10/352bd1d8/ICPC_UNEP_Cables.pdf. This report compiles and analyzes the environmental experience with cables in the marine environment since submarine cables were introduced into the ocean in 1850 and underscores the benign impact of a modern fiber optic cable on the marine environment.

38 R. Butler, "Using Submarine Cables for Climate Monitoring and Disaster Warning" ITU Report 2012 at 23.

39 These issues are discussed in Chapter 14 on Marine Scientific Cables.

There are several possible reasons for this lack of awareness and understanding. First, as mentioned above, there is a general misconception that satellites are the primary providers of telecommunications. After all, the idea that a telephone call made to an overseas recipient can be broken into bits, pulsed by lasers and lightwaves through unseen cables laid on the ocean floor, and reassembled into voice form thousands of miles away, all at the speed of light, is very hard to comprehend.

Second, the submarine cable network and industry has been driven by private businesses with minimum government subsidies or intervention.[40] Between 2008 and mid-year 2012 there has been approximately USD10 billion worth of investments in new systems. Of the billions of dollars spent to finance cable systems, currently less than five per cent is provided by governments or international agencies. The 95 per cent balance is provided by private consortiums (49 per cent), carriers (32 per cent) and non-government investors (14 per cent).[41] Accordingly, governments and their officials are often unaware of what it takes to build a cable system. Similarly, cable repairs (which can costs millions of dollars) are paid for privately by the cable owners and are carried out, not by government mandate, but by contract.

Third, the way the industry has evolved means there are difficulties for cable companies to assert or advocate their rights *vis-à-vis* States who have encroached upon the freedom to lay cables or who have not adopted the necessary legislation to protect cables. While the freedom to lay submarine cables is afforded to States under UNCLOS, it is actually privately owned cableships that are exercising these rights. Further complicating the situation is the fact that submarine cable systems are typically built or owned by many different private companies from different nations. A consortium of cable co-owners typically consists of about 4 to 30 or more telecom or content companies from multiple nations that co-own an international cable system's capacity and operate the cable system together pursuant to a cable construction and maintenance agreement (C&MA). Cables, unlike ships, are not registered under any flag. There is no mechanism whereby cable companies can challenge laws and policies adopted in contravention of UNCLOS.

Fourth, because States do not appear to have anticipated or appreciated the critical nature of submarine cables to their international communications, there is often no lead agency to coordinate effective policies on submarine cables. This could be a consequence of the fact that deployment of cables affects both land and sea. National telecommunications regulators frequently only address telecommunications standardization, licensing (for landing stations), and competition issues and may not be familiar with maritime issues. Similarly, maritime

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[40] More information on the way the industry works can be found in Chapter 2.

[41] Submarine Telecoms Forum Inc, *Telecoms Industry Report 2012* at 16 and 23.

agencies are usually responsible for maritime operations and may not have any inkling on the nature and importance of cables. The lack of a lead agency can lead to fragmented and short-sighted policy decisions which are not good for the industry, the State or the international community at large.

Fifth, there is also no inter-governmental organization responsible for submarine cables. This is in contrast to other public infrastructure such as shipping and aviation, the governance of which has been entrusted to specialized United Nations Agencies such as the International Maritime Organization and the International Civil Aviation Organization. The ITU is the leading United Nations agency for information and communication technology but is primarily concerned with standardization in the industry and has minimal awareness of law of the sea issues. International issues with respect to submarine cables inevitably fall through the cracks without an inter-governmental body to champion it.

Notwithstanding the above, submarine cables are not without advocates. The International Cable Protection Committee has been the principal professional body of the cable industry. ICPC membership, presently 136 members from over 63 nations, includes about 97 per cent of the owners of the various cable systems worldwide and almost all of the operators of the cable vessels that lay and maintain these systems. Since 2010, membership has been open to national governments and several governments are now represented.[42] The ICPC issues *Recommendations* available to the public regarding methods of protecting submarine cables.[43] The ICPC works with governments, organizations and other seabed users on a partnership basis to promote submarine cable security and compliance with UNCLOS. These include the International Seabed Authority, the United Nations Environment Programme, ITU, APEC, the EastWest Institute, and the Rhodes Academy on Ocean Law and Policy.

Apart from the ICPC, there are also Regional Cable Protection Committees (RCPCs) where cable companies which have commercial interests in the region come together to interface with national governments. Subsea Cables UK, the North American Submarine Cables Association (NASCA), Oceania Submarine Cable Association (OSCA) and the Danish Cable Protection Committee (DKCPC) are all examples of such RCPCs that have provided an effective forum for the cable industry to communicate their concerns to governments, and vice versa.

Indeed, the efforts of the ICPC, RCPCs and other like-minded organizations and governments have had some traction in the protection of submarine cables. Recent developments are positive with States such as Australia, New Zealand,

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[42] Australia, Malta, Singapore, the United Kingdom, New Zealand, and the United States all have government representatives as ICPC members.

[43] ICPC Recommendations cover areas such as cable protection, cable and pipeline crossings, cable proximity to offshore wind farms, civil engineering projects, and seismic activities, charting of cables on navigational charts, cable protection actions, and out-of-service cables. They are free upon request from the ICPC at www.iscpc.org.

Uruguay, and Colombia adopting extensive cable protection legislation and with the United Nations calling on all States to cooperate to protect submarine cables for the first time in 2010. However, there remains a lack of awareness and understanding on the nature of submarine cables, the industry that supports their development and the international legal regime that governs them. There is clearly still some way to go.

Filling the Knowledge Gap—the Objective of the Handbook

To this end, the Handbook, the first of its kind, aims to provide a collaborative practical description of the history, development, current structure and practices of the submarine cable industry and the rich, if obscure, development of cables under international law that has allowed cables to flourish as one of the most successful uses ever of the world's oceans. It addresses the various issues that have arisen (described in brief above) in national and international policies on submarine cables and provides concrete recommendations on how some of these issues may be addressed. Ultimately, the overarching objective of this Handbook is to inform, educate and generate discussion on the governance of submarine cables.

The Editors hope that the Handbook fulfills two related goals. First, we hope that one of the consequences of the Handbook will be more productive ocean laws and policies to govern submarine cables. The fundamental assumption underpinning this is that effective ocean law and policy is only attainable when governments and policy-makers understand how the submarine cable industry has evolved, is generally organized, and how cable operations take place.

Second, we hope that the one message that readers take away from the Handbook is that of balance. Balancing the various competing interests and rights of coastal States and other States requires the relevant parties to reject 'absolute' interpretations of their respective rights and obligations. The assertion of a 'doctrinaire, absolutistic conception of freedom of the seas'[44] including the freedom associated with submarine cables, without giving due regard to the rights of coastal States, may lead to even more extreme claims and actions by coastal States.[45] Likewise, coastal States that make expansive claims to rights and jurisdiction beyond what is allowed under international law will inevitably cause strain on the regime designed to protect their interests.[46] The common interest lies in minimizing conflicts between submarine cables and competing uses, with the ultimate goal of protecting the integrity of international communications.

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[44] McDougal and Burke, *supra* note 23, at 11.
[45] *Ibid.*
[46] *Ibid.*, at 12.

A Reader's Guide

One of the most important features of the Handbook is that it is a unique collaboration between industry experts, legal scholars, and scientists. The authors emanate from a wide range of backgrounds, with chapters being written by marine engineers, sea captains, marine geologists, commercial business leaders, diplomats and international legal scholars. The Handbook represents a rich mosaic of multiple life experiences and represents a lifetime of work in the world's oceans and the international law of the sea.

An important consequence of bringing together lawyers, cable industry experts and scientists is that this Handbook caters to a wide audience. It is not purely a legal tome or technical discourse, but a unique combination of both which aims to give readers the practical insight necessary to enhance understanding and shape policy. The Handbook will appeal to the following categories of readers (in no order of importance):

Students, Academics and Lawyers

Students and academics, particularly those involved in legal scholarship on competing uses of ocean spaces will find the Handbook a useful resource for their own research and understanding. This is also true of lawyers involved in the practice of international law, maritime law and telecommunications.

Government Officials and Policy-Makers

Presently, government officials/policy-makers have very few sources of information available to them with respect to issues surrounding submarine cables and the interests of different stakeholders in protecting cables and regulating activities associated with them. This Handbook is intended to provide a readily accessible and comprehensive overview of all of the issues from a domestic law perspective, an international law perspective, and an industry perspective. It is therefore relevant to the work of numerous Ministries and Departments within governments including telecommunications regulators, navies, maritime agencies and foreign affairs departments.

The Cable Industry

The Editors also hope that the Handbook will also be of use to industry as it continues to work in the ocean environment. Remarkably, given the dependence of the modern world on submarine cables for its critical international infrastructure, there are no degree programs or majors at the undergraduate or graduate level in submarine cable systems. Historically, this has always been the case. The question that necessarily follows is how did the industry, both on a national and international basis, develop and train its highly skilled international work force of engineers, ship officers and crews, commercial leaders, and skilled workers?

The answer is that companies historically developed extremely well structured apprenticeship and training programs that provided career training from a young age through to senior management. The training was always hands-on and merit was an essential qualification for advancement. Lessons learned in the challenging ocean environment were passed on in the form of continual refinements in ships, remotely operated vehicles, equipment, tools and procedures. Because of the international nature of the business, the training and 'lessons learned' were shared, even among competitors, through formal organizations such as the ICPC, and other professional bodies like SubOptic, the International Council on Large Electric Systems (CIGRE) and through innumerable joint ventures installing and operating submarine cable systems. These international working relationships fostered a level of cooperation among cable companies that is rare among land based industries. Every cableship and cable system operator lives with the knowledge that helping a competitor today is wise, because tomorrow they may be the one needing a favor. Formal legal disputes are uncommon in the industry; the practical need to work together to keep international communications and power uninterrupted is recognized as being more important.

But in the last 20 years or so, companies have faced difficult economic choices and the reality of escalating and rigorous market competition. The result is that many of the in-house apprenticeships and training programs have become victim to cost-cutting. Instead, companies are living off of their earlier investment in human capital. This has worked well, except that the industry now finds itself relying on a skilled but definitely aging workforce without a dependable pipeline of trained replacements. One of the motivations behind this Handbook is recognition of the need to train new workers in international law of the sea to keep the industry strong and skilled as it deals with ever changing commercial and ocean environments. Towards this end, it is hoped that this Handbook will be a valuable training and educational tool for the industry.

The Structure of the Handbook

Submarine Cables: The Handbook of Law and Policy contains 16 chapters divided into five Parts.

Part I provides readers with essential background information on submarine cables and the cable industry. Chapter 1 gives a general overview of the development of submarine cables, beginning with submarine telegraph cables and ending with submarine fiber optic cables. The technical and historical insights provided in this chapter are fundamental for any effective understanding of submarine cables. Chapter 2 gives much needed information on how the submarine cable industry works, including an overview of the different players in the industry (cable owners, suppliers and special interest groups), how a submarine cable system comes to life and the ownership structure of submarine cable systems.

Part II on 'The International Law on Submarine Cables' consists of one chapter, Chapter 3, which traces the development of the international legal regime governing submarine cables starting with the 1884 Cable Convention, and culminating with UNCLOS. Chapter 3 will discuss the relevant provisions of these conventions and will also provide the reader with an understanding of the competing uses of ocean spaces and how international law seeks to balance the interests of various stakeholders.

Part III on 'Cable Operations—Law and Practice' will provide information regarding the law and practice of individual aspects of the 'life-cycle' of submarine cables in five separate chapters. It will address: (1) the planning and surveying of cable routes (Chapter 4); (2) the manufacture and laying of cables (Chapter 5); (3) submarine cable repair and maintenance (Chapter 6); (4) the relationship between submarine cables and the marine environment (Chapter 7); and (5) dealing with out-of-service cables (Chapter 8). For each step of the 'life-cycle' there will be discussion and analysis of the nature of the activities that are undertaken, the international law that governs the activity, the law and policy challenges implicit in conducting the activity, and the proposed way forward for the future.

Part IV on 'Protecting Cableships and Submarine Cables' will address issues regarding the protection of submarine cables and vessels engaged in cable operations. Chapter 9 will give an overview of the international law on the protection of cableships engaged in cable operations and will then highlight the various issues that arise, including the disregard for safe working distances and the threat to cableships from piracy and armed robbery attacks. Chapter 10 will examine how natural occurrences such as earthquakes, typhoons and climate change impact submarine cables and the steps that the industry can take to mitigate such threats. Chapter 11 discusses the various threats to cables from competing uses such as shipping, fishing and resource exploration and exploitation and the steps States and the cable industry can take to protect cables from these threats. Finally, Chapter 12 will address the urgent security gap that currently exists with respect to the measures available in international and domestic law to protect submarine cables from deliberate damage from terrorists and propose a way forward for law and policy makers.

The last Part of the Handbook, Part V will look at other types of submarine cables, such as power cables, marine scientific research cables, military cables and cables used for offshore energy. While some of the issues raised in these chapters are similar to the issues raised in respect of submarine communication cables, these special purpose cables also raise different challenges for law and policy makers, which will be highlighted in each chapter.

Many of the chapters contain images or diagrams intended to aid readers in their understanding of the processes described in each chapter. In addition, the Appendices of the Handbook also contain invaluable information. Appendix 1 contains a comprehensive timeline on the submarine cable industry with signifi-

cant milestones in the development of submarine cables. Appendix 2 contains charts which depict the major submarine system suppliers from 1850 to 2012, and how they have amalgamated or divided to form today's most important submarine cable supply companies. Both Appendix 1 and 2 have been provided by Stewart Ash. Appendix 3 contains extracts of the relevant international conventions, including the 1884 Cable Convention (which is reproduced in its entirety) and pertinent provisions of UNCLOS. We encourage readers to refer to the actual provisions when reading each chapter as this will enhance their understanding.

Ultimately, the Editors and the various contributors hope that the Handbook will provide the foundation for meaningful engagement between the industry, academics, government officials and ocean policy decision makers. It is our collective aspiration that such engagement will engender further discussion, collaboration and cooperation on issues in ocean governance that are of increasing importance to the use of submarine cables in the world's oceans.