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THE ECONOMIC IMPORTANCE OF SUBMARINE CABLES

Submarine communication cables (submarine cables) are laid along the seabed to carry telecommunications signals between land based stations. They remain more reliable than satellites and possess a much larger capacity, transmitting approximately 95 per cent of all international data between continents and islands. Submarine cables are considered reliable because multiple paths are available for transmitting data in the event of a cable malfunction; they are also capable of transmitting terabits of information per second compared with often only megabits per second via satellite services. Modern submarine cables use fibre optic technology and cost hundreds of millions of dollars to construct and lay, but they transmit the digital payloads for telephone, internet, and private data traffic to which consumers worldwide have become accustomed.

Submarine cables link together the world's continents; currently active or due to enter service by 2014, 150 submarine cables facilitate global communications. The first submarine cables were laid during the 1850s and initially linked Great Britain to Ireland, France, the Netherlands and Germany, with other links between Italy and Corsica, and Sardinia and Africa. In 1866 the steamship, SS *Great Eastern*, laid the first cable across the Atlantic Ocean linking Ireland to Newfoundland. Four years later, a cable was laid from Yemen to India; and in 1872 Australia was linked to India by a cable via Singapore. Traversing the Pacific Ocean, Canada, Fiji, Australia, and New Zealand were linked in 1902.[1]

Due to the speed with which information could be exchanged, the use of submarine cables proved a catalyst for globalisation and international engagement because they significantly reduced communication times between continents. Submarine cables quickly became important international assets for news agencies, trading and shipping companies, governments and their armed forces, and the public. They enabled ship captains and companies to communicate from distant ports, immediately improving logistic management for industries such as cotton, and they dramatically enhanced communication between various states and colonies aiding diplomatic relations during peacetime and facilitating communication during conflict. Historically the demand for submarine cables was proportional to a nation's naval forces, distant colonies, and the perceived threat of conflict. The British government, for example, considered cables to be of strategic importance particularly for long distance colonial issues, which provided the impetus behind its major contribution to the international cable laying industry. During the 1920s, submarine cables came into competition with radiotelegraphy. Governments were also prepared to sponsor radio technology development as it enabled long distance voice communication, which was primarily important for communicating with warships. Although radio technology continued to expand and proliferate, the British government in particular was intent on retaining its submarine cable capacity in case of another war because telegrams via cable remained secure and were not as vulnerable to interception by enemies as radio messages were.[2]

Following World War II the global telecommunications network expanded to include satellites, a new wireless communication technology that for a short time outperformed submarine cables. Yet by the mid-1970s competition for new technology that could cope with increasing consumer demand for international telephone and data transfer services spurred on the development of fibre optic submarine cables, capable of transmitting large amounts of data. By 1988 the first transoceanic fibre optic cables were being laid linking the United States, the United Kingdom and France. With major improvements in design and the increased capacity available for international data transfers, retrospectively, these new cables proved to be the foundation for the internet. The result was a radical change to the communications, business, commerce, education and entertainment industries over the next 15 years.

Submarine cables are continually redesigned to maximise their capacity, and to improve their protection in the sea environment; cables have shrunk in size, reliability of components increased and their life expectancy extended out to 15-20 years. A modern cable is capable of carrying millions of telephone calls along with large amounts of internet and video data. The globalised international system is dependent on the security of these submarine cables. Whilst satellites remain useful as a back up and allow communication with remote regions, they are not capable of transmitting the volume of data transmitted along submarine cables. The last decade has also witnessed a shift away from the traditional Atlantic submarine cable networks towards the Pacific region reflecting the growing importance of, and expectations from, Asian markets.[3]

Given the critical importance of international communication, submarine cables are protected by international treaties including: the *International Convention for the Protection of Submarine Cables 1884*, and the *United Nations Convention on Law of the Sea 1982*. These treaties establish norms that enable nations to: lay and repair cables outside of territorial sea limits, afford special status to ships laying and repairing cables, indemnify vessels that sacrifice equipment to avoid damaging cables, and provide universal access to courts to enforce treaty obligations.[4]

Today, submarine cables are the cornerstone of globalisation and worldwide communication. For Australia, far away from other continents, submarine cables are vital infrastructure that is essential to the daily functioning of society. Their value to the Australian economy was estimated in 2002 to be in the order of $5 billion. Nevertheless, these cables are vulnerable assets susceptible to accidental damage by: earthquakes, fishing trawlers, anchors, dumping, sand dredging, turbidity currents, and espionage by state actors and terrorists. An

example of damage to Australian submarine cables occurred in July 2001 when a merchant ship cut both the *Southern Cross* cable and the *Tasman 2* cable (linking Australia to New Zealand) as it dragged anchor off Sydney. Magnifying the impact of this incident, the second arm of the *Southern Cross* cable was undergoing maintenance at the time. If cables are damaged, the flow of information to and from Australia is impeded and data may be lost, affecting commercial transactions and personal communication. The repair of cables can reach into million of dollars, depending on the extent of the damage.[5]

Australia has a number of major submarine cables. The *Southern Cross* cable network connects Australia and New Zealand to North America via Fiji and Hawaii. The *Australia Japan* cable connects Sydney to Japan via Guam. The *Gondwana* cable connects Sydney to New Caledonia. The *PPC-1* cable links Sydney, Papua New Guinea and Guam. The *Endeavour* cable connects Sydney to Hawaii. The *APNG-2* cable links Sydney directly to Papua New Guinea. The *Pacific Fibre* cable, due to come into service in 2014, will link Sydney to North America via New Zealand and the proposed *OptiKor* cable will link Sydney to New Zealand, and will compete for business with the Southern Cross cable. The *SEA-ME-WE3* cable connects Perth to Asia, the Middle East and Europe. The *ASC* cable links Perth to Singapore. The *ASSC-1* cable will link Perth, Indonesia and Singapore by the end of 2013. These cables not only connect Australia to the world but are also critical for connecting Australia's smaller neighbours to the international community.[6]

Submarine cables connecting Australia to the world:

Cable Name	**Exit point**
Southern Cross	Sydney (protection zone)
Australia-Japan	Sydney (protection zone)
Gondwana – 1	Sydney
PPC – 1	Sydney
Endeavour	Sydney
APNG – 2	Sydney
Pacific Fibre	Sydney
OptiKor	Sydney
SEA-ME-WE-3	Perth (protection zone)
ASC	Perth
ASSC-1	Perth

Source: Submarine Telecommunication Map, TeleGeography, 2012.

Aware of the vital importance of submarine cables to the Australian economy, and concerned about the lack of security and protection for the cables, the Australian government implemented a tough cable protection regime. The *Telecommunications and other Legislation Amendment (Protection of Submarine Cables and other Measures) Act 2005*, enables the Australian Communications and Media Authority (ACMA) to establish submarine cable protection zones safeguarding cables that are considered to be of national importance. ACMA has subsequently declared three protection zones: two covering the *Southern Cross* and *Australia-Japan* cables off the New South Wales coast, and one covering the *SEA-ME-W3* cable off Western Australia. The protection zones extend 1nm either side of the submarine cable out to a depth of 2000 metres. Activities regarded as illegal in protected zones include: fishing; lowering, raising or suspending an anchor from a ship; sand mining; exploring for or exploiting natural resources; mining; and any activity that involves a serious risk that an object will connect with the seabed. Penalties include fines of up to $A66,000 and/or ten years imprisonment for an individual, or up to $A330,000 for a corporation.[7]

The greatest threats to submarine cables appear likely to come from accidents as a result of fishing, shipping, mineral and hydrocarbon exploitation or renewable energy generation; although they have been considered a legitimate target in war. As examples of the latter, during World War I the German warship SMS *Emden* conducted an operation in November 1914 to cut cables on the Cocos Islands; they were successful in cutting the cable to Perth, but were interrupted by HMAS *Sydney* before being able to cut the cable to South Africa. Towards the end of World War II, Australia led an operation in July 1945 to cut two cables off French Indochina to disrupt Japanese communications. During the Cold War the United States tapped Soviet cables near the Sea of Okhotsk and in the Barents Sea.[8]

In Australia, if a cable is damaged or a threat to the cable system arises, Australian authorities may be called upon to respond. Any involvement by state police and/or the RAN will be determined on a case by case basis according to jurisdictional factors and relevant capabilities.

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1 See 'Landing the New Zealand cable', *The Colonist*, p. 3, 19 February 1876; Juan Pablo Conti, 'Frozen out of broadband', *Engineering & Technology*, 4(21), 2009, pp. 34-36; *TeleGeography*, <www.telegeography.com/telecom-maps/submarine-cable-map/index.html>; and International Cable Protection Committee (ICPC) UNEP Report, <www.iscpc.org/publications/ICPC-UNEP_Report.pdf>.

2 See Daniel Headrick and Pascal Griset, 'Submarine Telegraph Cables: Business and Politics, 1838-1939', *The Business History Review*, 75(3), pp. 543-578.

3 See Annie Lindstrom, 'Taming the terrors of the deep', *America's Network*, 1 January 1999, <http://findarticles.com/p/articles/mi_m0DUJ/is_1_103/ai_n27546809/pg_4/?tag=content;col1>; and ICPC UNEP Report, p. 16.

4 See International Cable Protection Committee, <www.iscpc.org/publications/About_SubTel_Cables_2011.pdf>.

5 House of Representatives, *Telecommunications and other Legislation Amendment (Protection of Submarine Cables and other Measures) Bill 2005, Explanatory Memorandum, 2004-2005*, Parliament of Australia, Canberra.

6 See *TeleGeography*, <www.submarinecablemap.com>; Huawei Marine Networks press releases on 16 and 20 January 2012, <www.huaweimarine.com/marine/marine/homeWeb.do?Method=showIndex>; and Pacific Fibre, <http://pacificfibre.net/news/>.

7 See ACMA, 'Submarine telecommunications cables', 5 February 2010 <www.acma.gov.au/WEB/STANDARD/pc=PC_300133>; Border Protection Command, *Guide to Australian Maritime Security Arrangements*, Commonwealth of Australia, Canberra, 2009, p. 30; *Telecommunication Act 1997*; and *Telecommunications and other Legislation Amendment (Protection of Submarine Cables and other Measures) Act 2005*.

8 See Bill Burns, 'Direction Island Cable Station and the Battle of Cocos', <http://atlantic-cable.com/Article/1914BattleOfCocos/index.htm>; Department of Veteran Affairs, 'Cutting Cables', *Australia's War 1939-45*, <www.ww2australia.gov.au/farflung/cuttingcables.html>; and Sherry Sontag and Christopher Drew, *Blind Man's Bluff: The Untold Story of American Submarine Espionage*, Public Affairs, New York, 1998.