Antarctic research as a precedent for diplomacy exercised through international scientific cooperation: applying collaborative systems in non-jurisdictional spaces

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Acknowledgements

This paper accompanies a senior thesis manuscript on the effect of heightened soil moisture and salinity on soil microbial communities within an Antarctic water track. Field work for this thesis was conducted as a part of the 2018 Tawani Expedition to Lake Untersee, Antarctica, a hyperarid Mars-analog environment. This supplementary paper will examine how multinational Antarctic research exemplifies the potential of scientific cooperation to mediate diplomacy in non-jurisdictional areas. Specifically, this paper will briefly examine how multilateral Antarctic treaties prioritizing collaborative research have facilitated scientific diplomacy, minimized geopolitical conflict and mitigated threats of militarization. This paper will be submitted along with the manuscript for honors to the Science, Technology, and International Affairs program within the School of Foreign Service at Georgetown University.

Introduction

A significant percentage of the Earth's surface is non-jurisdictional, falling outside traditional bounds of national sovereignty. The vast majority of this area lies within polar regions and the high oceans beyond the reach of national exclusive economic zones. Successes and failures in the governance of these spaces in the absence of sovereign authorities provide valuable lessons for the avoidance of further militarization and destructive resource extraction in continued polar, ocean and space exploration. Antarctica serves as an ideal case study for how initial militarization and territorial contests were successfully diffused through the enactment of an international treaty formally prioritizing international scientific research. As a function of the Antarctic Treaty and the high entry cost of conducting research in this remote region, Antarctic research uniquely exemplifies cooperative efforts of state and private actors to pool resources and expertise to conduct science of global importance.

American, British and Russian national and commercial expeditions began exploring the Antarctic Peninsula and areas south of the Antarctic Circle in the early 1820s.[1] However, the continent received little human activity until later in the 20th century. The military significance of the continent – for weapons testing, satellite systems, and strategic geopolitical positioning – became apparent in the lead up to World War II and persisted well into the Cold War. In the wake of World War II, scientific research in Antarctica also began in earnest, with several countries establishing a series of year-round and seasonal stations and camps. By the 1950s, seven countries had made territorial claims, but none were universally recognized.[2] To address conflicting territorial claims and mitigate further division and militarization of the continent, the Antarctic Treaty was signed in 1959. The evolution of national presence on the continent, from

[1] Coates, A. (2017) "Geopolitics Threatens Antarctica's Future as Peaceful Hub for Science."
[2] Ibid.

whaling outposts to military outposts to permanent of research bases, signals the progression of state interests from economic to military to scientific. Underlying geopolitical interests are arguably implicit throughout this progression. The coincidence of a new geopolitical order with the Antarctic Treaty's upcoming renewal in 2048 may foster new, divergent expressions of these economic, military and scientific interests on the continent.

The "Scramble for the Antarctic"

In 1923, Britain's undersecretary of state for the colonies, Leo Amery, briefly considered incorporating all of Antarctica into the British Empire. Amery's expansionist ambitions were quickly thwarted by the competing interests of Chile and Norway, who had interest in the continent for whaling purposes.[3] In 1924, the French responded to British expansion by declaring their own territorial claim to 167,000 square miles in Southwestern Antarctica on the basis of the earlier Jules Dumont d'Urville expedition. (A map delineating these claims and all other contemporary territorial claims can be found in Appendix I). Britain and France were both drawn to the Antarctic and South Atlantic by the abundance of baleen whales, whose oil was a highly profitable commodity. National honor was also a motivating factor, as early British Antarctic expeditions were highly publicized and considered synonymous with British "exploratory zeal and pride."[4]

Not to be outdone, the MS Schwabenland left Germany in December 1938 on a secret mission to establish a German territory in the Antarctic. Arriving on January 19, 1939, the crew laid claim to a significant patch of Queen Maud Land, formerly claimed by the Norwegians.[5] The Germans demarcated their claim by planting Nazi flags along the coast and going so far as to throw darts from planes with Nazi flags attached.[6]

Establishment of German claims triggered a short period of militarization on the continent. The British established permanent bases and instigated a secret expedition to solidify British control over both the British Antarctic Territory and islands within the Falkland Islands Dependency.[7] The British cited deterrence of German U-boats as justification for their increased presence, however the growing threat posed by Argentina was likely another motivating factor.[8] In 1944, Argentineans had raised their flag on Deception Island where an American whaling outpost had been located for over a century and located within the existing British claim. The Chilean government followed suit by launching their own Antarctic expedition in 1947 and establishing claims to British territory.

Abstaining from this territorial scramble, under the Truman administration the United States Navy Antarctic Developments Program sought to establish a continuous American presence in the region through the construction of a new research base.[9] The US continues to make no official claim to any part of Antarctica, choosing to instead exert a strong presence through several distributed bases and a multi-million-dollar science program.

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[3] Coates, A. (2017) "Geopolitics Threatens Antarctica's Future as Peaceful Hub for Science."
[4] Dodds, K. J. *Pink Ice: Britain and the South Atlantic Empire,* p. xix.
[5] Coates, A. (2017) "Geopolitics Threatens Antarctica's Future as Peaceful Hub for Science."
[6] Andersen, D. (2019, April 7). Email Interview.
[7] Sullivan, W. (1982). "1948 British-Argentine Clashes in Antarctic Ended Peacefully."
[8] Ibid.
[9] Coates, A. (2017) "Geopolitics Threatens Antarctica's Future as Peaceful Hub for Science."

As the first significant arms control treaty of the Cold War, the Antarctic Treaty was a vital instrument to preserve control of the Antarctic continent and oceans by the United States and its allies.[10] By including the Russians as signatories to the Treaty System, the Allies were able to exercise greater control. In preventing the establishment of military bases and fortifications and prohibiting the use of military maneuvers and weapons tests, the system was sufficient to keep the peace in the Cold War years.

The 1959 Antarctic Treaty System

The Antarctic treaty had a pivotal role in establishing the current prioritization of scientific research on the continent. The treaty was signed in December 1959 by twelve member countries. These countries had active scientists in and around the continent during the International Geophysical Year of 1957-58.[11] The Geophysical Year was viewed as a prime opportunity to extend protections and address broader concerns of nuclear proliferation and testing.[12] The treaty entered force in 1961 and the total parties to it has since grown to 53.

The Antarctic Treaty contains several provisions to ensure the primacy of scientific research. In direct response to the continent's militarization in the early 20th century, the first article stipulates that Antarctica will only be used for peaceful purposes.[13] All military equipment and personnel on the continent be put towards facilitating research or other peaceful endeavors, often providing necessary infrastructure to access remote field sites. Article Two of the treaty ensures the freedom of scientific investigation and international cooperation towards that end. To facilitate this cooperation, the treaty stipulates that scientific observations and results derived from Antarctic research be exchanged and made freely available.

Under the Antarctic treaty, extant territorial claims are neither reinforced nor denied. The United States and Russia, though not included among the seven countries with territorial claims, maintain a "basis of claim."[14] In a strongly diplomatic maneuver, Article Four of the treaty prohibits actions "asserting, supporting or denying a territorial claim or creating any rights of sovereignty," effectively maintaining the status quo. Additionally, no enlargements of existing claims are permitted.

Unresolved attempts at international arbitration in the 1950s has resulted in several overlapping claims. For example, the Argentinian claim is entirely overlapped by British and Chilean claims. The Marie Bryd Land, which covers 620,000 square miles, is the largest unclaimed land mass globally and will remain as such under the stipulations of the Treaty.[15] Although it fails to offer a definitive resolution to contested and overlapping territorial claims, in minimizing their importance to the proceeding of current operations, the Antarctic Treaty sets aside a contentious issue to pragmatically ensure that Antarctica remains a peaceful collaborative effort. However, the sustainability of this deferment of contested claims remains in question.

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[10] Anne-Marie Brady qtd. in Coates, A. (2017)
[11] Gray, A.D., and Hughes, K.A. (2016) "Demonstration of 'Substantial Research Activity' to Acquire Consultative Status under the Antarctic Treaty."
[12] Ibid.
[13] Secretariat of the Antarctic Treaty. (1959) "The Antarctic Treaty."
[14] Ibid.
[15] Mitchell, B. and Kimball, L. (1979) "Conflict over the Cold Continent."

To ensure compliance with the treaty and protocols to it, all stations and installations are open to inspection at all times.[16] To administrate the continent, the Antarctic Treaty Consultative Meeting has convened annually since 1994 for member countries to inform each other of their activities. [17] Decisions arising from these meetings are carried out by member nations in accordance with their own national laws. Members are responsible for altering their operations in accordance to Treaty and Protocol stipulations.

Specifics on the appropriate recourse to violations of the treaty are not addressed. Preliminary construction of China's most recent research base was initiated before an environmental impact assessment was completed, constituting a violation of the Treaty's 1991 Environmental Protocol.[18] The lack of punitive measures in response to this infraction illustrates the weak enforcement structure of the treaty system. Although territorial claims effectively stand as they did in 1959, a growing number of countries looking to expand their presence on the continent threatens this current balance.

Shifting Geopolitics and Resource Prospecting

Several Antarctic scholars have questioned whether the 1959 treaty is adequately positioned to address new challenges of resource scarcity, climate change and a new geopolitical order.[19] Emerging global powers are shaping a new geopolitical landscape on the continent by introducing new territorial claims and establishing research facilities.

Antarctica has been found to contain significant oil and gas reserves, along with deposits of coal, chromium and iron ore. Researchers have also located kimberlite deposits potentially containing diamonds.[20] The US Geological Survey estimated in 1991, that there may be as many as 36 billion barrels of oil and gas buried under rock and ice.[21] With improvements in available technologies and increased accessibility due to climate change, extraction of these resources may soon be economically viable.

The Antarctic treaty did not permanently resolve issues involving access to mineral resources. A mineral resource agreement was signed in 1988 but was never ratified.[22] A lack of political trust and shared values among Antarctic states, coupled with conflicting interests in resource extraction could lead to a breakdown in the current treaty system.[23] With the technological and economic barriers to Antarctic exploration and research lessening, more and more states are seeking access to the continent, placing a strain on existing governance structures.

[16] Secretariat of the Antarctic Treaty. (2019a) "The Antarctic Treaty."
[17] Ibid.
[18] Hook, L. and Mander, B. (2018) "The fight to own Antarctica."
[19] Teller, M. (2014) "Why Everyone Wants a Piece of Antarctica."
[20] Romero, S. (2015) "Countries Rush for Upper Hand in Antarctica."
[21] Kingston, J. (1991) "The Undiscovered Oil and Gas of Antarctica." Department
[22] Dodds, K. (2018) "In 30 Years the Antarctic Treaty Becomes Modifiable, and the Fate of a Continent Could Hang in the Balance."
[23] Anne-Marie Brady qtd. in Coates, A. (2017)

Environmental protections and obligations assumed by parties to the Antarctic Treaty have demonstrated a capacity for collective responsibility in the absence of sovereign authority. The 1991 Protocol on Environmental Protection to the Antarctic Treaty provides for assessments of environmental impact, conservation of native flora and fauna, proper waste disposal and waste management, and the prevention of marine pollution.[24] The Protocol also prohibits all activities relating to mineral resources except for scientific research.

However, protective conventions currently in force will expire within the next few decades and countries are already focused on existing strategic and commercial opportunities.[25] When the convention governing the protection of natural resources comes up for review in 2048, it is uncertain whether all countries will agree to further prohibitions on Antarctic mining.[26] Resource scarcity could also raise pressure to renegotiate Antarctic treaties to enable commercial endeavors before 2048.[27] Antarctica's nutrient rich seas are actively exploited for fish and krill by Russia, China and South Korea.[28] These economic interests have undermined measures to protect the area's wildlife. Russia and China, who view the fish stocks as exploitable resources claimed that countries proposing conservation measures were simply attempting to extend their sovereignty and strengthen their own national security interests.[29]

Although a small marine protected area in the Ross Sea was eventually agreed upon, future clashes over marine and terrestrial resources are inevitable due to conflicting values over conservation. In the wake of the creation of this marine protected area, China and South Korea have continued to ramp up their fishing of krill. In 2018, China, Norway and Russia collectively thwarted efforts to create a vast Antarctic ocean sanctuary.[30] Changing climatic conditions could compound resource scarcity concerns by fundamentally altering access to previously remote resources and threatening or changing the distribution of current resources, including fishery populations. The current treaty system does not currently have the infrastructural capacity or weightiness to effectively resolve these resource conflicts.

In addition to intensification in economic interests due to resource scarcity, a new geopolitical order is emerging on the continent with the increasing presence of developing countries. In the past couple of years, Turkey, Iran, Belarus and Columbia have all expressed or acted on desires to have an Antarctic presence. The prevailing order dominated by the primarily Anglophone established powers of Britain, America, Australia and New Zealand is increasingly giving way to these upstart nations eager to exhibit soft power through displays of scientific prestige. Turkey and Belarus have announced that they will begin cooperative polar research. To that end, a team of Turkish researchers toured research bases in the 2018 season.[31] Belarus, Turkey, Colombia and Iran have all announced concrete plans to build bases on the continent.[32] The introduction of

[24] Central Intelligence Agency. (2016) "Antarctica," *The World Factbook*.
[25] Romero, S. (2015) "Countries Rush for Upper Hand in Antarctica."
[26] Dodds qtd. in Coates, A. (2017)
[27] Ibid.
[28] Coates, A. (2017) "Geopolitics Threatens Antarctica's Future as Peaceful Hub for Science."
[29] Ibid.
[30] Dalton, J. (2018) "Fury as China, Russia and Norway block landmark Antarctic ocean sanctuary plan."
[31] (2019) "Turkish Scientists Visit Bases of Spain, Britain and Russia in Antarctica."
[32] Romero, S. (2015) "Countries Rush for Upper Hand in Antarctica."

these new actors holds promise for new inputs of scientific expertise and resources but also promises to alter the current geopolitical order tenuously preserved by the 1959 Treaty.

Russia, China and India have also recently expanded their Antarctic presence through the construction of new cutting-edge research bases. These bases are both displays of competence, intent and tools to extend their geographic reach on the continent. Russia is in the process of expanding monitoring stations for their satellite positioning system, Glosnass. China has the fastest-growing operation in Antarctica, with its fifth research station slated for completion in 2022. The program is also building its second icebreaker and setting up research drilling operations. Chinese officials have stated that their expansion prioritizes scientific research but is also influenced by "resource scarcity concerns."[33]

Increased scientific presence could have dual use applications for both resource extraction and military activities, with distinctions between these activities increasingly blurred. Areas ideal for intercepting satellite signals or re-tasking satellite systems are of both commercial and military interest, and could enable enhanced global electronic intelligence operations. Continued prioritization of scientific objectives over commercial and military development is necessary to ensure the continued conservation of the continent's pristine environments. International scientific collaborations are thus a way to ensure the continued primacy of research over national economic and defense interests.

Scientific Diplomacy Exemplified by the Tawani Expedition

Research for the author's thesis was conducted as part of a collaborative, international effort emblematic of the objectives of the Antarctic Treaty. This research was made possible via a number of partnerships with both private and national and international governmental organizations. Funding for logistical support was provided primarily by philanthropy grants from the Tawani Foundation and from the Trottier Family Foundation. The expedition also received support from the Russian Antarctic program and grants for sample analysis from the National Air and Space Agency's Astrobiology Institute and Exobiology programs. Product donations and discounts were also leveraged to facilitate research in partnership with an international array of actors from Russia, Canada, Japan, Austria, New Zealand and India.[34]

Unlike most research expeditions funded through national Antarctic programs, the Tawani Expeditions rely on private funding for logistics support. In the U.S., basic research has been increasingly funded by philanthropy groups even as governmental support for basic research has declined.[35] As U.S. governmental Antarctic programs continue to face budgetary cuts, philanthropic funding may increasingly fill this funding gap.[36] However, current private funding for Antarctic expeditions primarily finances recreational and media expeditions, rather than basic fundamental science. One other contemporary exception to the norm for national funding is the Belgian program at the Princess Elizabeth Station.[37] This station was built primarily with private

[33] Romero, S. (2015) "Countries Rush for Upper Hand in Antarctica."
[34] Andersen, D. (2019, April 7). Email Interview.
[35] Mervis, J. (2017) "Data Check: U.S. Government Share of Basic Research Funding Falls below 50%."
[36] Ledford, H. (2019) "Trump Proposes Slashing Science Spending at the NSF."
[37] Andersen, D. (2019, April 7). Email Interview.

foundation funding but has since moved towards a private-public partnership in order to sustain a scientific program. This transition spanned several years and required court intervention. Prior to the International Geophysical Year of 1957-8, private funding was more commonly utilized for early scientific efforts, including those of Finn Ronne and Lincoln Ellsworth in the 1930s and 1940s.[38]

The research field site, Lake Untersee was first explored in January 1969, relatively late compared to other ice-free regions of the continent. The lake was first discovered in January 1939 by the third German Antarctic Expedition during their reconnaissance flights. Additional fly-overs were undertaken by Soviet and Norwegian aircraft in 1958-61 in the remapping of the region. Following the Soviet expedition in 1969, Soviet, Estonian and East German scientists established a research presence in the area. The International GeoMaud Expeditions within the newly unified German Antarctic program, also conducted research in the region in the 1994-95 and 1995-96 seasons.[39] India has more recently sent several expeditions, once in a joint capacity with the 2012 Tawani Expedition. The Indian station, has also supported multiple helicopter day-trips to the lake. Transportation costs associated with accessing the lake and transporting scientific equipment and gear limits the volume of traffic to the area relative to other dry valley regions.

The 2018 Tawani Expedition was composed of scientists from the United States, Russia and Canada. Logistical support was provided by personnel of the Novolazarevskaya Russian Base in conjunction with the Antarctic Logistics Center International (ALCI). ALCI operates flights from South Africa to the Novolazarevskaya base, along with intra-Antarctic flights to remote field sites. ALCI is a private company that formed in 2001 due to an increase in Antarctic operators and agencies departing for Antarctica through Cape Town, South Africa. It has been the primary service provider in the Dronning Maud Land Air Network since its establishment.[40] ALCI also provides logistics such as customs clearing, warehousing and management to ensure the safe and legal return of both samples and waste from the continent. In providing the necessary infrastructure to facilitate both scientific and private expeditions in Dronning Maud Land, ALCI has accrued a multinational clientele. The company has associates in Germany, Russia, Belgium, UK, Finland, India, Japan, Netherlands, Norway, South Africa, Sweden, Iceland, China, Canada and the United States.

Additional technical support was provided by Argentinian mechanics, Canadian pilots and countless others. The inaccessibility of the Untersee field site and its relative proximity to the Novolazarevskaya, 100 kilometers distant, necessitates this cooperative relationship for communication and emergency response. ALCI, and by extension the Tawani Expeditions, are thus reliant on the Russian Antarctic program for a variety of services. These services include maintaining an ice runway for ALCI flights, providing transitory lodging and board for research and tourist groups, and providing transportation to remote field sites. This infrastructural support is heavily reliant on military equipment repurposed for the peaceful purposes stipulated in Article I of the Antarctic Treaty. The facilitating role of ALCI and equivalent multinational commercial coordinating companies in other regions of the Antarctic enables research in these

[38] Ibid.
[39] Paech, H.-J. (2005). *International GeoMaud Expedition of the BGR to Central - Dronning Maud Land in 1995/96.*
[40] Antarctic Logistics Centre International (2019a) "Services"

remote locations and lowers associated infrastructural costs that might otherwise pose entry barriers.

The private funding structure of the Tawani Expedition enables both this partnership with a commercial coordinating company and the international composition of Expedition research teams. A primary dependence on philanthropic funding, with secondary government support, allows the Tawani Expeditions to engage partners across and external to national Antarctic programs. The diplomatic potential of this cooperation is exemplified by the Expedition's dual reliance on the Russian Antarctic program to provide infrastructural and logistics support and on research grants from the U.S. National Science Foundation and National Air and Space Agency. By involving international researchers in collaborative efforts, the Expedition is not only able to broker transnational personal relationships, but also more effectively pool global expertise. In doing so, this multinational Antarctic research exemplifies the potential of scientific cooperation to mediate diplomacy in non-jurisdictional areas.

Discussion

The informal scientific diplomacy evidenced by the Tawani Expedition has been deliberately facilitated by the Antarctic Treaty system's prioritization of scientific research above geopolitical and military interests. Though a small cooperative effort relative to national Antarctic programs, the Expedition highlights valuable strengths of the Antarctic Treaty. The 1959 treaty and subsequent protocols have effectively diffused threats of militarization and deferred difficult issues of resource ownership and extraction arising from ambiguous territorial claims. In offering a pragmatic solution for cooperative governance in the absence of clear sovereign authority, the Antarctic treaty system sets a useful precedent for space and ocean exploration in similarly non-jurisdictional spaces. The threat of militarization and commercialization of these singular environments could jeopardize rich opportunities for scientific research of global importance.

Privately funded research conducted by international research teams could become the emergent model for Antarctic research, providing an important counterbalance to the current nationalistic model. By encouraging the pooling of expertise on matters of collective interest, these programs would minimize the relative importance of resources and security interests implicit in the objectives of many national Antarctic programs. National programs participating in these collaborative efforts would still be able to cultivate prestige and exercise soft power through the fruits of their research. Additionally, such programs would help redirect national investments in research infrastructure towards underfunded, policy-relevant science. To this end, the Scientific Committee on Antarctic Research has advocated expanding its own role in coordinating resources for research.[41]

As technology enables further exploration of realms beyond the bounds of national state sovereignty, this model of cooperative research integrating state and private actors could set a valuable precedent. As seen in both space and deep ocean exploration, national programs are increasingly being displaced by commercial ventures and public-private partnerships. Private actors in these sectors are uniquely situated to mediate international cooperation by lowering cost

[41] Chown, S. L. (2018) "Polar Collaborations Are Key to Successful Policies."

barriers to entry for smaller state and private actors. This function is effectively illustrated by the facilitating role played by the ALCI and other Antarctic coordinating companies.

By enabling the involvement of a broader array of state, independent and private actors in Antarctica, these companies also introduce a greater diversity of perspectives on the relative importance of the continent's economic and scientific value. With greater access to previously inaccessible regions of the poles, deep ocean and space, ensuring the conservation of these spaces in the absence of a strong governing body becomes imperative. As previously discussed, compliance with environmental protection and contamination protocols is currently difficult to enforce, with violators often going unpunished. Assigning responsibility for maintaining remaining 'pristine' environments on the continent independent of jurisdictional claims sets an important precedent for commercial and state space exploration. To address current inadequacies in protections of endemic microbial communities, the author intends to pursue a study to determine the extent of human impact on soil microbial communities within the Untersee field site.

A cooperative model of research is well suited to Antarctic research, much of which carries international implications of global concern. In its valuation of the Antarctic environment and dependent ecosystems, the 1991 Environmental Protection to the Antarctic Treaty highlights the value of the area for the conduct of scientific research, "in particular research essential to the understanding of the global environment."[42] Paleoclimatology research discerning historical climate records from ice cores, and modeling studies quantifying the stability of the West and East Antarctic Ice Sheets, are of particular importance to predictions for global environmental change and sea level rise. The unifying importance of this research makes it conducive to cooperative scientific diplomacy. This multinational research, explicitly enabled by multilateral agreements, will in turn inform diplomatic agreements of climate change. Illustrating that the two, science and diplomacy are mutually reinforcing.

Conclusion

This paper has attempted to briefly address the origin of the 1959 Antarctic Treaty System, its deferral of conflicting national territorial claims and its prioritization of scientific interests over competing military and economic interests. In discussing the changing geopolitical landscape of the continent and the expansion of research infrastructure with both commercial and dual use concerns, I hoped to highlight how science has since been the face of national expansion, but strategic interests have continued to be implicitly at play. The Treaty effectively deferred an array of contentious issues and introduced environmental protections preventing the exploitation of mineral resources, thus far. However, with resource scarcity concerns, a new set of actors and increased accessibility of resources with climate change, priorities are likely to shift over the next couple of decades. Privately funded research expeditions and public-private partnerships are uniquely positioned to integrate multinational scientific interests and foster informal diplomatic ties. These privately funded groups offer a necessary counterbalance to national Antarctic programs and enable more effective coordination of differential expertise and resources across national boundaries. In minimizing the entry costs of research, ensuring the primacy of science

[42] Secretariat of the Antarctic Treaty. (1991) Protocol on Environmental Protection to the Antarctic Treaty.

and encouraging collaborative systems, Antarctic research of this kind sets a valuable precedent for exploration of parallel realms of non-jurisdictional governance.

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Appendix

Appendix 1. Map of Territorial Claims (CIA)