

Antarctic Gateway Cities

Definition

Chua et al. (2014) define an Antarctic gateway port as a coastal or island port, able by its proximity to the Antarctic to benefit from, and control access to, Antarctic and Southern Ocean resources, including fishing, tourism and scientific support. Minimal characteristics of such a port include:

- (i) managers who maintain political and scientific interests in Antarctica;
- (i) good deep-water facilities for refuelling and re-provisioning ships;
- (i) an international airport close by; and
- (i) local infrastructure developed to facilitate exchanges of commodities and people.

For the purpose of this report, this definition is narrowed to include only those cities that were signatories to the 2009 Southern Rim Gateway Cities Agreement: Christchurch, Hobart, Cape Town, Ushuaia, and Punta Arenas (Statement of Intent Between the Southern Rim Gateway Cities to Antarctica 2009). This agreement underscores a commitment by the cities to cooperate and collaborate on Antarctic issues, such as science research, education and outreach initiatives, logistical frameworks, and business and tourism opportunities (Boekstein 2014). This statement of intent provides an interesting lens to analyse the Gateway Cities' cooperation and competition with one another, as it lays down an active objective to work together.

By confining our analysis to these five signatories, we are excluding other cities that could be considered Gateways under a looser definition. For example, China's engagement with Antarctica has dramatically increased over the last decade, as they built a third base at Dome A and upgraded their other two stations (Brady 2010). Alongside this Antarctic development, they built an Antarctic research and logistics base in Shanghai during the Austral summer of 2008/09, which sees vessels departing for the Antarctic (Brady 2010). Over the coming years, as the Chinese Government continues to increase Antarctic spending and step up domestic focus on its Antarctic program (Brady 2010), Shanghai may feasibly become a recognized Gateway City, but for the purposes of this report will not be discussed as such.

1) What are the key characteristics of the different Antarctic gateway cities, and the countries they are located in, with respect to their connections to Antarctica and, more specifically, to Antarctic research?

Christchurch

Christchurch is situated on the east coast of New Zealand's South Island and is over 2800 kilometres away from Antarctica. The port at Lyttelton is used for current transport of resources and personnel to Antarctica but also has a historic connection to the continent with the departure of many early expeditions, such as Scott's Discovery expedition form

1901 to 1904, leaving from the port (Roldan 2011). New Zealand has claimed rights over the Ross Dependency since 1923. New Zealand operates a year-round station, Scott Base, on Ross Island which is supported by the New Zealand Defence Force (NZDF) and the United States Antarctic Programme. Antarctica New Zealand is the body responsible for New Zealand Antarctic activities, it manages Scott Base and is in charge of carrying out New Zealand's Antarctic Policy, its headquarters are located in Christchurch. The NZDF and USAP provide New Zealand with flights to Scott Base (Roldan 2011).

Christchurch is not only the base for New Zealand Antarctic activities but also allows a number of other states to use Christchurch's facilities. Christchurch has had a continual connection with the United States Antarctic Program (USAP). Starting in 1928 Richard Byrd, an American, used Christchurch for the launching point for his Antarctic expeditions. In the 1950s the American Antarctic Programme came to Christchurch and since then there has been an ongoing presence from the United States in Christchurch. The United States fuel tanker and re-supply ship uses Lyttelton port for Antarctic activities and assists New Zealand with the transport of resources using the ship once a year. New Zealand and the United States share logistics, resources, communications, have shared scientific activities, and cooperated in search and rescue missions together, a long-standing Antarctic partnership has been achieved by these two nations. Christchurch also hosts delegates from the Republic of Korea who aim to create a base in the Ross Sea area. The Italian National Antarctic Programme also makes use of the joint logistics efforts between New Zealand and the United States (Roldan 2011). Christchurch supports the movement of people and resources to Antarctica and there is international Antarctic collaboration being carried out.

In terms of Antarctic education and research, Gateway Antarctica, part of the University of Canterbury, undertake a wide range of Antarctic research and teaching, the university provides Antarctic subjects and post graduate courses. The New Zealand Antarctic Research Institute (NZARI) works with research agencies to inform industry, government and community on Antarctica in a changing climate (Roldan 2011).

Hobart

The history of Australia's involvement in Antarctica originated in the 1820s and 1830s with expeditions who sought to find the continent and magnetic pole moved through Australian ports. The first Australian led expedition was carried out in 1911 by Douglas Mawson. In 1929 an official Australian expedition was carried out, The British Australian New Zealand Antarctic Research Expedition (BANZARE), the aim was to explore the coast of Antarctica below Australia and claim it. In 1933 the British government handed over Australian Antarctic Territory to Australia (Antonello 2013).

As the regional capital of Tasmania on the southern coast of Australia, Hobart is ideally positioned to serve ship traffic to Antarctica, it has a deep-water port and an international airport (Herbert 2014). It has an established maritime history, with shipping and ship-building remaining major industries today (Roldan 2011). Australia is one of the twelve original signatories of the Antarctic Treaty, and has a claim to a large part of East Antarctica (Roldan 2011).

Hobart is less reliant on Antarctic-related business than the South American Gateway cities (Bertram, Muir, & Stonehouse 2007). Hobart has also benefitted significantly from a longstanding government focus on establishing the city as a Gateway City (Hall, 2000; Hunt

2014), including substantial programmes of investment (Tasmanian Government 2015). Hobart Antarctic tourism is limited consisting of approximately 3-4 operators (Roldan 2011), but employment and income relating to Antarctic science activities is a stable and significant contributor to the region's economy (State Growth 2014).

As a wealthy nation, Australians are one of the main markets for Antarctic tourism (Michiel, Hasse & Amelung 2008), but Tourism from Hobart is limited by the long travel times imposed by geographical distance from the continent (Cool Antarctica 2016). Ship tours from Hobart generally take 26-30 days, and the price of these tours is also considerably higher than tours from Ushuaia and Punta Arenas, reflecting the longer distances. These longer travel times and higher prices undoubtedly limit the Hobart Antarctic tourist market (Cool Antarctica 2016).

In regards to Antarctic education and research Hobart has the University of Tasmania, which offers Bachelor's and Master's qualifications, a graduate diploma and a graduate certificate in Marine and Antarctic science (Roldan 2011). The Institute for Marine and Antarctic Studies (IMAS) is a centre for research and education being part of the University of Tasmania which carries out Antarctic, Southern Ocean and temperate marine research (Antarctic Tasmania 2014). The International Antarctic Institute, now based in Hobart, facilitates exchange programs and research between its 25 member organisations (Roldan 2011). Hobart has attracted numerous scientific institutions over the years (Roldan 2011). Hobart is the home of the Secretariat for the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), the secretariat provides support to the commission and annual meetings occur in Hobart. A division of The Commonwealth Scientific and Industrial Research Organisation (CSIRO) which is a national science agency, conducts research on climate, weather and atmosphere in the Southern Ocean. The Australian Antarctic Division (AAD) is part of the Department of the Environment, the AAD coordinates Antarctic research and runs the Australian Antarctic Program (Antarctic Tasmania 2014). As well as greatly enhancing the profile of the city, these organisations greatly benefit the region, providing 756 jobs in Tasmania, paying \$63.3m in wages and \$58m for goods and services (State Growth 2014). Hobart's position as a gateway city is reflected in the numerous public outreach services, education and research institutions and organisations that the city is home to.

Numerous countries have used Hobart's role as a gateway city to the Antarctic to benefit themselves. France's Antarctic operations are based in Hobart, and the Chinese, Americans, Norwegians, Italians, Japanese, Germans (Tasmanian Government 2015) and Russians have made use of the city's facilities (Bertram, Muir & Stonehouse, 2007). In this, Hobart is second only to Punta Arenas which serves fifteen national programmes (Roldan 2011). Just as Punta Arenas dominates this market with regard to the West Antarctic, Hobart has established itself in supplying the East Antarctic. Hobart's closest direct competitor, Christchurch, has a longstanding relationship with and a heavy reliance on the very large US Antarctic Programme, which is inherently risky. Christchurch has made some attempts to diversify, attracting the Italian and South Korean programmes, but is still heavily dependent on the US in a way which Hobart is not.

Cape Town

Cape Town, located on the southern tip of South Africa, has been a re-supply and commercial port since the middle of the 1600s (Roldan 2011). The Antarctica tourism industry in Cape Town is undeveloped in comparison to other gateway cities, mainly as a result of the distance to Antarctica from Cape Town is significantly more than what it is from South America, a larger amount of sea ice present throughout the year is also a barrier for tourist ships. However tourist flights do operate from Cape Town through the Antarctic Logistics Centre International (ALCI) for adventure and private tourism. Other tourist flights occur to the continent and focus on such activities as Emperor Penguin viewing and ski events (Roldan 2011).

South Africa runs scientific expedition from Cape Town and other states make use of Cape Town's Antarctic facilities. A polar research vessel, S.A. Agulhas, leaves for the Antarctic from Cape Town from its own zone in the wharf. Other states also make use of Cape Town's facilities, the national research programs of Russia, Belgium and Sweden have made use of communication facilities and office space offered in Cape Town (Roldan 2011). In 2002 The Dronning Maud Land Air Network (DROMLAN) was formed by the national programmes of eleven states with the aim to establish an intercontinental air link from Cape Town to East Antarctica for members of the Scientific Committee on Antarctic Research (SCAR) and the Council of Managers of National Antarctic Programs (COMNAP). Flights operate between October and March each year and are operated by the Antarctic Logistics Centre International (ALCI), a private company (Roldan 2011). The South African National Antarctic Program (SANAP) was established in 1959 and assists Antarctic research activities that occur in Dronning Maud Land and Marion and Gough Islands in the sub-Antarctic, the main office is located in Cape Town. The program uses science and technology to increase knowledge about the natural environment and life of Antarctica (Roldan 2011).

Ushuaia

Ushuaia is the gateway city located closest to Antarctica, being only 1131 km away from land near the Antarctic Peninsula. Ushuaia's involvement in Antarctica was not as strong as other gateway cities in the early 1900s, as it only had a small port that was not of interest to early explorers. It was not until 1991 that Ushuaia's port became useful for Antarctic activities with the creation of a new Argentine government that prioritised improving Ushuaia's facilities, such as the port and airport, establishing Ushuaia a gateway to the Antarctic. The size of the port has increased over the years and allows many vessels to be docked, while the airport has established flights to Antarctica (Roldan 2011). Over 90% of Antarctic cruises originate at Ushuaia's port during the tourism season (Vereda 2008). Antarctic tourists do not see Ushuaia as a potential complimentary destination to their travels, but just as a stepping stone towards their Antarctic voyage. This result highlights the image of Ushuaia as a Gateway to Antarctica, but diminishes its potential benefits from further business associated to Antarctic tourism (Vereda 2008). Ushuaia appears to be an Antarctic gateway city only for tourism, there is limited scientific or national programs originate from Ushuaia, this is likely due to the economic and political instability of Argentina. There is limited funds for Argentina's Antarctic Programme and the Programme's headquarters are currently located in Buenos Aires (Roldan 2001;COMNAP 2016a). Ushuaia is the hub for Antarctic tourism but is limited in its regards to any non-tourism Antarctic activities.

Argentina's first year-round station, Orcadas Station was established in 1904, since then Argentina has continually operated bases in Antarctica (COMNAP 2016a). The Argentine Antarctic Programme (DNA) is in charge of Argentine activities in Antarctica. Argentina maintains six permanent bases in Antarctica, on the Peninsula, it has numerous other seasonal (non-permanent) bases and refuges. Logistics are provided by the Argentine Army (COMNAP 2016a). The key focus areas of Argentine research in Antarctica include past and present ecosystems, observing natural systems, atmospheric physics and chemistry, and global climate change (COMNAP 2016a). Ushuaia is home to the Southern Scientific Research Centre (CADIC), created in 1969 to provide opportunities for scientists interested in undertaking research in Patagonia and Antarctica. The University of La Patagonia San Juan Bosco (UNPAT) houses the Centre for Antarctic Information and Publications (Roldan 2011). Argentine Antarctic research has key focus areas and has institutions to deal with scientific research in Antarctica.

Punta Arenas

Punta Arenas was created in 1843 as a penal colony. It grew as a naval base and a hub for repairs and re-supply for shipping around the southern parts of South America. From the 18th century Punta Arenas was visited by early Antarctic explorers who used the port to re-supply and repair their vessels and to update their exploration progress, the port was important for key items needed right before departure (eds. Snyder & Stonehouse 2006). Whaling ships in the early 20th century also used the port for such necessities (eds. Snyder & Stonehouse 2006;Elzinga 2013).

Chile lays a claim to a section of Antarctica which includes the Antarctic Peninsula and South Shetland Islands, and overlaps British and Argentinian claims. This claim stems from boundary disputes between Chile and Argentina early on, in 1893 a boundary line was created based on the strait between the two states. In 1940 Chile established its claim in Antarctica based on historical and geographical factors. Argentina followed Chile by laying an Antarctic claim in 1942, the claim was based on Argentina's western boundary and thought of an extension of this boundary. These two claims both overlap a claim by the United Kingdom in 1908 (Elzinga 2013). In 1945 an Antarctic naval zone was created based in Punta Arenas and from 1947 Chilean expeditions were carried out on Antarctic Peninsula islands. It was during this time the British set up bases on the Peninsula which worried Chile and Argentina, tensions were eminent as each state attempted to back up its claim. (Elzinga 2013). Chile has a lengthy history in regards to Antarctica and maintains its Antarctic claims to this day.

As Chile established Antarctic research stations Punta Arenas was used to supply these bases. Transfer of goods and personal from Punta Arenas to Antarctica was mostly achieved through shipping as aircraft operations were costly and difficult to maintain (eds. Snyder & Stonehouse 2006). In the early period Punta Arenas was a more popular port for Antarctic tourism due to its facilities and stability, however, as time progressed Ushuaia became the leading city as a result of its significant growth. Punta Arenas is used for smaller tourist ships, whose dock is closely located to the city centre, and a larger container port out of the city is used for bigger ships. Early on the US and later European states developed tourism activities out of Chile, while Chile had and still has no operations of their own, however, Chile has benefited economically from these operations. Punta Arenas is a popular port for ships heading to South Georgia, however, the journey to the Antarctic Peninsula and South

Shetland Islands takes a day longer than from Ushuaia (eds. Snyder & Stonehouse 2006). Punta Arenas is used for a small amount of cruise ship docking, but a larger amount of resource transport by ship (Hall 2015). Two flight operations are carried out from Punta Arenas and one US adventure tourism company operates from the gateway city (eds. Snyder & Stonehouse 2006). Punta Arenas is home to ship and aircraft tourism, however, its tourism operations are much smaller than that of Ushuaia's as a result of Ushuaia's proximity to the Antarctic Peninsula.

In terms of Antarctic research Punta Arenas is home to the Antarctic Laboratories Building "Ambassador Jorge Berguño Barnes", which has Antarctic biology laboratories, a paleontological collection and meeting rooms (COMP NAP 2016b). Chilean scientific operations in Antarctica are carried out by the Chilean Antarctic Institute (INACH) which is an organisation of the Chilean Ministry of Foreign Affairs. INACH organises, coordinates and manages scientific and technical activities, carries out expeditions and manages stations in Antarctica, and reports back to the Ministry of Foreign Affairs. INACH's headquarters are located in Punta Arenas. INACH and other financial programs fund universities and research organisations which are organised under the Chilean Antarctic Science Program (PROCIEN). These research programmes are managed and conducted in Antarctica under INACH. Chilean Antarctic research has a focus on the environment in physical and biological respects and in modelling the future (COMP NAP 2016b). Chile has bases on the Peninsula, South Shetland Islands and in the Patriot Hills-Union Glacier region. Its first base was established in 1947 on Greenwich Island, which was one of the first in Antarctica (COMP NAP 2016b). Chile has an active involvement in activities in Antarctica and has clear aims for its research in Antarctica.

The five cities reflect their name as Antarctic gateway cities as they provide public facilities, conduct and support scientific research, support Antarctic tourism, national Antarctic programs and logistical operations. Most cities have a deep historical connection with Antarctica and this has carried through to the present day.

2) What roles do Antarctic gateway cities assume with regard to environmental management, education and outreach, Antarctic science and Antarctic politics?

Outreach and Education

Antarctica presents particular challenges in outreach and education. As a remote and extreme environment that few people will ever visit, it can often seem foreign and disconnected to the public (Robertson et al. 2009). However, considering the significance of Antarctica in the global climate system and wider marine ecosystem, as well as its inherent wilderness and aesthetic values, its communication to the general public is imperative (Schroeter et al. 2015). For example, increasing public understanding of Antarctic climate science could possibly catalyze more substantial climate action (Schroeter et al. 2015), and engaging with students – from primary through to university graduate students – would help make Antarctic science more relevant and tangible (Robertson et al. 2009).

Acknowledging both the difficulties and benefits of Antarctic outreach and education, increasing public awareness of Antarctica became one of the priorities of the fourth International Polar Year (IPY) (Robertson et al.; 2009, Cheek et al.; 2011). The importance of public engagement is well articulated by Neufeld et al., who state that "the values that

people bring to at Antarctic are rooted in their experience elsewhere, at home, outside the Antarctic” (2014). The Gateway Cities have all, to a greater or lesser extent, developed outreach institutions and initiatives that work to connect that city’s citizens and its visitors to Antarctica and the Southern Ocean. This includes government run or funded institutions and programs, such as museums and community festivals, and private ventures, such as Antarctic science attractions (see Section 1 for specific examples).

There is a concentration of institutions that hold tangible cultural heritage, including objects in museum collections and Antarctic artworks, in Gateway Cities. This may be attributable to their proximity to the Antarctic community generally, leading to these physical objects being preferentially deposited in Gateway City institutions. For example, Canterbury Museum houses an internationally significant Antarctic collection, and has strong ties to the Antarctic Heritage Trust; this means that New Zealand’s Antarctic taonga is largely situated in Christchurch, increasing Canterbury Museum’s capacity to engage in Antarctic outreach. Beyond this physical concentration of Antarctic content in Gateway Cities, the city’s councils will actively choose to celebrate their Antarctic connections by creating their own content or events. The Antarctic festivals, monuments, film events, heritage trails and gardens described in Section 1 are all examples of how outreach and education can be used to proactively demonstrate Gateway City status.

In essence, the role of Gateway Cities as a logistical entry point to Antarctica is also upheld in their outreach: these are places where the general public can connect with Antarctica. Indeed, the commitment to communicating Antarctica to the public has been made patent by the signatories of the Southern Rim Gateway Cities Agreement, and these cities act as inspiration for one another in achieving this. On visiting Antarctic outreach facilities and events in Christchurch and Hobart, dignitaries from Cape Town expressed interest in establishing an Antarctic information centre, Antarctic-themed festivals, and ceremonies to mark the start of the summer season (Boekstein 2014). This is a good example of collaboration and sharing between the Gateway Cities, in line with their statement on intent.

However, it is important to note that, even in the context of outreach and education, the Gateway Cities can exhibit a competitive edge. For example, a stated goal of NZIceFest, a biennial Antarctic Festival in Christchurch, is to “cement New Zealand as the world’s leading ‘Gateway to Antarctica’” (NZ IceFest 2014). In 2000, a report published by the Tasmanian Polar Network described Tasmania as harbouring “the world’s most fertile and diverse Antarctic research, education and expedition support community” (Tasmanian Polar Network, 2000). These statements show that outreach and education can be employed by Gateway Cities to assert their political interests in Antarctica.

Politics

Sovereignty was and still remains one of the principal reasons for human endeavor in Antarctica (Scott 2013) This is reflected in the role that Antarctic gateway cities play. Out of the seven Antarctic claimant states, four have gateway cities – Argentina, Chile, New Zealand and Australia. All states with gateway cities are consultative members of the Antarctic Treaty System.

Even though Article IV section 1 of the 1959 Antarctic Treaty explicitly suspends territorial

claims in the region, and section 2 states that, “No act or activities taking place while the present Treaty is in force shall constitute a basis for asserting, supporting or denying a claim to territorial sovereignty in Antarctica or created any rights of sovereignty in Antarctica,” gateway states still view having a gateway city as a politically strategic move motivated in part by a political desire to further their interests in the area.

Each gateway state has explicit aims to maintain control and/or presence over the Antarctic region. Argentina’s Antarctic programme, the DNA, states that ‘the fundamental objective of the national Antarctic policy is to further Argentine sovereignty rights in the region.’ (DNA 2015) The Chilean Antarctic programme, INACH, lists as one of their key objectives the need to ‘strengthen and increase the Chilean influence in the Antarctic Treaty System, promoting the state’s interest in regards to Antarctica, particularly through its national scientific programme...’ (INACH 2014) One of the Australian Government’s main objectives in the Antarctic is to: “preserve Australia’s sovereignty over the Australian Antarctic Territory, including our sovereign rights over adjacent offshore areas”, with a specific outcome of “[advancing] Australia’s strategic, scientific, environmental and economic interest in the Antarctic”, which is through “protecting, administering and researching the region.” (Australian Government 2014) In South Africa, SANAP has stated that it wishes to “optimise present and preserve future options for South Africa in the region.” (SANAP 2015). The New Zealand programme, Antarctica New Zealand, also maintains on behalf of the New Zealand government, its right of sovereignty over the Ross Dependency, and lists its first strategic priority is to “[maintain] a continuous and effective New Zealand presence in the Ross Dependency” (Antarctica New Zealand 2014)

Even though activities taking place in Antarctica post-1959 can technically not be used to support claims or bases of claim *vis-à-vis* Antarctic Treaty parties, “their relevance cannot be disregarded in the event that a sovereign claim to Antarctica is disputed by a state that is not party to the Antarctic Treaty.” (Scott 2013 p.12)

From a strategic perspective, a gateway city’s role is critical. There are a few other ways of accessing Antarctica, but the overwhelming majority of travel to the continent – either via tourism or national science programmes – is through these gateway cities. (Murray, 2004) They are thus the key facilitators of presence in Antarctica, which is a critical strategic advantage in having the state’s interests in the area promoted.

Environmental Management

The gateway cities’ role in environmental management isn’t clearly defined, with limited guidelines for the gateway cities on the subject. Currently gateway cities still have little to nothing to do with directing human activity in Antarctica, as most management responsibility of Antarctic affairs are exported to either an international body such as IAATO or to one of the national science programmes (Murray 2004)

In terms of waste disposal, national science programmes usually dispose of their waste in their home state (Murray 2004). Tourist vessels, however, are required under IAATO to sort waste and dispose of said waste at their gateway port. (Snyder 2006) The disposal of waste produced by tourist vessels is an ever-increasing environmental management problem gateway cities are facing, Ushuaia especially. (Argentina Independent 2014) Ushuaia has waste disposal issues as a result of the limited space available for waste disposal on the

island and the increasing supply of waste coming in from the growing number of Antarctic cruise tourists. (Argentina Independent 2014) As tourism is expected to continue to increase, waste disposal from Antarctic vessels will become an even more compounded problem for Ushuaia.

In terms of Antarctic environmental management, gateway cities play a small role. Under the 1991 Protocol on Environmental Protection to the Antarctic Treaty (“the Madrid Protocol”), environmental impact assessments must be carried out and approved for any proposed Antarctic activity before departure, the initial assessment must be done by the state that organised the activity or the state in which the activity is to depart from – i.e. the gateway state (Tin 2013; Maher 2011). While the 1973 International Convention for the Prevention of Marine Pollution from Ships (“MARPOL”) allows inspections of vessels by states while it is in their port, there is no similar ruling for port state control in the Antarctic Treaty System (Swanson 2015)

It has been proposed that port states should exhibit more control of vessels departing from their ports to ensure environmental standards are in place and to reduce the potential for disturbance to the Antarctic environment. (Swanson 2015; Snyder 2006) The environmental pressure-group ASOC has voiced their concern that there are not enough safeguards in place in the case of tourist vessels (as well as fishing vessels) which operate under flags of convenience in Antarctic waters (and are thus only subject to flag state jurisdiction and not bound by the Madrid Protocol) (Bertram 2007.) ASOC have argued that if port state jurisdiction could be applied, a more rigorous inspection of fishing and tourist vessels within the gateway ports would occur (Bertram 2007)

This has been suggested elsewhere, notably in a draft memorandum to the 25th Antarctic Treaty Consultative Meeting in 2002, where it was proposed that, as a means to enhance the Protocol, all vessels bound for the Antarctic and calling at gateway ports should be subject to inspections at the gateway cities which – as all gateways are owned by Treaty parties – could be designed to conform to requirements laid down by the Treaty parties (Bertram 2007)

However, although port state jurisdiction would be practical and beneficial to Antarctic environmental management, it has not been explored further due to the various sovereignty issues at hand. Considering that five of the six gateway countries that would be involved in such a development are claimants, and the fifth is interested in claiming in the future, port state jurisdiction has been considered as a tool for furthering the gateway countries’ status in the region and strengthening their claims.

Science and Research

The fundamental role of Gateway Cities in supporting science activities is in their provision of access to the continent through logistical and science support. This is facilitated by various national programs, whose operations are situated in Gateway Cities. While research science programs do not necessarily need to be located near national program headquarters, there is a concentration of Antarctic science carried out in Gateway Cities.

At a tertiary level, Gateway Cities' institutions often support university programs or have established Antarctic research faculties. In Christchurch, Gateway Antarctica describes itself as a "focal point and a catalyst for Antarctic Scholarship" (University of Canterbury 2016). Even in its name, Gateway Antarctica, the University of Canterbury is highlighting the special position that Christchurch holds with regards to Antarctic access and connection. Similarly, the University of Tasmania's Institute for Marine and Antarctic Studies takes advantage of its Gateway status, with aims to be an "internationally recognized centre of excellence for marine and Antarctic research and education" (IMAS 2016). In South Africa, the closest tertiary institution to Cape Town is the University of Stellenbosch, which offers Antarctic focused studies (Academic Sun 2016) and has previously hosted a Scientific Committee on Antarctic Research (SCAR) History workshop (Nash 2016). In Ushuaia, the Universidad Nacional de Tierra del Fuego offers biology and atmospheric courses that, despite not being purely Antarctic studies, contain Antarctic focused content (untdf.edu.ar, 2016). Punta Arenas is home to an Antarctic laboratories building, which houses a palaeontological collection and biology labs, at the Instituto Antártico Chileno (Chilean Antarctic Institute/INACH), which oversees Chilean science in Antarctica (COMNAP 2016a).

All Gateway Cities, to a greater or lesser extent, are home to Antarctic science research. Significantly, the science conducted can be used as a political tool for asserting a nation's territorial claim or other national interests. One of the main areas of research in the Chilean Antarctic Science Program is into the "relationships between South America and Antarctica" (COMNAP 2016a), a factor that is fundamental to their territorial claim.

3) Given the economic drivers and national politics, is the future likely to be increased competition or increased collaboration between the gateway cities?

Competition between Private Tourism Operators

Antarctic tourism has many of the characteristics of an oligopoly, as described by Stabler, Papatheodorou and Sinclair (2010):

- Relatively small number of tour operators
- Significant barriers to entrance into market
 - Capital to buy/lease a suitable boat and equipment
 - Human capital (experience) to operate in the Antarctic environment
 - Tourism licence
 - Ongoing costs and expertise to comply with environmental requirements
- Capital indivisibility

In oligopolies, price competition is ineffective, because one company lowering its prices will lead to immediate price reductions by rivals as these rivals seek to preserve their market share. However, if a company raises its prices in order to increase its profits, its sales will drop. The result is price stability determined by the prevailing market rate (Stabler, Papatheodorou & Sinclair 2010). As a consequence, a feature of oligopolies is that instead of direct price competition, product differentiation takes place, with firms identifying and serving niche markets (Stabler, Papatheodorou & Sinclair 2010). Antarctic examples of diversification are tours specialising in wildlife, photography, hiking, skiing, kayaking, also sailing ship expeditions and bespoke activity programmes. A cursory look at tours from Punta Arenas also indicates route diversification involving other cities such as Santiago and Buenos Aires. Where large companies exist within oligopolies, competition can also take the form of branding and strategic pricing, using economies of scale to preserve profits (Stabler, Papatheodorou & Sinclair 2010). However, within the Antarctic market, the industry restriction against large ships landing makes it more than usually difficult for large companies to exploit economies of scale.

A key part of the Antarctic market seems to be that it is comparatively steady, and limited as much by available berths as by potential customers. This balance between supply and demand may preserve profitability, as perhaps shown by the longevity of many IAATO tour

operators. In such a market, there can be reduced need for competition, which is both expensive and time consuming.

At present, Ushuaia has by far the large market share, due mainly to its geographical location with respect to the Antarctic Peninsula. No other Gateway City appears to be directly competing with Ushuaia. Tourism from Cape Town, Hobart and Christchurch is to East Antarctica, and therefore these countries' markets are not in direct competition with Ushuaia. Punta Arenas is, to some extent, competing by offering fly-cruise tourism to the Peninsula, which helps offset the longer travel times from Chile, but is generally more expensive. However, such fly-cruises usually return to Ushuaia, so it would be more accurate to see this as a collaborative relationship.

Other reasons for collaboration include:

- Personal relationships within a small industry
- Common membership of IAATO
- Search and rescue obligations to each other
- The "one ship, one place, one moment" principle which portrays the illusion to tourists that they are the only ship in the area, this requires ongoing cooperation between rival operators

Going forward, Ushuaia's control of the ship-based tourist market is likely to continue with very little change in the medium term (Rolden 2011). In the longer term, as runways and tourist-grade facilities become established within Antarctica (Bertram, Muir and Stonehouse 2007), this will allow other countries to enter the Antarctic tourism market, and will erode the status of the Gateway Cities (Bertram, Muir and Stonehouse 2007). An unlikely but possible development could be a government-backed Chinese tourism industry, making use of Chinese facilities in the Antarctic to strengthen their presence in the region. Two large risks remain largely unaddressed, which are the problems caused by unpermitted and especially private tourism, and the likelihood of an environmental disaster caused by a permitted tourist ship.

Competition between Gateway Cities

The local governments of Gateway Cities have a clear incentive to encourage and develop successful and profitable parts of their economies, including their tourism industries. In Ushuaia in 2009, tourism directly accounted for 24% of employment, and indirectly for 553% (Herbert 2014). Direct public sector involvement in commercial activities (such as tourism) is not generally successful. This is due, at least in part, to the heavily bureaucratic nature of government, long planning cycles, compared to very short-times frames in commerce, and to diverse and often contradictory government policy objectives and stakeholders. Nevertheless, several of the Gateway cities have assisted their Antarctica-related economies by indirect methods, particularly through infrastructure investment and the development of local Antarctic-themed tourism. Improvements to Ushuaia infrastructure have included a new international airport and its subsequent extension (Herbert 2014) plus extension of the harbour (Herbert 2014); Hobart has seen a \$38m airport extension (Tasmanian Government 2015). Also of great interest to the Gateway cities, and to their national governments, has been competition for other countries' national Antarctic programmes and scientific organisations.

Antarctic-themed tourism

A number of Antarctic-related tourist attractions have been established, to a greater or lesser extent, in Gateway cities. The nature of these attractions is broadly similar across the cities, and Christchurch and Cape Town in particular have co-operated to encourage the development of such attractions in Cape Town (Purchase 2009). The nature of the activities demonstrate considerable city council involvement, including supporting and funding festivals, and encouraging themed museum displays (City of Cape Town 2016). The replica Mawson House on the Hobart waterfront is a strong example of support at both city and government levels, as the site was provided by the Hobart City Centre and the Federal Government Department of the Environment gave a grant of \$350,000 (Leane 2014). The Christchurch Ice Fest is another such example, requiring a \$0.5m commitment by the council towards organising costs (Cairns 2015).

Typical Antarctic-themed tourist activities include: Museum displays, such as the Islands on Ice display in Hobart (Rolden 2011), and a permanent display in Canterbury Museum (Rolden 2011). Cape Town has Antarctic exhibits at both the Two Oceans Aquarium and the MTN Science Centre (City of Cape Town 2016). The Maritime Museum in Punta Arenas has a display on the rescue of Shackleton's Endurance expedition (Rolden 2011), and Ushuaia has exhibitions of artefacts from Nordenskjöld's expedition and models of Antarctic ships (Rolden 2011). Festivals: The two Christchurch Ice Fests have been hugely successful, but the 2016 festival is in doubt, due to the \$1.5m funds required (Cairns 2015). The Hobart Midwinter Festival was popular at its inception in 2001 (Rolden 2011), but support evidently declined; the festival was relaunched as THAW in 2015, to run biennially with the Wooden Boat Festival, and with only very limited city funding of \$32,500 (City of Hobart agenda 2015). Ushuaia has a week-long Antarctic festival (Rolden 2011). Tours e.g. the Polar Pathways driving tour around the Hobart region (State Growth 2014), and historic walking tours around Hobart, Punta Arenas, Ushuaia and Christchurch (Rolden 2011). The New Zealand Antarctic Centre has been very successful and the Cape Town Science Centre are keen to develop an attraction along similar lines (Purchase 2009), but the Antarctic Adventure attraction in Hobart (1997-2004) failed (Rolden 2011) and has not been replaced.

For New Zealand and Australia, whose Antarctic foreign policies are very conservative regarding tourism, these Antarctica-themed attractions are a convenient way to promote an awareness of Antarctica which does not conflict with their aim of achieving strong environmental controls on the region. However, it seems unlikely that these attractions are sufficient to attract significant numbers of tourists to any Gateway City who would otherwise not have visited. Nor is it clear whether money spent at these attractions represents additional money into the region, or whether these tourists would have spent their time, and money, elsewhere. It is plausible that local visitors may generate some real, rather than redistributed, spending. They do, however, generate international prestige for their city, and go some way to justify their governments' Antarctic expenditure to current and future taxpayers.

National Programmes and Scientific Institutions

Attracting the national programmes of other nations to use Gateway facilities is a significant economic contribution to the Gateway region, a way to offset the host nation's own Antarctic programme costs, and potentially a way to build new and powerful diplomatic and scientific relationships. It is therefore of great interest to both cities and their national governments. Cape Town's statement (City of Cape Town 2016) emphasises the economic

developments of being a Gateway city, particularly with regard to supplying European, Russian, and Indian links to Antarctica. The Australian and Tasmanian governments have explicitly identified the ongoing development of Hobart and Tasmania to attract national programmes (Australian Government 2013).

Both Punta Arenas (Rolden 2011) and Hobart (Tasmanian Government 2015) have secured an impressive number of other countries' national programmes as customers, and the Tasmania Strategic Plan identifies the Australian Government's intention to build up Hobart to be the world's leading Antarctic Gateway by continuing this trend (Steel 2008). The branding of Hobart as Gateway to the East, rather than the whole of, Antarctic (Rolden 2011) is probably more realistic than this government ambition, since Hobart's potential to expand in this market is limited by its geography and large distance between the city and the many stations around the Peninsula. Punta Arenas supplies fifteen national programmes (Rolden 2011); Hobart and Hobart-based businesses have supplied about half this number (Tasmanian Government 2015). By contrast, Ushuaia supplies no regular national programmes (Rolden, 2011). Cape Town supplies the Germans (ZARGES 2016) and will supply a future British base (City of Cape Town 2016). Christchurch is dominated by the USAP, although moves to attract other national programmes continue (Rolden 2011). South Korea opened a Christchurch office in 2014 (Antarctica New Zealand 2014), and both Christchurch and Hobart are looking to build long-term relations with China (Radio New Zealand 2015). The supply of national programmes can be very significant, with a wide range of services being supplied, from power, equipment and waste to accommodation and legal advice (Tasmanian Polar Network 2016). In Hobart, nearly half the goods supplied were locally sourced (Herbert 2014).

Hobart has also successfully established itself as the base for a wide range of national, Commonwealth and International scientific institutions, including CCAMLR, ACAP, SOOS and CSIRO (Tasmanian Government 2015). In 2011/12 these organisations contribute 756 jobs to the region, \$63.3m in salaries and \$58m in purchasing goods and services (State Growth 2014). The presence of so many these organisations is also a diplomatic and strategic coup for Hobart, and strengthens its profile as a Gateway City immensely. Cape Town is seeking the establishment of the Belgian Polaris Institute within their city (City of Cape Town 2016). Christchurch has COMNAP.

Countries are also able to establish their own national institutions within their Gateway Cities, such as the Antarctic Chilean Institute in Punta Arenas (Rolden 2011), Antarctica New Zealand within Christchurch, and a number of Australian institutions in Hobart (Tasmanian Government 2015). In addition, all Gateway Cities support university level education programmes (Rolden 2011). These supply skilled researchers and other specialist Antarctic support, as well as enhancing the city's prestige and supporting their country's national commitment to scientific research in Antarctica. These represent another form of competition, albeit one in which governments can only compete indirectly via financial support and similar incentives.

Competition is certainly occurring between Gateway Cities, principally for the supply of national programmes. This competition is motivated by economics, prestige and international standing. With regard to national programmes, Hobart and Punta Arenas hold the advantage due to their established relations and their proven track records. Their dominance is likely to continue as the other Gateway Cities will find it difficult to win

national programmes away from their established relationships with Punta Arenas and Hobart. However, new countries developing an Antarctic presence will be competed for by the Gateway Cities.

The competition between cities does not prevent co-operation. The Statement of Intent signed between the five cities in 2009 was a clear acknowledgement of this. And although this Accord was not renewed 18 months later as intended, this is not necessarily an indication that co-operation has broken down.

National Policies

All five of the countries with Gateway Cities clearly support Antarctic science, as demonstrated by their ongoing national scientific programmes on the continent. However, there is a clear difference in national strategic interests between those four countries which have territorial claims to parts of Antarctica, and South Africa, which does not.

South Africa

South Africa, which does not have a territorial claim to Antarctica, emphasises the peaceful scientific uses of Antarctica, and the economic benefits at home of developing their Gateway status. The South African government website states that, “Scientific and technical development and cooperation in Antarctica and globally, will be promoted and environmental protection will be supported” (African National Congress 1994). The ruling party in South Africa, the ANC, has its own party website, with a similar statement emphasising science (African National Congress 1994).

Countries with Antarctic claims

By contrast, Chile, Australia and New Zealand, all of which have territorial claims in abeyance through the Antarctic Treaty, strongly emphasise their national interests in the region in addition to the scientific value of the continent. All of these countries also refer to diplomatic benefits to be gained through their nation’s active participation within the Antarctic Treaty System. Australia and New Zealand also explicitly cite the protection their large-scale economic interests, the economies of Tasmania and Christchurch respectively, and the development of Antarctic resources.

Chile’s Ministry of Foreign Affairs states explicitly their concern for protecting their sovereign claim to their Antarctic territory Principles of Chile’s Foreign Policy webpage, Ministry of Foreign Affairs of Chile (Ministry of Foreign Affairs of Chile 2016). They also cite diplomatic benefits to be gained through their Antarctic involvement (Ministry of Foreign Affairs of Chile 2016).

The Australian Government’s Department of the Environment’s Statement of purpose and values refers to both sovereignty issues and economic benefits to be derived directly from the region (Australian Government 2013). Similarly, the 20-year Australian Antarctic Strategic Plan (Press 2014) identifies a number of sovereign issues regarding their ongoing access to the area, and also highlights diplomatic influence to be gained over the area through their involvement in the Antarctic Treaty system.

For Antarctica New Zealand (Antarctica New Zealand 2016), the top priority for the New Zealand government in Antarctica is preserving the country’s sovereignty claim in the region through an ongoing presence on the continent. This list also includes diplomatic and

economic considerations including protections of the toothfish industry, and the growth of the Christchurch economy.

The Argentine Antarctic policy has as its main purpose the defence and strengthening of the Argentine claim https://en.wikipedia.org/wiki/Argentine_Antarctic_Program (“Auditoria general de la nacion: programa de gestion ambiental y turismo”).

This government-level competition in Antarctica is perhaps less obvious than competition between the cities themselves and their tour operators. However, competition over sovereign claims, competition for future resource allocation, and competition for present and future diplomatic benefits lie at the heart of each country’s support for their Gateway City, for their economies and particularly through their science programmes. Science has become the principle means by which governments assert their sovereign interests and by which they ensure their ongoing physical presence on the continent.

Conclusion

While competition within the tourism industry is muted, significant competition is occurring within and between the Gateway Cities at the level of cities and governments. Governments of New Zealand, Australia and Chile all see their involvement within Antarctica as being driven by sovereignty, economics, and diplomacy, and it is likely that Argentina also does so. For Cape Town, the sovereignty issues are absent, but the other two motives remain. For this reason, governments of Gateway Cities do compete through their cities, but they are at present doing so through peaceful and not directly confrontational methods such as scientific research and funding, and advantageous economic strategies.

This competition will continue, but is likely to remain at the same level in intensity and nature for the foreseeable future, particularly because Chile, Australia and New Zealand see these benefits accruing due to their active involvement within the Antarctic Treaty System rather than in opposition to it. Threats to this stability do exist, within the Antarctic itself (eg, mineral extraction), from regional politics, such as a future Falklands conflict, and due to global issues such as climate change. The greatest stressor on the situation in the medium term is likely to be the continued growth of new powers such as China, India and Korea within Antarctica; this seems more likely to draw the Gateway Cities together due to their shared interests in the status quo rather than driving them apart.

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