



LUND UNIVERSITY

# **FROZEN POLITICS ON A THAWING CONTINENT**

*A Political Ecology Approach to Understanding Science and its Relationship to Neocolonial and Capitalist Processes in Antarctica*



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## **Abstract**

Despite possessing a unique relationship between humankind and the environment, and its occupation of a large proportion of the planet's surface area, Antarctica is markedly absent from literature produced within the disciplines of human and political ecology. With no states or indigenous peoples, Antarctica is instead governed by a conglomeration of states as part of the Antarctic Treaty System, which places high values upon scientific research, peace and conservation.

By connecting political ecology with neocolonial, world-systems and politically-situated science perspectives, this research addressed the question of how neocolonialism and the prospects of capital accumulation are legitimised by scientific research in Antarctica, as a result of science's privileged position in the Treaty. Three methods were applied, namely GIS, critical-political content analysis and semi-structured interviews, which were then triangulated to create an overall case study. These methods explored the intersections between Antarctic power structures, the spatial patterns of the built environment and the discourses of six national scientific programmes, complemented by insights from eight expert interviews.

This thesis constitutes an important contribution to the fields of human and political ecology, firstly by intersecting it with critical Antarctic studies, something which has not previously been attempted, but also by expanding the application of a world-systems perspective to a continent very rarely included in this field's academia. It also highlights the importance of conducting interdisciplinary research, demonstrating the utility of applying and connecting multiple theories and methods to an individual context to draw out nuance within a case study.

Results showed that science is used to legitimise a neocolonial present on the continent, as well as acting as a facilitator for states to act upon future capital accumulation interests. It was found that the emphasis placed on scientific governance and leadership means that powerful states are able to consolidate political power through the Antarctic Treaty, reifying Western scientific knowledge hegemonies to the exclusion of developing nations. Furthermore, narratives of managerial necessity and environmental stewardship were also used as mechanisms of exclusion, creating a dichotomy between environmentally responsible states and those perceived to have resource-focussed intentions. This is despite all nations analysed being found to have resource interests, albeit to differing degrees.

The enabling of this neocolonial order and foot-holding for future resources is facilitated by a cognitive disconnect between nations' politically motivated Antarctic programs and the self-professed neutrality of scientists, which quells potential resistance to these insidious interests on the ground. Parallels with the rapidly melting Arctic are also drawn, where resources are poised to be extracted, raising questions of whether a similar scenario will play out in the Antarctic in the future, should the Treaty dissolve under the pressures of a climate-strained world.

**Keywords:** Antarctica, Political Ecology, Neocolonialism, Capital Accumulation

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## Glossary

**AIV**: Article IV (of the Antarctic Treaty)

**ASSPS**: Amundsen-Scott South Pole Station

**ATS**: Antarctic Treaty System

**BAT**: British Antarctic Territory

**CCAMLR**: Convention for the Conservation of Antarctic Marine Living Resources

**CPCA**: Critical-Political Content Analysis

**CRAMRA**: Convention on the Regulation of Antarctic Mineral Resource Activities

**CSM**: Case-Study Method

**GIS**: Geographical Information Systems

**IGY**: International Geophysical Year

**IPY**: International Polar Year

**SCAR**: Scientific Committee on Antarctic Research

## **Frozen Politics on a Thawing Continent:**

### **A Political Ecology Approach to Understanding Science and its Relationship to Neocolonial and Capitalist Processes in Antarctica**

*“Every day some new fact comes to light - some new obstacle which threatens the gravest obstruction. I suppose this is the reason which makes the game so well worth playing.”*

*Robert Falcon Scott – Personal Journal*

*“Outside, the silent wilderness surrounding this cleared speck on the Earth struck me as something great and invincible, like evil or truth, waiting patiently for the passing away of this fantastic invasion...”*

*Joseph Conrad – Heart of Darkness*

## **1. Introduction**

At the southern-most point of planet Earth, the icy continent of Antarctica lies beyond the reaches of most commonplace imaginaries. The last landmass to be ‘discovered’ by European explorers, the Antarctic is defined as all land and ocean below 60°S, covering an area of over 14million km<sup>2</sup>. Only the fringes of the continent remain ice-free, with 98% of Antarctica dominated by glaciers and ice-sheets, and characterised by extremely harsh, cold and windy weather (Redd, 2012). The continent has no indigenous population; the absence of humans for most of history has effectively rendered Antarctica a clean slate, isolated and in a manner, protected from exterior global events. However, since humanity made landfall in this once untouched environment, the continent has become entangled within the geopolitical and economic world-system that has governed the rest of the world since the Industrial Revolution (Zarankin & Senatore, 2005).

Despite this unique relationship between humankind and the environment, Antarctica is markedly absent from literature produced by both human and political ecology scholars, and is also thus far largely overlooked within literature produced in neocolonial and world-systems academia (Dodds, 2006). Its frequent distortion or complete omission by map projections (Routley, 2017) does little to stimulate critical discussions over this vast continent and the multifaceted political, ecological and socio-economic processes that have shaped the landscape over the past 250 years since humanity’s arrival.

In light of this omission, by applying a political ecology lens to Antarctica and its geopolitical structures, this thesis will aim to fill a gap in the current literature by prompting critical reflections on the privileging of science in the Antarctic context. By connecting and applying neocolonial, world-systems and politically-situated science perspectives, this research will discuss how Antarctic space has been utilised as a novel arena for the processes of neocolonialism and prospective capitalist accumulation through mechanisms of scientific research. Using an interdisciplinary triple-pronged methodological approach, it will deconstruct how science has been used as a key tool for the legitimisation of Antarctic exploitation by dominant political interests, and how the casting of the Antarctica as *terra scientifica* has helped to crystallise a neocolonial hegemonic order on the continent.



## 2. Background

This section briefly outlines key information relevant to this thesis, divided into geographical, historical and political sections.

### 2a. Geographical Background

Antarctica is the coldest, driest and windiest place on Earth (AAD, 2019), is 90% ice-covered and contains 70% of the world's fresh water. It is also geographically interconnected with global climatic, atmospheric and oceanographic processes, notably its interaction with global thermohaline circulation, its importance for the world's albedo effect and its critical potential to impact global sea-levels. Due to this connectivity, any disturbances within the Antarctic environment will have serious compounding effects for the rest of the planet (Solomon et al., 2008). As a result of climate change, Antarctica is predicted to warm by over 3°C this century. Weather patterns have started to shift, with warmer temperatures and warm-water current intrusions causing West Antarctica to thin at ever-increasing rates (Davis et al., 2005). Should the entire Antarctic ice-sheet melt, it would contribute over 60m to global sea-level rise (NSIDC, 2002).

With respect to geological history, Antarctica is known to have been connected with Australia, South America and India via the Gondwanaland landmass some 550-180 million years ago. Prospecting for offshore oil and gas in Australia and South America has indicated that multiple areas in Antarctica, notably the Ross and Weddell seas are likely to have similar geological compositions, meaning they may contain significant petroleum reserves (USGS, 1974). Some estimates have speculated that there could be up to 36bn barrels of oil in the Southern Ocean (Reed, 2017). Onshore, coal deposits have been discovered in various locations across Antarctica, however, initial studies suggest that quality is poor, with deposits at present being locked under ice up to 2km thick.

Other mineral resource deposits, including iron, copper, titanium, uranium, cobalt and manganese, have also been discovered in significant quantities across Antarctica, both on and offshore. However, what is known about these resources is based on few samples, and much of these speculated reserves are not economically viable, as the deposits lie under thick ice sheets or sea-ice. It is thus too dangerous at present to exploit these resources, due to extreme weather conditions, geological constraints, permanent darkness in winter and a current lack of deep cold-water extraction technologies, not to mention the large transportation distances from consumer markets (Peterson, 1980).

### 2b. A Brief Historical Background

From the 1800s onwards, reports of plentiful fish, whale and seal stocks in the Antarctic drew vessels from colonial powers, including Britain, Norway and France to the region to exploit its resources. Within the first 25 years of human activity, Antarctic fur seals were almost completely eradicated, due to being hunted for their pelts, while multiple whale species, including the Blue, Fin and Minke, were also hunted to near-extinction for their oil, blubber and meat, particularly with the advent of pelagic whaling (Stein, 2019). Large-scale commercial fishing did not begin until the 1970s, when

trawler fleets and long-line fishing began to arrive, targeting krill, tooth- and ice-fish populations – this marine resource harvesting continues to this day.

Despite the abundance of marine resources at the coast, successive expeditions failed to penetrate the continental interior; it was not until 1892 that the discovery of plant biota and fossil wood in the region led to a flurry of intense geographical and scientific study (Lambert, 2017). Seventeen expeditions were then launched from ten nations in what was termed the “Heroic Era of Antarctic Exploration”. Roald Amundsen of Norway became the first man to reach the South Pole in 1911, narrowly beating British explorer Robert Falcon Scott, whose entire party died in the attempt.

This series of ‘heroic’ activities culminated in Britain staking a claim to a sector of the Antarctic in 1917<sup>1</sup>, with the eventual aim of incorporating the entire continent into its Empire. This was substantiated through further claims later made by Britain, via its then-colonies of New Zealand and Australia, provoking Norway to cement its land-claims in the region in 1939<sup>2</sup>, alarmed by the encroachment and spread of dominance of the British Empire and the threat this posed to its whaling interests. Chile and Argentina also made claims in 1940 and 1942 respectively, albeit in areas already claimed by the British, leading to two decades of friction (Headland, 1989; Larrain, 2004).

After WWII, the USA and the USSR also began to take interest in Antarctica. The proto-conflict that ensued between the two countries led to the fear of cold-war tensions spilling over into Antarctica. Whilst never asserting their own claims, these nations continue to ignore previously established territories, yet reserve the right to stake their own. This tension, combined with increasing scientific and resource interests, culminated in the International Geophysical Year (IGY) of 1957-58, which promoted global scientific co-operation in Antarctic research. The IGY led to the establishment of over 50 bases within Antarctica, laying the groundwork for the formation of the Antarctic Treaty in 1959.

### 2c. Political Background and the Antarctic Treaty

The Antarctic Treaty was initially signed by twelve nations in 1959, including the seven claimants<sup>3</sup>, and came into force in 1961. The key tenets of the Treaty were that Antarctica should be used for peaceful purposes only (i.e. banning military and nuclear testing on the continent), freedom of scientific research, cooperation, and exchange of information between countries. All actions should uphold the three fundamental values of science, conservation and peace (ATS, 2011a).

Antarctic Treaty membership takes on two forms;

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<sup>1</sup> The United Kingdom had asserted sovereignty over the Falkland Islands in 1833, extending this to the South Shetland Islands, South Georgia, South Orkney, Graham’s Land and the South Sandwich Islands in 1908, before finally extending this into include all territory in the sector extending to the South Pole.

<sup>2</sup> France had previously claimed Adelie Land in 1840, the borders of which were formalised with the UK in 1938.

<sup>3</sup> The original twelve signatories to the Antarctic Treaty in 1959 included the seven claimants (United Kingdom, France, Norway, Argentina, Chile, Australia and New Zealand) as well as the USSR, USA, Belgium, Japan and South Africa.

- Consultative status, entitling states to participate in Treaty meetings, submit working papers and partake in decision-making. This is gained by demonstrating significant interest in Antarctica, by “*conducting substantial scientific research there*”.
- Non-consultative parties, who are invited to meetings but are not allowed to vote or submit working papers.

Currently, there are 53 states who have acceded to the Treaty, 29 of which are Consultative<sup>4</sup>, and 24 Non-Consultative parties (ATS, 2019). The Treaty is widely regarded as one of the most successful agreements in the history of mankind; there has never been a war in Antarctica, and countries for the most part operate cooperatively and peacefully in pursuit of scientific and environmental goals (ALE, 2019).

Despite this, Article IV (AIV) of the Treaty has led to some controversy. It states:

*“Nothing contained in the present treaty shall be interpreted as... a renunciation of previously asserted rights of, or claims to, territorial sovereignty in Antarctica...no acts or activities taking place shall constitute a basis for asserting, supporting or denying a claim to territorial sovereignty...”*

(Article IV of the  
Antarctic Treaty)

Instead of abolishing them, AIV effectively ‘freezes’ the territorial claims made by the seven nations. This caveat is regarded by many as “ingenious and innocuous”, as it prevented the escalation of tension between the claimant nations, as well as prohibiting the staking of new claims on the continent by other countries. However, others view AIV as a mechanism which both rewards and gives longevity to the original colonialist countries’ motives, as nothing in the Article stops these claims from being reinstated in future, should the Treaty dissolve (Scott, 2011, p1).

Key agreements and working parties under the Treaty include;

- The Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) of 1982. This operates to protect marine life by monitoring fisheries and other species harvesting in the Southern Ocean, using ecosystem-based management in response to increasing commercial interests (CCAMLR, 2015).
- The Protocol on Environmental Protection to the Antarctic Treaty of 1998, henceforth referred to as the Madrid Protocol, which crucially prohibits any activity relating to mineral resources for 50 years, except for scientific research purposes. The protocol will be up for renegotiation in 2048 (ATS, 2011b). This Protocol was briefly preceded by CRAMRA<sup>5</sup>, an agreement designed in 1988 to manage and develop Antarctica’s non-renewable resources. However, this broke down and later developed into the Madrid Protocol.

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<sup>4</sup> A full list of countries and parties to the Treaty can be found in Annexe 1.

<sup>5</sup> Convention on the Regulation of Antarctic Mineral Resource Activities.

## 2d. Background Summary

This background information has provided the fundamentals of the geography, history and politics of Antarctica. In doing so, it demonstrates the long-held political and economic interests of states in the continent, and outlines the main structures of the ATS, the current political configuration to which Antarctica is governed, highlighting the positioning of science as the core mechanism of this. With this in mind, situating contemporary Antarctic politics within the context of its historical political structures and their connections with economic values provides the key grounding for this thesis.

## 3. Aim, Justification and Research Questions

Firstly, in order to position this thesis within Human Ecology, the three core concepts of the discipline are defined and their relevance to this research highlighted.

This study uses the definition of culture as “the diversity and plurality of life...guided by different world-views, priorities, belief systems and making sense of the world (Crang, 1998, p2-3). Power is defined as “an expression through actions, representation and discourse”, located in “all forms of social interaction”, a form of “oppression, domination, negotiation, persuasion and inducement that is always relational (Castree et al., 2013). Lastly, sustainability is a system which can survive or persist: needing a sustainable scale of economy, an equitable distribution of resources and opportunities, and an efficient allocation of resources accounting for natural capital (Costanza and Patten, 1995).

Using these definitions, Antarctica is placed at the nexus of the three concepts:

- The way that different groups, whether that be nation states, individuals or companies conceptualise Antarctic space is a culmination of their **Culture** – their views about and priorities for the continent;
- **Power** – how different countries exert their power over this space, through territorial claims, science or political mechanisms;
- **Sustainability** – how Antarctica is held up as a beacon of environmental purity and conservation, and what this means in light of the complexities of power and culture that rule it.

With these concepts in mind, this thesis uses a political ecology approach to formulate an understanding of Antarctica, insofar as how the processes of capitalism and colonialism operate on the continent. Drawing on world-systems and neocolonial perspectives, it seeks to uncover how these processes differ from traditional contexts, instead functioning via the legitimising proxy of scientific research, which enables certain nations to achieve political gains and to maintain their historical hegemonies. It aims to demonstrate the impacts of contemporary scientific governance on the continent to be “power laden rather than politically inert” and to understand how climate change could play a role in generating a new geopolitical landscape of the Antarctic in future (Robbins, 2012, p13; Nielsen, 2017).

From this aim, the following research questions were derived:

## 1. How is neocolonialism and the prospect of capital accumulation legitimised by scientific research in Antarctica?

- a. How do the spatialities of Antarctic research stations reflect political interests of Consultative Nation stakeholders?
- b. In what ways do the scientific discourses constructed by Consultative Nations embody political interests, and what are the purposes of these narratives?

This will be undertaken

- Firstly, *spatially*, by examining the **built environment**, i.e. scientific stations, as de facto territorial land-claims – addressing research question 1a;
- Secondly, *textually*, through analysis of the **discourses** of scientific programmes, policies and scientists – addressing research question 1b; and
- Thirdly, exploring how the two components above arise as a result of the privileging of science by **political power structures**, which works to the advantage of powerful nation-states and capital interests – addressing the overarching research question.

Integrating social science perspectives within Antarctic research will be critical to improving our understandings of the changing climate and polar geopolitics (Brady, 2014). As such, this thesis offers a novel approach of positioning political ecology within critical Antarctic studies, an emerging discipline which focusses on the intersections of Antarctica with colonialism, race and nationality, to unravel the dominant narratives, purposes and legacies of actions taken on the continent (Nielsen, 2017; Dodds & Collis, 2017). The resulting findings can be used to address the gap in the literature with regards to the application of neocolonial and world-systems perspectives to Antarctica, as well as commencing conversations over the continent's current omission from human and political ecology scholarship.

## 4. Theoretical Framework and Literature Review

### 4a. Building a Theoretical Framework

In order to answer the research questions, this thesis draws from elements of political ecology, which serves as the umbrella approach for three further perspectives; world-systems, neocolonialism and politically-situated science. These perspectives together produce a theoretical framework through which to view and understand Antarctica.

### 4b. An Umbrella Approach: Political Ecology

Political ecology is a framework with multiple definitions and concepts. At its core, it examines the role of politics in “shaping human-environment relationships” (Walker, 2007, p1) through the analysis of different groups' access to and control over environmental resources. It is a useful perspective to understand the political-economic forces and actors that, at a global scale, interact with the environment at regional to local scales, and how power flows operate through these actions (Watts, 2000; Blaikie & Brookfield, 1987).

The key political ecology tenets that underpin this thesis are:

- That power exists in the interactions and processes that “constitute people, places and resources” (Paulson et al., 2003, p1);
- That resource access and environmental changes reflect existing socio-economic disparities, which have profoundly political causes and implications (Bryant & Bailey, 1997); and
- That there must be a recognition of the diversity of “positions, perceptions and interests” of different social groups in relation to the environment (Paulson et al., 2003, p2).

These tenets are interwoven throughout the thesis and are used to guide the following perspectives, methodologies and discussion.

#### 4bi. Perspective 1: World-Systems

Building upon Andre Gunder Frank’s dependency theory, the idea of a world-system is proposed by Immanuel Wallerstein, who argues that the world is divided into economic zones. Constant economic growth, as prescribed by a capitalist economy, generates an imperative for infinite resource accumulation and technological progress, leading to the continuous encroachment of extractive industries on previously unexploited land. Peripheral zones are those areas that are exploited for their labour and natural resources, while the core is made up of economically powerful nation-states, which appropriate and accumulate resources from the peripheries to drive the growth of their capitalist economies. The paradox of infinite accumulation meeting the boundaries of finite amounts of land means that the number of zones capitalists are able to move production to are becoming fewer, as resources become exhausted and development in peripheral regions brings them correspondingly closer to the depleted consumer core (Wallerstein, 1974; 2004).

The rise in fossil-powered technologies has allowed sparsely populated continents to be transformed into centres for growth and accumulation of both populations and capital (Harvey, 2011), allowing increasing geographical limits to accumulation to be overcome. This has led to a phenomenon known as time-space compression, which posits that technological, economic and communications developments have caused the distance between places to effectively “shrink” (Harvey, 1989). People and objects move faster, hence reducing the restraining role of distance in capital mobility. Nation states who have dominant command over this hypermobility are rewarded with economic and political benefits, with better access to markets for surplus absorption (ibid; Warf, 2017).

The introduction of steam engines unlocked a faster and more efficient pursuit for new land and resources via the consumption of fossil fuels (Malm, 2016a; Hornborg 2006). This rise in modern transportation systems, which sped up and increased access to the Antarctic hence has affinities with time-space compression; in the past, its vast distance from states and their market mechanisms provided a form of isolation and protection from the processes of capitalism rampant elsewhere in the world (Hemmings, 2007). Consequentially, the fossil economy successfully ignited Antarctica’s integration into the logics of the world-system, leading to the augmentation of interest in the continent, particularly by the global core nation-states with existing access to means of production, such as the United Kingdom, France and Norway

(Malm, 2016b). This began with gestures such as flag planting on so-called *terra nullius*<sup>6</sup>, transitioning over time to the establishment of property rights and official claim-staking. Wallerstein argues these processes are central to capitalism, as there is no way to accumulate a region's resources if one cannot own or retain it (Wallerstein, 1974; Dodds & Collis, 2017). Indeed, Keynes (1933) stated that "unappropriated nature has no economic value". On the *terra nullius* of Antarctica, the economic potential of land and the prospect of capital accumulation, rather than the exploitation of people, was used to justify imperialistic interests. Perceived superior knowledge of how to manage and control this land over that of less-developed nations was then used to legitimise its take-over<sup>7</sup>.

Although the premises of world-systems and time-space compression perspectives are alluded to in several critical Antarctic studies, such as Hemmings (2012), who recognises that due to the relentless pursuit of resources, commercial penetration is only a matter of time as technical barriers diminish, Antarctica is never explicitly positioned as part of the world-system. This leaves a fruitful void to be explored; by not considering Antarctica and its place in the world-system, a complete understanding of the modern-world system cannot be achieved, and a crucial scholarly segment of political ecological geopolitics is lost.

Therefore, it can be theorised that the ever-decreasing time taken to travel between continents, as initiated by technological progress, has increased Antarctica's exposure to capitalistic mechanisms, by increasing its accessibility and the subsequent opportunity to exploit it. This process came about as a result of the existing power held by imperialist nations, who had already laid claim to vast areas of the planet to fuel their growing economies, and arguably set the scene for the geopolitical order we see in Antarctica at present. To this day, the main factor still governing human activity on the continent is its remoteness, and the limits to and costs of polar technologies, of which the main capacity is held by rich nation-states.

#### 4bii. Perspective 2: Neocolonialism

Colonisation refers to the process whereby an imperialist power occupies an area of land, from which the exploitation and appropriation of both labour and natural resources takes place. Although the settler-colonial period has ended, scholars of colonialism suggest that the world is currently experiencing a neocolonial era (Nkumrah, 1965). This is manifested in the ways that some cultural forms, ways of life, modes of politics and economics hold greater influence in the modern world than others, reinforcing and reconstituting inequalities instigated by colonial powers (Nealon & Giroux, 2012). This includes the practices and outputs of the Western scientific episteme, which are portrayed as universal, neutral and relevant, despite

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<sup>6</sup> *Terra Nullius* is a term meaning literally, "nobody's land" and was a concept often used in the colonial era to justify the acquisition of a territory through a state's occupation of it.

<sup>7</sup> The particularity of Antarctica having no indigenous population poses an interesting challenge to Wallerstein's assertion that the only basis of capital accumulation in the world-system is surplus labour (Wallerstein, 2004). Clearly, there are economic interests and the potential for capital accumulation in Antarctica but no domestic labour supply; an exploration of this contradiction is beyond the scope of this thesis, but posits an important point of reflection.

having embedded roots in the practices of colonial projects (Weingart, 2010; Seth, 2009).

Antarctica is a historically unpopulated space<sup>8</sup>, and as such, it is often excluded from debates on post or neocolonialism, due to the absence of indigenous peoples, the subjugation and domination of which were elsewhere a key feature of imperial projects (Kohn, 1962). As a result, Antarctica has until now been a fringe focus within these studies, yet are suggested by Scott (2011) to be useful perspectives through which to critique mainstream scientific and political practices on the continent. If colonialism is reduced to its bare-bones definition of a struggle for control over territory, and a colony as a settlement designed to “render a landscape both familiar and useful”, Antarctica and its research stations undoubtedly fall within these categorisations (Collis & Stevens, 2007). However, as a result of it being uninhabited yet contested, governed by scientific internationalism yet with conflicting geopolitical ideologies, colonialism in Antarctica necessarily takes on different and specific forms to the colonialism known to the rest of the planet (ibid); through mechanisms of crystallised knowledge hegemonies, in place of racial violence and subjugation.

Such perspectives are hence theorised in this thesis to be critical to understanding Antarctica and its governance, as they “posit a challenge to the dominant, taken-for-granted systems of power-knowledge and emphasise historical and continuing domination and inequality” (Dodds & Collis, 2017, p50). That “states (active in Antarctica) are not rapacious does not erase the fact that the bulk of the continent is claimed by a handful of states on the basis of discover, claim and occupation” (ibid, p52).

Although current literature cites Antarctica as being postcolonial (Dodds, 2006), this thesis will continue with the perspective of neocolonialism to analyse contemporary Antarctic science and politics. This is contended because the colonial era never explicitly ended, as evidenced by Article IV of the Treaty merely freezing the colonial territorial aspirations of claimant nations, rather than abolishing them. In this manner, the continent is governed by politics founded on colonial legacies, merely reconstituted in a contemporary setting. Furthermore, although Collis and Stevens (2007) argue that the scientific “colonies” of Antarctica are not governed by capital stratification, intercultural relations or resource extraction, this thesis argues that resources have been in the past, and will continue to be, vital to Antarctic politics in the future.

#### 4biii. Perspective 3: Politically Situated Science

The separation of scientists from politics and the policy-making process arises from the idea of an objective, neutral and value-free modern form of science. However, scholars, not least postcolonial theorists, contend that science is inseparable from politics (Seth, 2009), as it exists and participates within political environments and activities which are “infused with values” (Cortner, 2000, p23; Wellerstein, 2018).

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<sup>8</sup> Reference is made to Antarctica being “historically” unpopulated, as in the modern era, several hundred scientists and logistical support staff overwinter in Antarctica, and as such the argument can be made that the continent is now in some way inhabited.



These values are present in both scientific content as well as the applications and implications of scientific results (Dupre, 2007; Kincaid et al., 2007).

In an Antarctic context, it can be argued that scientific research has always been connected to politics. Knowledge about something is a crucial component of exerting power over it; for example, past imperial powers and modern-day states utilised the concepts of *benevolent paternalism* and *environmental authority* to argue that scientific research is carried out for the benefit of society, hence legitimising their political presence in Antarctica (Howkins, 2011). Howkins goes as far as to claim that the Treaty's "exclusive scientific and political arrangements are a form of frozen empire in a postcolonial world" (ibid, p186), whereby science is politics by other means. By determining Antarctica as *terra nullius*, combined with the high value placed upon science, spaces and realities are able to be re-ordered through powerful nations' scientific discourses, effectively rendering Antarctica a *terra scientifica*<sup>9</sup> (Baldwin, 2009). Therefore, it is theorised that Antarctic scientific knowledge is not innocent or objective, but is deeply rooted within a contemporary imperialistic relationship and a complex colonial history (Loomba, 2015).

The "process of producing Antarctic environments has become a powerful strategy in Antarctic politics" (van der Watt, 2017, p584), yet no academic research has engaged with the discourses of scientific programmes, which are key actors in Antarctica. While critical discourse analyses have been undertaken to understand how Antarctic space is represented through texts, images and maps, (see Spufford, 2008, and Simpson-Housley, 1992) these have been conducted on travel writings and diaries kept by early explorers. No discourse analysis has been carried out on Antarctic programme websites or policy documents, nor have these been combined with the viewpoints and understandings of the scientists themselves: this thesis therefore constitutes a novel contribution to critical Antarctic literature in this regard.

Analysis of Antarctic discourse is hence important to highlight how power is exerted via scientific knowledge, both in its systems and practices, as "socio-cultural constructs embedded in specific languages could have a decisive effect on the power constellations within it" (van der Watt, 2017, p584). As a result, it can be argued that seemingly controversy-free aspects of science, such as Antarctic climate studies are imprinted with both historical and contemporary politics. The concept of politically-situated knowledge can thus be utilised to understand which and whose political, economic and cultural interests are embodied within the praxis of science (Doppelt, 2007).

#### [4c. Tying Together the Perspectives](#)

By linking the historical background and existing literature with the lenses of the above perspectives, one can begin to conceptualise how the processes of capital accumulation and neocolonialism have begun to take form in Antarctica, and how they have taken root over time through the legitimising proxy of scientific research. A world-systems perspective suggests that processes of capitalism must continually extract

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<sup>9</sup> Terra Scientifica is a term used by the author of this thesis denoting Antarctica not as *terra nullius* (land belonging to nobody), but as a land belonging to science, as stated under the ATS, and as such, belonging to those who have the power to conduct Antarctic science.

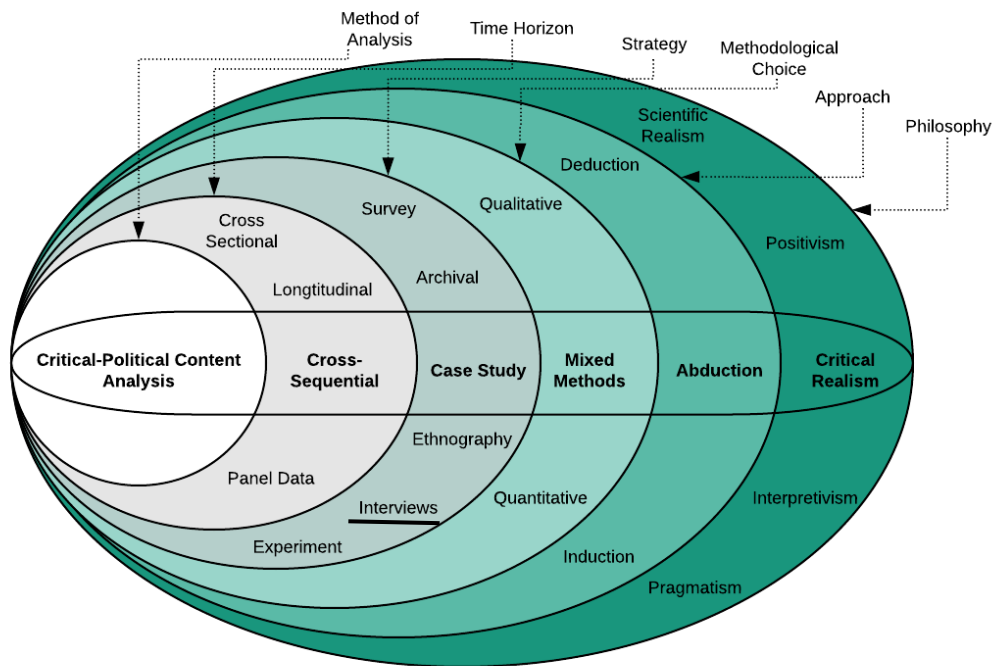
resources and labour from the peripheries. Therefore, to maintain the current system, the boundaries of peripheries must be continuously extended to provide new areas for the environmental load displacement (Hornborg, 2011). Yet due to the unique situation of Antarctica and its afforded protection under the Antarctic Treaty, the traditional mechanisms through which capitalism operates do not apply. As such, Antarctic space has had to be appropriated in alternative ways: as Moore (2000) states, every phase of capitalism emerges from restructuring society-nature relations. The Antarctic hence perhaps reflects the “struggle on the international stage for the remaining conditions of accumulation” (Luxemburg, 1913, p348), the arena where the tension of hitting the physical peripheral and resource boundary of planet Earth is played out.

This thesis therefore theorises that through the casting of Antarctica as a *terra scientifica*, scientific research is the primary means through which capitalism has been restructured, to begin to incorporate Antarctica into the modern-world system as an exploitable periphery and continue the processes of continuous capital growth. To understand the prospects of future Antarctic exploitation, one must understand how science has and continues to operate on the continent, and how the science-orientated structures of the ATS continue to benefit powerful states. Scientific actors are not neutral, and neither is research conducted in a geopolitical vacuum; there are a multitude of cultural, economic and social dimensions to the way it is articulated, all of which affect the way the Antarctic environment is constituted, and the way that this research operates to cement a neocolonial present on the continent.

## 5. Methods and Methodology:

### 5a. Methodology:

In order to build the research design, as well as to ensure transparency, the “research onion” concept was utilised, which clearly outlines the hierarchical framework needed to construct an effective methodology (Saunders et al., 2016, Figure 1). Due to the subjectivity of the research topic, the methods applied are also described and justified in detail, enabling the reader to trace the research process, enhancing replicability and transparency.



**Figure 1:** Research Onion adapted from Saunders et al. (2016).

This research was approached from a critical realist philosophy, which acknowledges that the intrinsic meaning of a social phenomenon is both descriptive and constitutive, and related to its referents and contexts (Sayer, 1999). Critical realism also recognises that human knowledge about the world is always embedded in its cultural, social and historical context, articulated from varying viewpoints according to their influences and purposes (Archer et al., 2016). As this thesis analysed materials produced from multiple geographical contexts, it must be kept in mind that no knowledge is neutral, and instead is reflective of personal, contextual perceptions. Although critical realism prescribes against a cook-book prescription of methods (Sayer, 1999), as aforementioned, transparency in research methods is critical to replicability and reliability, and thus the research process is outlined in detail. This is particularly pertinent due to the novel approach of this research; the methodology must be clear to demonstrate how conclusions were reached and to strengthen the argument made.

An abductive approach was selected, as it allows for a continuous movement on the part of the researcher between theory and data to provide the most suitable

explanations for an observed phenomenon (Morgan, 2007). It acknowledges that data is not collected in an atheoretical vacuum and permits the research questions to be fluid and changing (Friedwicks & Kratochwil, 2009). An abductive approach is also complementary to the form of content analysis adopted (Krippendorf, 2019), which will be outlined in a later section.

A mixed-methods approach was used, as qualitative and quantitative data are necessary to address both the spatial and discursive elements of the research questions. Specifically, the case-study method (CSM) was used as an umbrella method, with GIS and GIS-derived data, a critical-political content analysis and interviews used as the component methods.

This thesis' time horizon is a combination of longitudinal and cross-sectional designs, or cross-sequential, as data is sampled from different groups over a period of fifty years. This method was deemed most appropriate in order to best understand whether attitudes towards Antarctica differ based on year of accession to the ATS whilst simultaneously allowing sampling from contemporary documents authored in multiple countries.

Finally, the method of analysis utilised was qualitative critical-political content analysis (CPCA), which will be delineated in section 5bii.

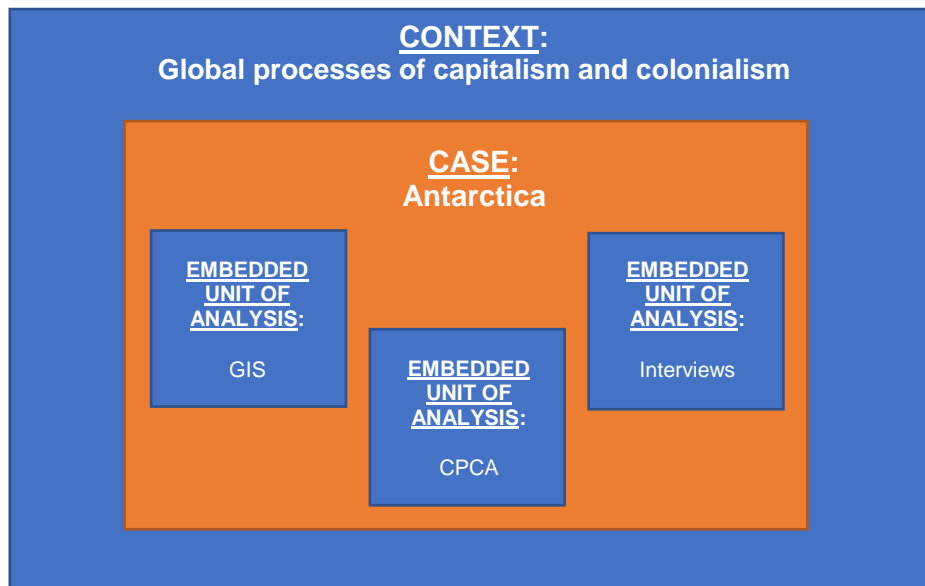
#### 5b. Overarching Method:

##### 5bi. The Case-Study Method – From Macro to Micro and Back Again

The Case-Study was selected as the overarching method, as it allows in-depth, intensive analysis of a case with the purpose of unveiling key features about its nature and setting (Bryman, 2012). In essence, the case study method (CSM) is an empirical investigation that examines a specific phenomenon and its context in detail, in order to explain how and why the phenomenon occurs (Yin, 2009; Hartley, 2004).

The CSM is pertinent for this thesis as Antarctica is an unexplored case within both world-systems and political ecology theories, making it ripe for further study (Flyvbjerg, 2006). The CSM will be used to connect macro-scale perspectives and concepts of world-systems, neocolonialism and political ecology to the micro-scale; the unique case of Antarctica and its geopolitical-scientific networks, its built environments and discourses (Collis & Stevens, 2007). This comparison of the two scales aids the researcher in connecting “present and past in anticipation of the future” (Burawoy, 1998: p5) to explore wider historical patterns that have produced a contemporary phenomenon, and to discuss potential future pathways.

The CSM calls for multiple lines of enquiry to generate evidence (Burawoy, 1998). This thesis uses the framework of a single case with multiple embedded units of analysis (Yin, 2009) and draws upon three methods – one quantitative and two qualitative, as outlined in Figure 2.



**Figure 2:** A single case study with multiple embedded units of analysis.

*Figure adapted from Yin (2009)*

### 5c. Component Methods:

#### 5ci. Geographical Information Systems: The View from Above

Geographical Information Systems (GIS) were employed in order to spatially analyse the built environment in Antarctica to investigate patterns of scientific activity on the continent, over the period 1904-2014, when the first and most recent stations were built respectively.

Using ArcGIS, a novel database was created of every station in Antarctica, collating information on GPS location, station name, country, continent, year of opening, operator and status (see Annexe 2). This was used to generate a series of maps, and then exported to Excel to compile graphs to cartographically and quantitatively display spatio-temporal trends of scientific activity.

#### 5cii. Critical-Political Content Analysis – A Context Specific Approach

This method was deployed to textually analyse the narratives and discourses of Consultative Nations in the ATS. This was achieved using the website platforms through which national Antarctic programmes disseminate information on behalf of governments and publicly available policy documents<sup>10</sup>. It was important to carry out analysis on such sources, as secondary data can provide a socio-economic, geographical and historical contextual lens, in combination with which primary data – the maps and interviews – can also be analysed (Clark, 2005).

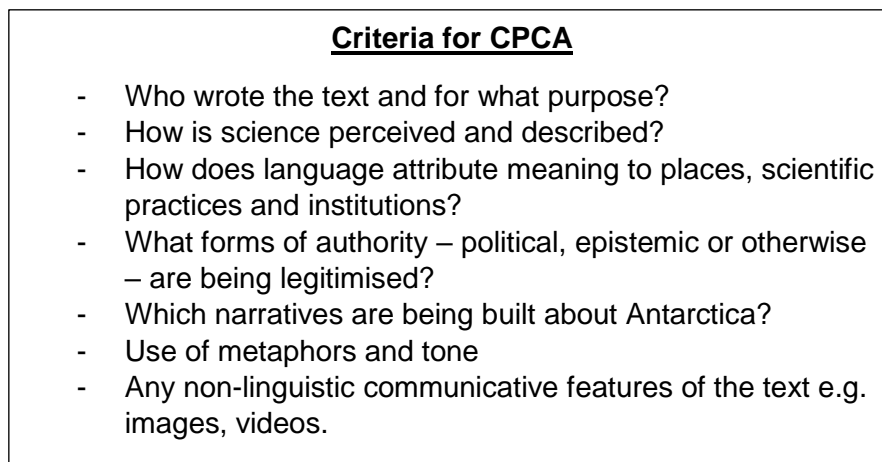
When reviewing discourse analysis methods however, none were sufficiently appropriate for the types of information that this thesis draws upon and the subsequent

<sup>10</sup> A full table of analysed texts can be found in Annexe 3.

analysis that was to be undertaken. Therefore, in order to conduct the most rigorous and suitable study, a context-specific dual-pronged form of analysis was created by the author, drawing on Content and Political Discourse Analysis schools of thought.

Content Analysis (CA) is a method which has multiple uses in social research, including to reveal trends in communications, highlight international differences in and identify the foci of attention and intentions of these communications (Berelson, 1952). Political Discourse Analysis (PDA) is a form of analysis under the umbrella of Critical Discourse Analysis, predicated on the idea that language, particularly when used in political documents, is not neutral (Fairclough, 1989). Political texts allow actors to exercise agency to impact matters of concern in the world, utilising language as a way of accomplishing acts, attributing blame, presenting oneself in a particular way, or communicating an argument within their discourses. PDA is also a useful method to investigate how ideologies are embedded within the language of texts and contexts, reproducing “political power, dominance and inequality” (van Dijk, 2004, p352; Sriwiwimon & Zilli, 2017; Fairclough & Fairclough, 2012).

Using the essence of these two methods – the overarching principles of CA, combined with the critical and political focus of PDA – and drawing on Kvale’s concept of bricolage, an eclectic approach to analysis, whereby the researcher moves freely between techniques (Kvale, 2007), a novel Critical-Political Content Analysis (CPCA) was formulated. The criteria of analysis are described in Figure 3.



**Figure 3:** Outline of the points of consideration and method of analysis in the dual-pronged CPCA. Content adapted from (Wilson, 2015; Mayr, 2015; Fairclough, 1989).

Only ATS Consultative Nations were considered for selection due to the prerequisite that they must be conducting significant Antarctic science, and therefore would have an online platform of information for their national research programmes. Although in the preliminary research design, it was envisaged that the Consultative Nations analysed would be selected at random by decade of accession to the ATS, this was not possible. This was in part due to a lack of publicly available online information, but

also because many countries' Antarctic programme websites were not in English (or did not have an English version of the webpage).

As such, it was decided that rigorous content analysis could not be carried out using an in-browser translator, particularly for non-Latin script languages, due to the lost nuance and the possibility of inaccurate translations. Therefore, convenience sampling had to be used, which drastically narrowed down the available scientific programmes upon which to conduct the analysis, particularly when trying to draw on content produced outside of the western world.

The final selected countries are as follows;

| Year of Accession                         | Country               |
|---|-----------------------|
| 1959 (Claimant Nation)                    | United Kingdom        |
| 1959 (Initial Signatory but non-claimant) | USA                   |
| 1970s                                     | Germany <sup>11</sup> |
| 1980s                                     | South Korea           |
| 1990s                                     | Netherlands           |
| 2000s                                     | Ukraine               |

**Table 1:** The final selected countries for analysis, sorted by year of accession to the Treaty. The 1960s and 2010s are omitted as no new consultative parties that met sampling criteria were admitted to the Antarctic Treaty during these periods.

Data is based on information extracted from the Antarctic Treaty website (Secretariat of the ATS, 2019).

### 5ciii. The Interview: In Depth Experiences

The final method used to build the case-study was the semi-structured expert interview. These were undertaken in order complement and contrast the narratives uncovered using the CPCA, to delve deeper into human understandings of the continent, how the ATS operates and how science can legitimise political interests.

The people with the best understandings of how science operates in Antarctica are scientists working for national programmes and/or have done research on the continent. On this basis, eight scientists were interviewed in order to better comprehend their experiences and understandings of the politics behind scientific endeavours in Antarctica. It was hoped that interviews would be undertaken with scientists from each of the research programmes selected for the CPCA, however, this proved impossible due to a lack of response from two of these.

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<sup>11</sup> East and West Germany both acceded to the Treaty and became Consultative Members separately, East in 1974 and West in 1979, before German reunification in 1989.

The final sample of interviewees and their representative organisations were as follows:

| <b>Interview Code</b> | <b>Interviewee Position</b>                                 | <b>Representative Organisation</b>          | <b>Representative Nation</b> |
|-----------------------|---|---|------------------------------|
| IR-1                  | Assistant Professor (Antarctic Glacio-Isostatic Adjustment) | Durham University, British Antarctic Survey | United Kingdom               |
| IR-2                  | Antarctic Marine Biologist                                  | NORCE                                       | Sweden                       |
| IR-3                  | <i>Respondent</i>   | Durham University                           | United Kingdom               |
| IR-4                  | Senior Scientist (Geophysics and Geodesy)                   | TU Dresden                                  | Germany                      |
| IR-5                  | Senior Scientist, Head of Geophysics                        | Alfred Wegener Institute                    | Germany                      |
| IR-6                  | <i>Respondent</i>   | Scientific Committee for Antarctic Research |                              |
| IR-7                  | Director  | Netherlands Polar Programme                 | Netherlands                  |
| IR-8                  | <i>Respondent</i>   | Byrd Center, Ohio State University          | USA                          |

**Table 2:** Table summarising the expert interview respondents by their position, their representative organisation and nation. The interview code shall be used in subsequent sections to attribute quotes to a specific respondent.

The interviews were semi-structured, which allowed for further questioning and the development of answers on particular topics, following what the interviewees deemed important, as well having the scope to pursue emerging themes in depth (Bryman, 2012). An interview guide was developed, covering a list of questions, keywords and topics that should be covered, but was not intended for use as a strict script (see Annexe 5) (Kvale, 2007). Prior to the interview, each respondent was sent a consent and ethics form, which outlined the purpose of the study and also informed participants of their rights regarding the interview, such as anonymity and recording permission (see Annexe 4).

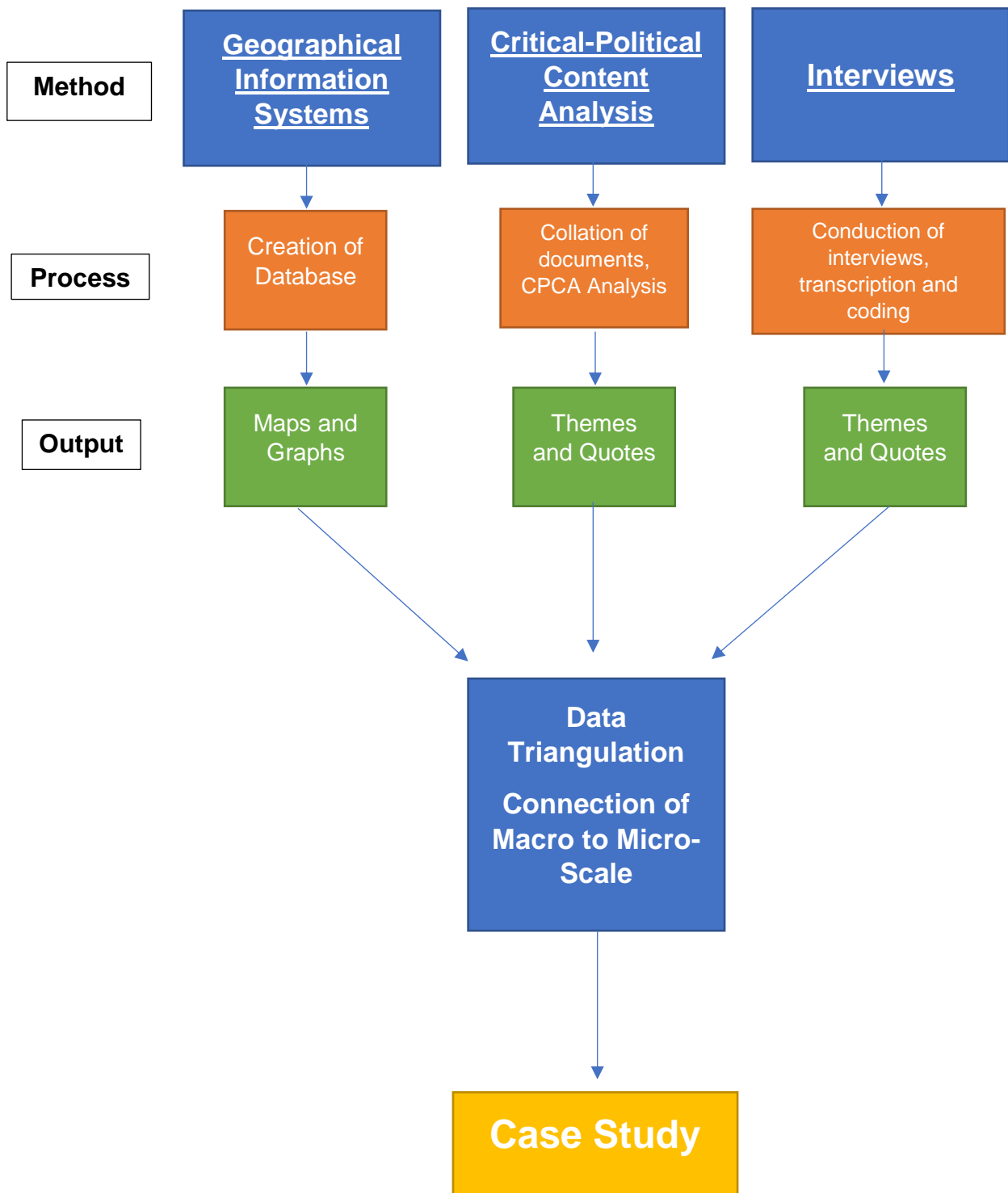


The interviews lasted between 45 and 90 minutes, and as soon after as possible, verbatim transcription took place. The texts were then coded and organised into themes. Using the CPCA framework as a guide, the interview codes were sorted according to the themes that arose most often. Those which were complementary or contradictory to those uncovered in the CPCA were also highlighted (Flick, 2014). At this stage, each interviewee was offered the opportunity to review the coded themes and transcription to ensure that their meanings were accurately conveyed, and that they consented to the use of the material before its inclusion in the project.

#### 5d. Triangulation

In line with conducting a mixed-methods case-study approach, triangulation was used to connect the overarching case-study with its component methods. This process enables a clearer understanding of how each line of enquiry converges when using data collected from multiple sources, adding depth and accuracy to the investigation (Mabry, 2008). In addition, triangulation is complementary to the critical realist philosophy, as the multiple methods can combine to reveal different facets of the social world (Yeung, 1997).

The interconnections between the above-mentioned methods can be seen in Figure 4.



**Figure 4:** Figure 4 outlines a simplified method schematic to clearly show the steps and processes undertaken.

5e. Methodological Limitations, Reflections and Positionality

It must first be clearly stated that this research is political: it is about politics, on a politically fraught subject and involves political entities. In line with the political ecology

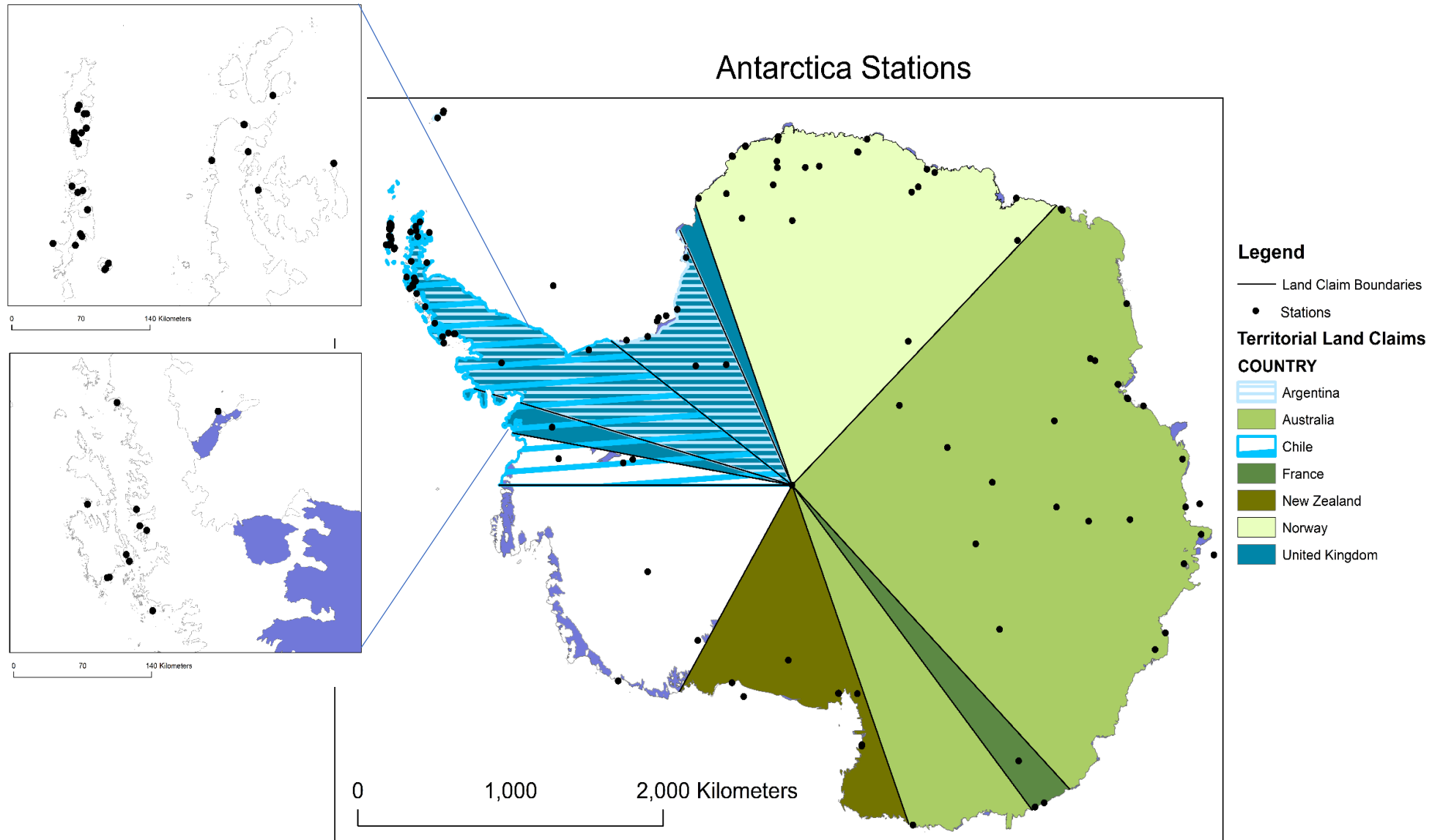
framework that is utilised, it must be understood that this thesis therefore cannot be apolitical (Robbins, 2012). As such, one returns to the critical realist philosophy, and acknowledges that this, combined with the author's positionality, means that the results of this thesis are constitutive of the author's version of the truth as they have been deduced from this research and its findings, and that these are undoubtedly politicised.

As Burawoy (1998) states, interviews cannot be removed from the political, social and economic contexts in which they are conducted, which in turn shapes responses; the geopolitically-fraught nature of Antarctic science and politics meant that some questions were perhaps answered in a censored or guarded manner by respondents as a result of their positions within their organisations, even if anonymity was retained. Nevertheless, as this research is conducted within a critical realist philosophy, this is accounted for as an alternate explanation of reality. Therefore, this research should not be construed as generalisable and applicable to all Consultative Nations within the ATS – indeed, each nation has its own nuance, its own agenda and its own discourse – and instead should be used to demonstrate the reality of the complexity of the politics which govern contemporary Antarctica.

The positionality of the author within this research must also be a point of reflection. Any characteristic a researcher has – their gender, race or religion – shapes how people perceive and relate to them. Hence as a Masters' student interviewing expert academic researchers, the author was in a position of far less power and knowledge. To alleviate this as far as possible, it was ensured that the interview material was thoroughly known, to avoid being "taught" by interviewees or having the interview hijacked (Bryman, 2012). However, the responses that were obtained from their position as a young woman would perhaps have differed if the author was male, older, or a person of colour, for example.

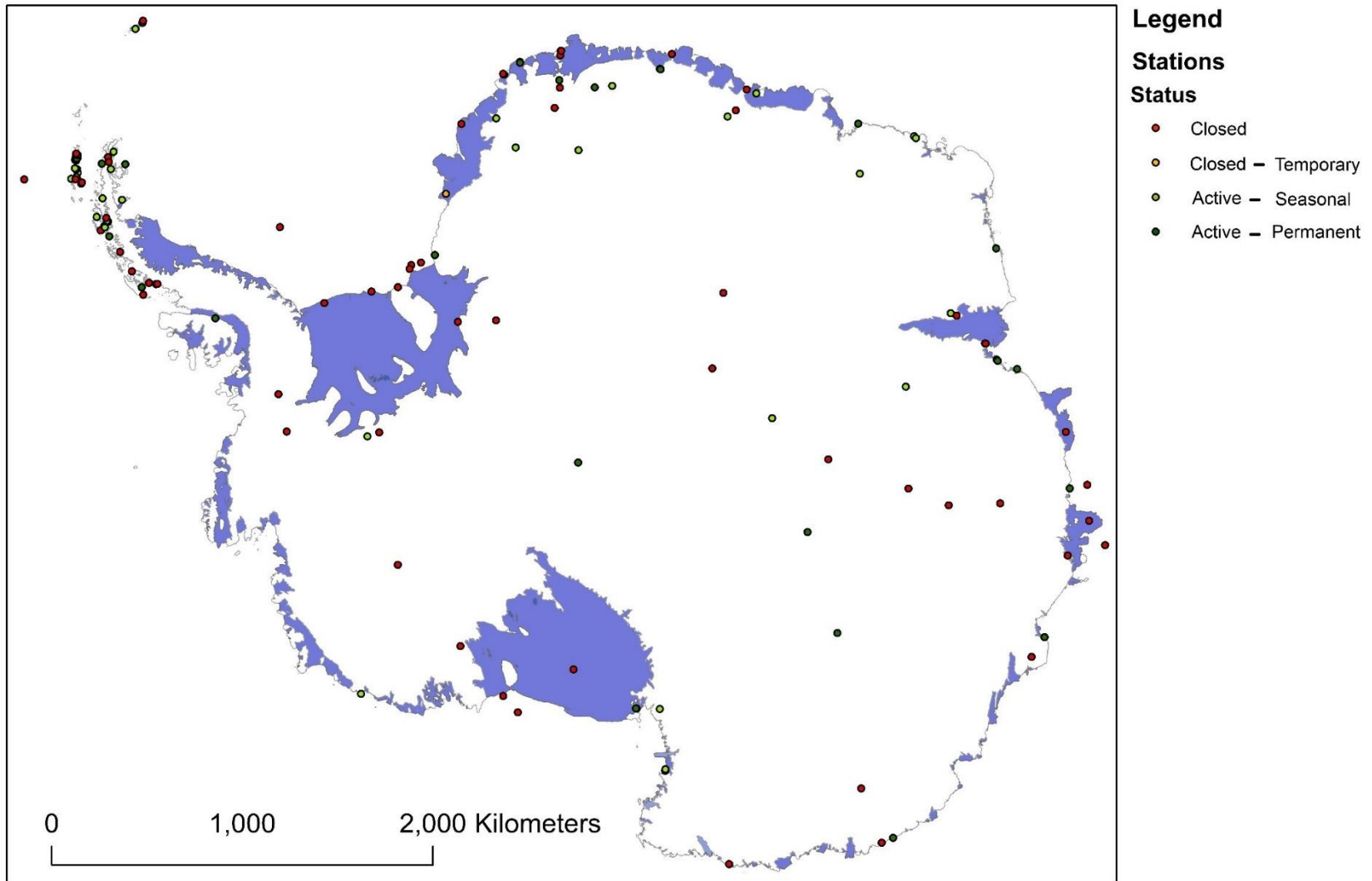
A political ecology approach also necessitates reflection on who gains and who is disadvantaged by this research (Robbins, 2012). One major drawback of this study's methodological approach is that the material collected was primarily from scientific research programmes that are Western-research-centric and funded. By only focussing on texts in English for the CPCA, a certain type of knowledge was privileged, namely scientific documents and policies mainly produced by Western epistemologies and institutions. In addition, all interviewees necessarily had to be Anglophone to match the author's linguistic ability, which introduced a large bias into the sample, only revealing a limited insight into the opinions and experiences of Antarctic scientists as a whole. This is particularly noticeable in the absence of respondents from the Global South. Therefore, as a result of the author's limitations, achieving an unbiased, representative sample for both CPCA and interviews proved to be an overambitious task and beyond the scope of this thesis. Consequently, this research, however well-intentioned, has contributed to the continuation of the Anglophone, Western-centric hegemony of knowledge that is produced about Antarctica. This is negated as much as possible by adopting a transparent methodological approach, so that future researchers can replicate this study and apply it to non-Anglophone contexts, to better represent and analyse the countries within the ATS.

## 6. Results and Findings



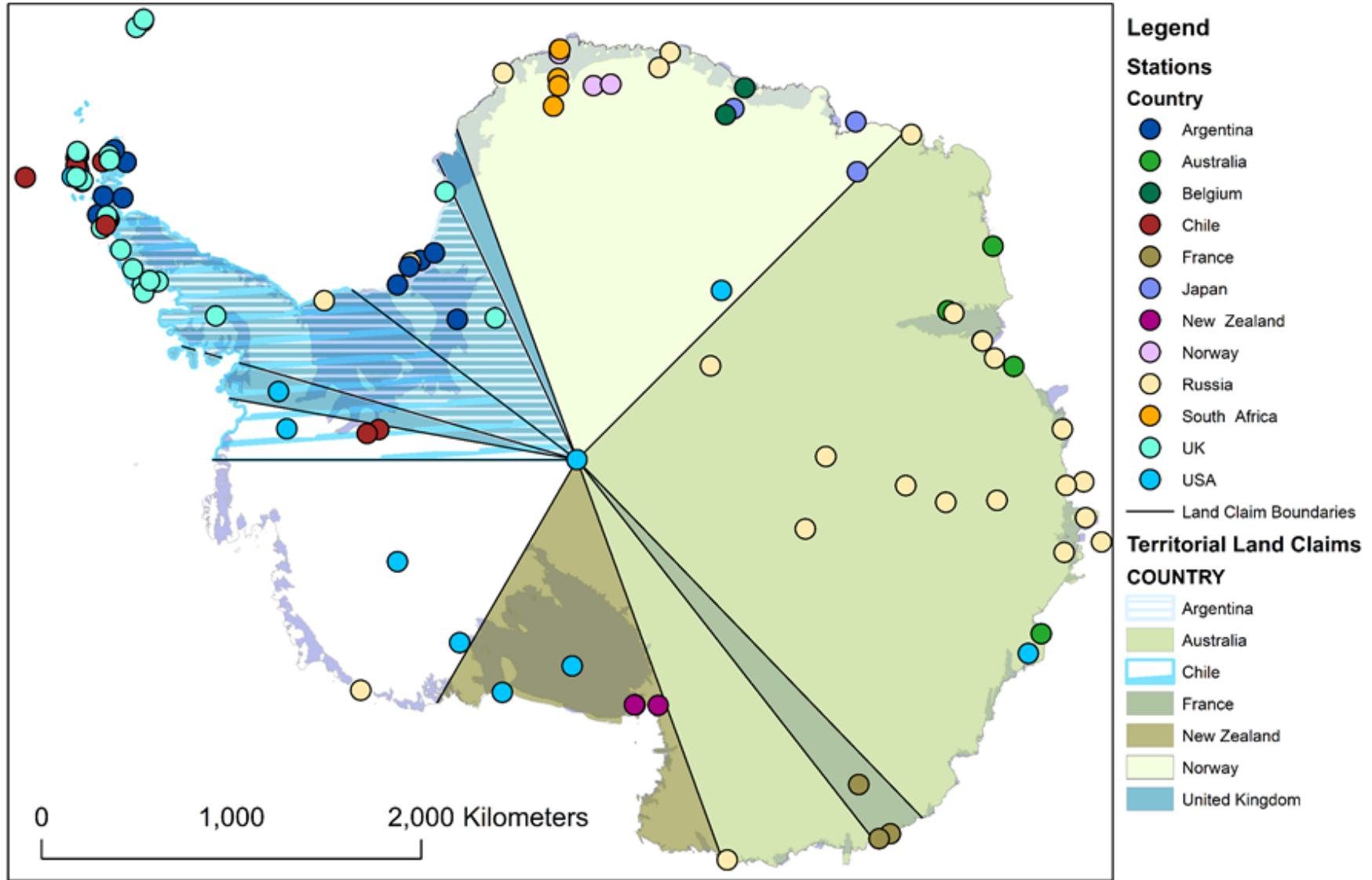
**Map 1:** Map showing the locations of all stations built in Antarctica between 1904-2014, overlaid on the territorial land claim boundaries made by the seven claimant nations; Argentina, Australia, Chile, France, New Zealand, Norway and the United Kingdom. Zoomed maps demonstrate a close-up view of the locations of stations on the Antarctic Peninsula.

## Antarctica Stations



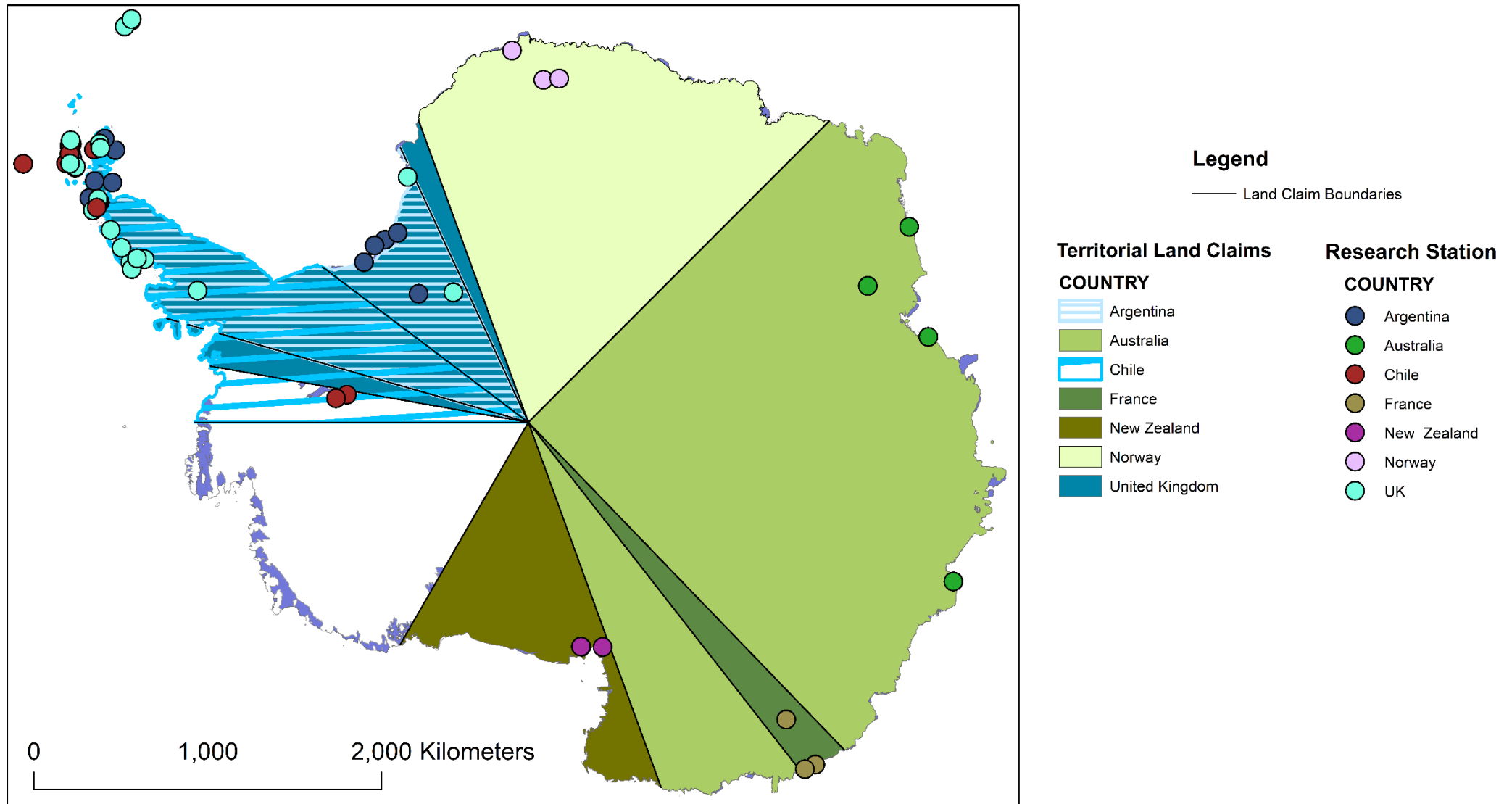
**Map 2:** Map showing the locations of all stations built in Antarctica between 1904-2014. Dark green shows stations that are open year-round, pale green shows stations open during the austral summer and red shows stations that have been closed.

# Initial Treaty Signatories and their Research Stations



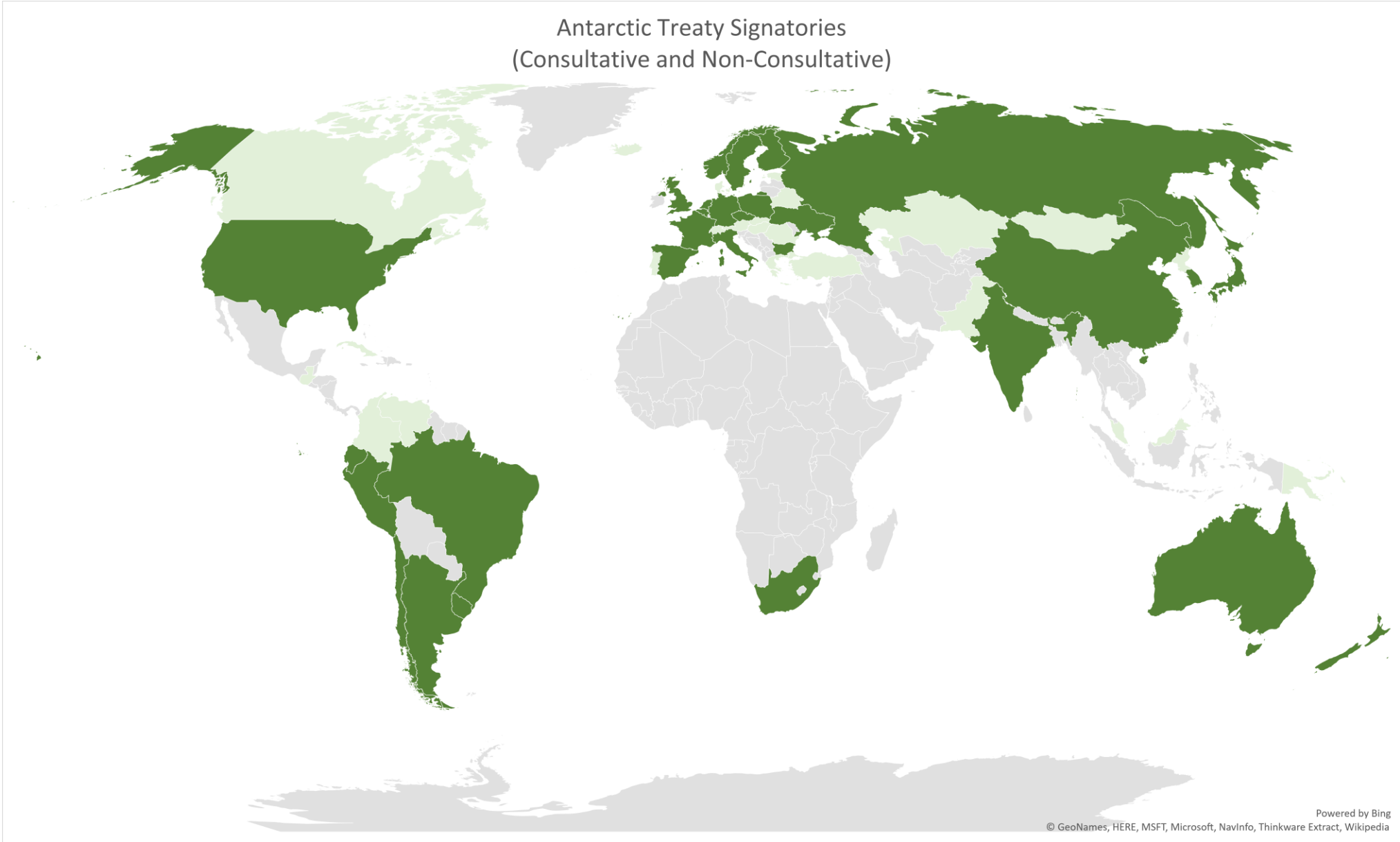
**Map 3:** Map showing the locations of stations built by the twelve initial signatory nations, overlaid on the territorial claim boundaries.

# Claimant Nation Territorial Claims and their Respective Research Stations



**Map 4:** Map showing the locations of stations built by the seven claimant nations, overlaid on the territorial claim boundaries made by those nations.

Antarctic Treaty Signatories  
 (Consultative and Non-Consultative)



Powered by Bing  
 © GeoNames, HERE, MSFT, Microsoft, NavInfo, Thinkware Extract, Wikipedia

**Map 5:** Map showing the location of all Antarctic Signatory nations. Consultative Nations are shown in dark green, non-Consultative are shown in light green.

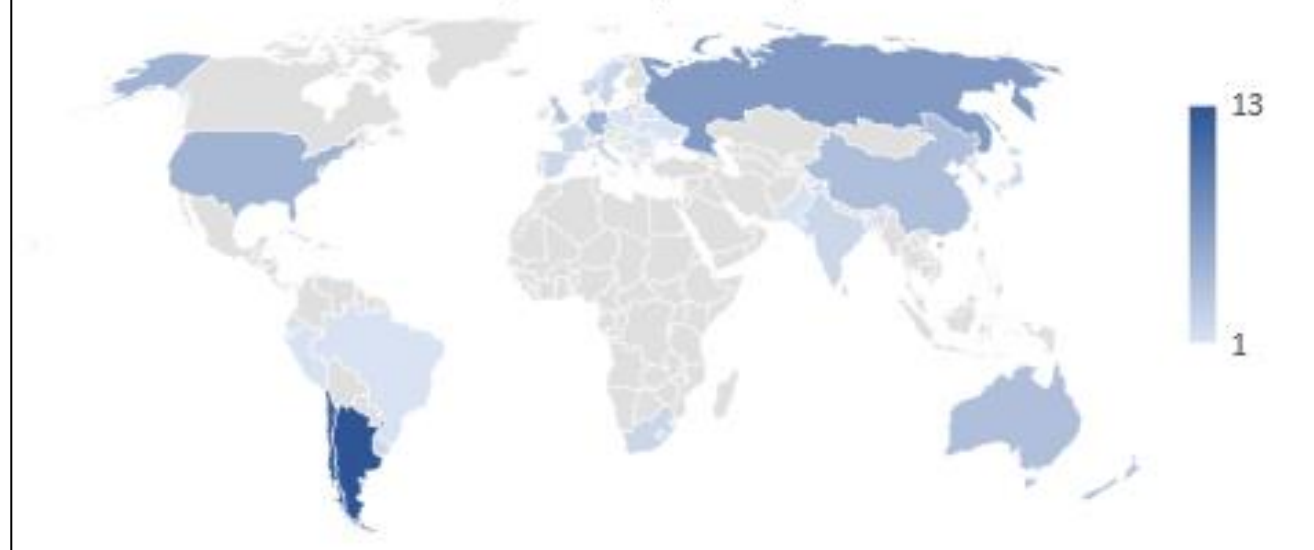


Number of Stations per Country  
(Total Over Time)



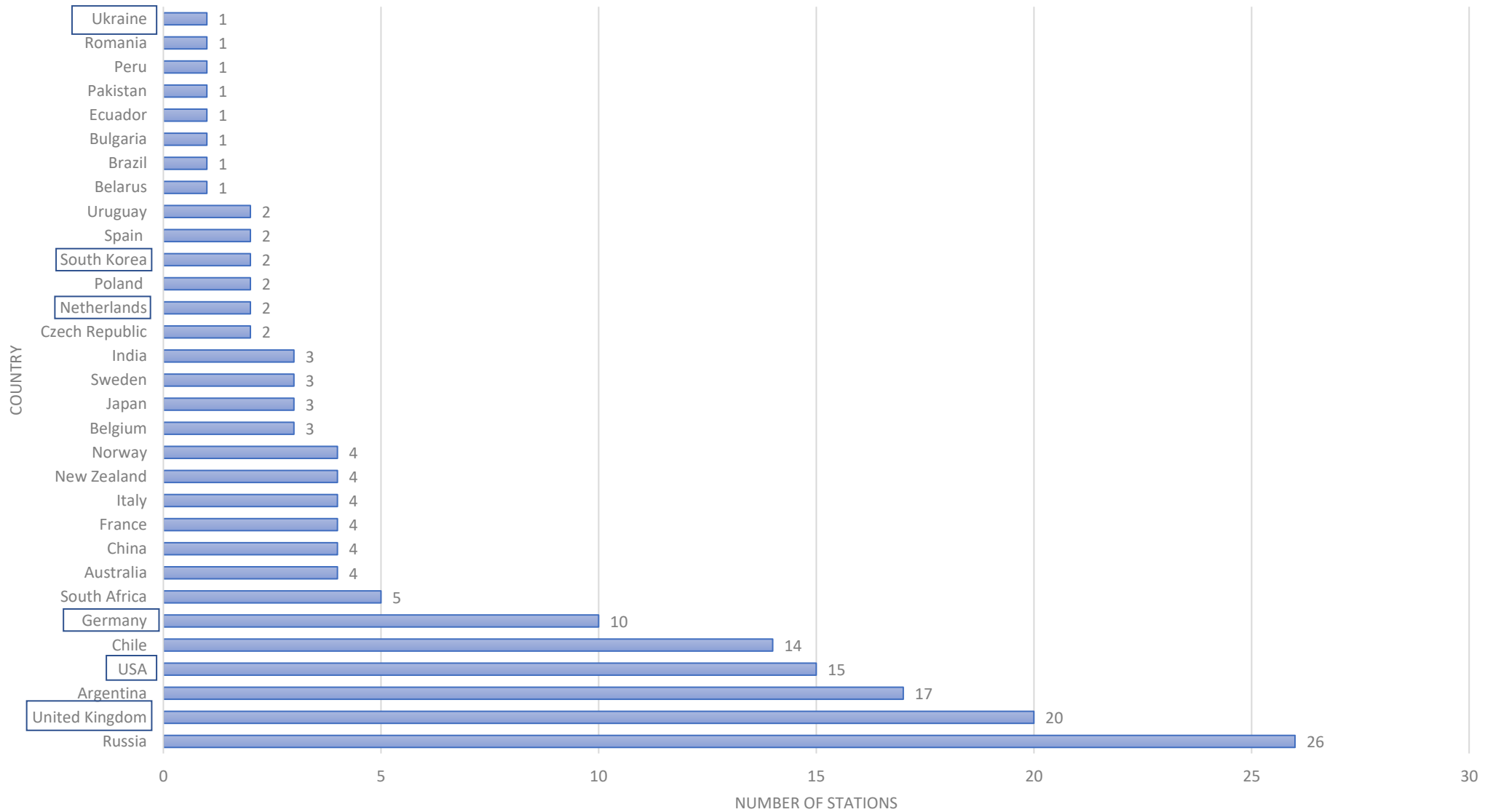
**Map 6a:** Map showing countries with stations in Antarctica between 1904-2014. The greater the number of stations, the darker the colour.

Number of Stations per Country  
(Currently Active)



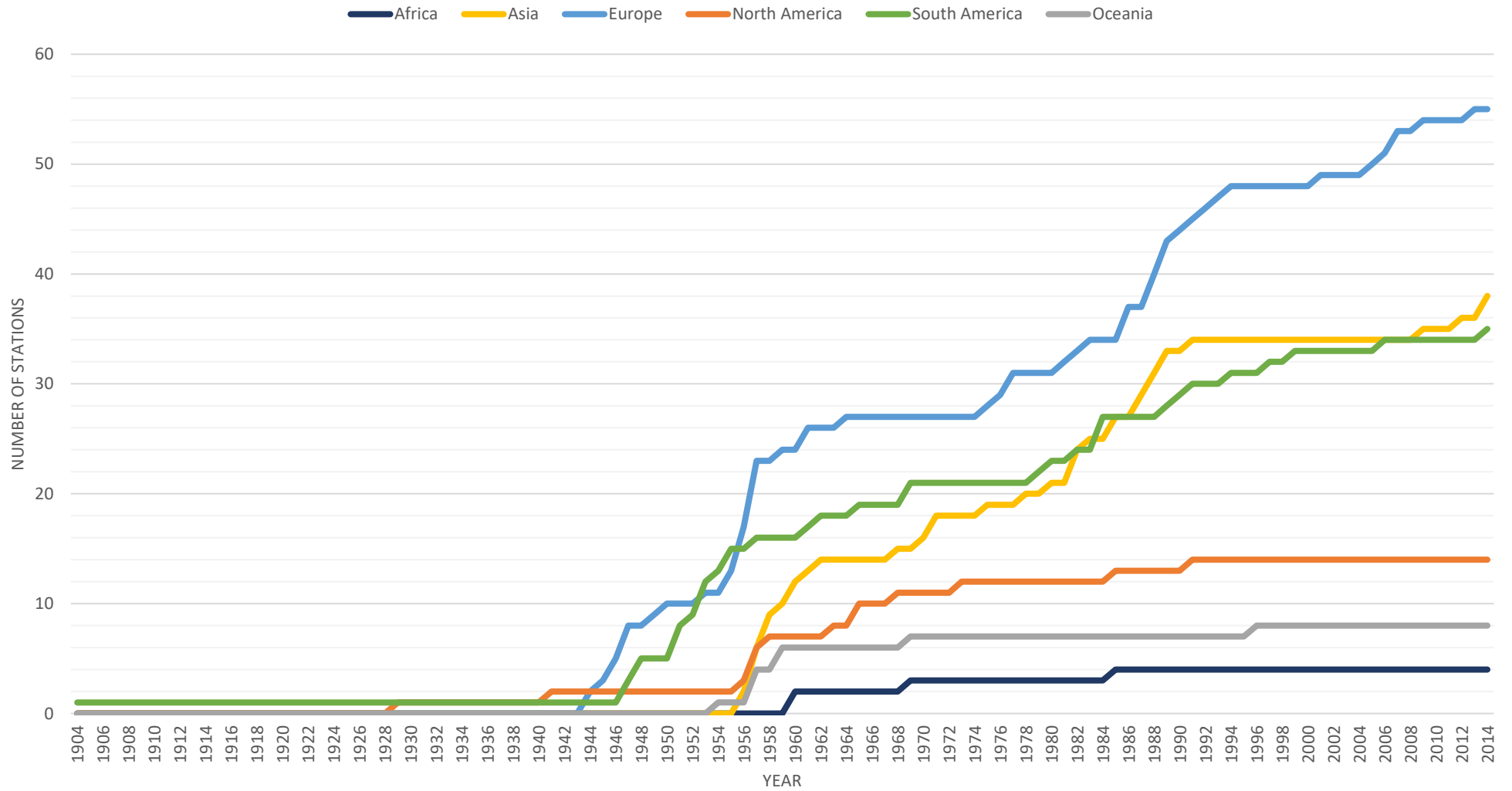
**Map 6b:** Map showing countries with stations in Antarctica that are currently active (permanent or seasonal). The greater the number of stations, the darker the colour.

## Number of Stations per Country

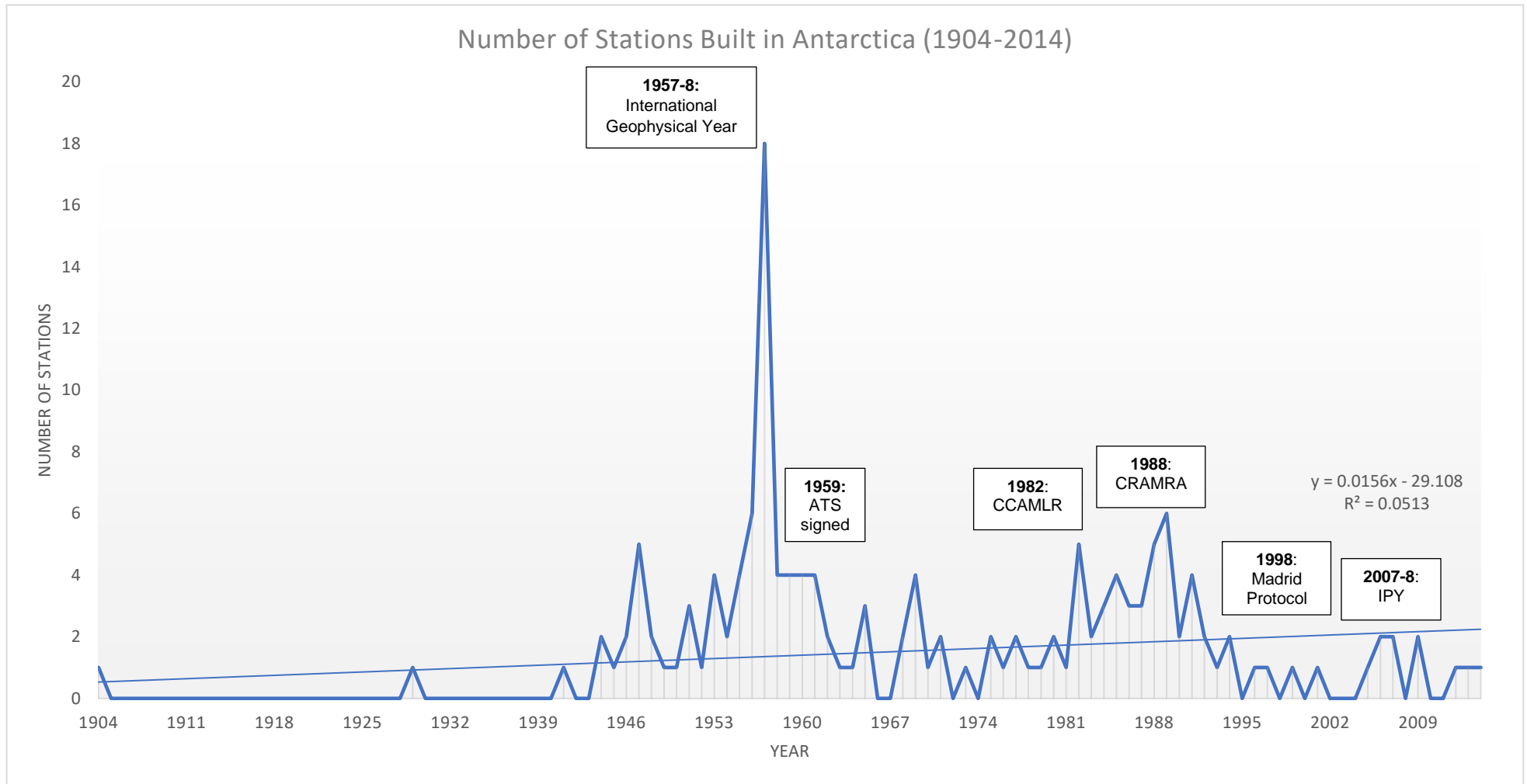


**Graph 1a:** This graph shows the number of stations divided by country, both historical and currently open.

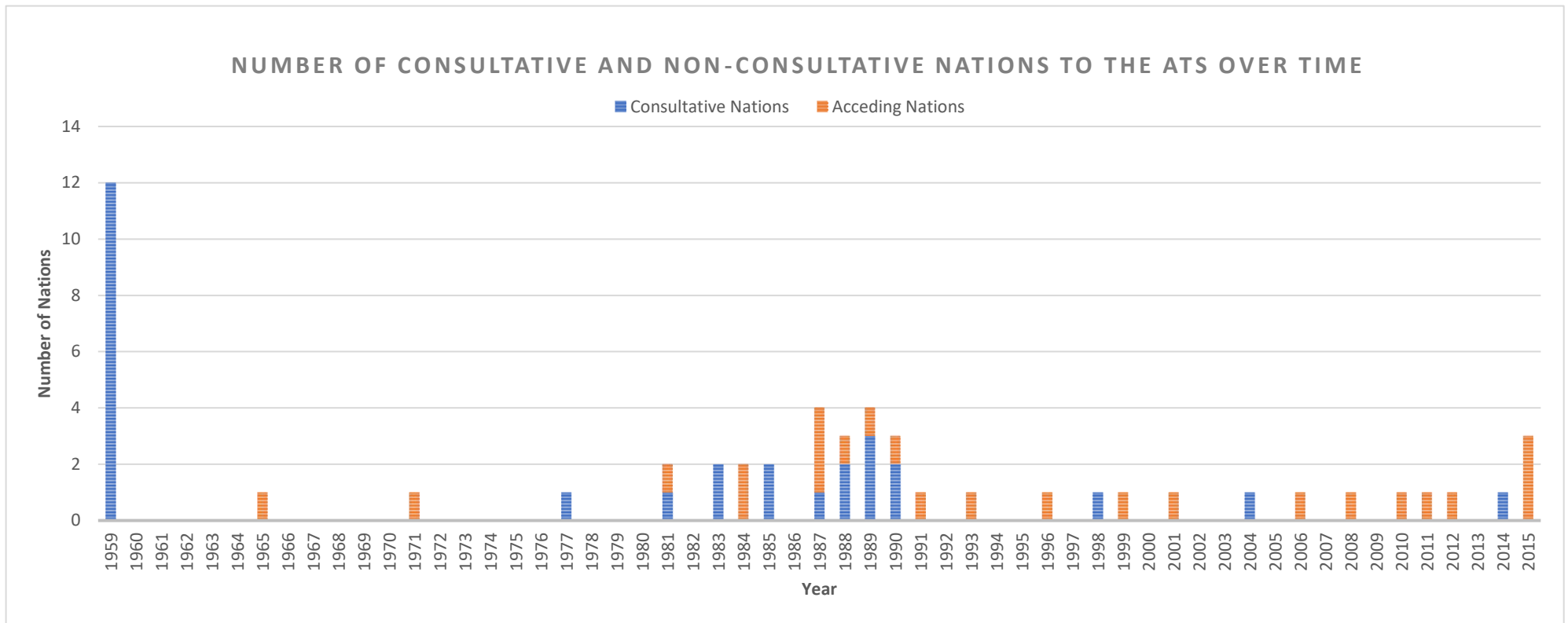
# Number of Stations by Continent Over Time



**Graph 1b:** This graph shows the number of stations built cumulatively between 1904 and 2014, divided into continents.



**Graph 2a:** This graph shows the number of stations built in each year between 1904 and 2014. The trendline shows a small, statistically insignificant increase in the number of stations built over time. Key geopolitical events relevant to the Antarctic are indicated.



**Graph 2b:** This graph shows the number of countries that acceded to the Antarctic Treaty between 1959 and 2015. Orange bars show non-Consultative acceding nations, whilst blue bars show Consultative Nations.

## 6a. Quantitative Analysis Findings: Maps and Graphs

This first section of results will present the maps and graphs that were produced to examine the intersection between territory, science and the built environment in order to answer research question 1a – how the spatialities of Antarctic research stations reflect political interests of consultative nation stakeholders.

### 6ai. Spatial Locations of Research Stations and Land-claims

Map 1 shows the location of all stations that have ever been built in Antarctica, overlaid on the territorial claims made by the seven claimant nations. The stations show high levels of clustering around the edges of the continent, particularly on the Antarctic Peninsula, although there are some clear inroads made by certain countries inland (see Map 2). Only three stations were ever built in the ‘unclaimed sector’ of Antarctica, the rest falling within countries’ claimed territorial portions. It is also of note that the highest concentration of stations lies in the contested area of the continent, where the UK, Argentina and Chile’s claims overlap.

Map 3 pinpoints for reference the locations of all 12 initial treaty signatories’ research stations overlaid on the territorial claims. The stations in the unclaimed sector interestingly are owned by the USA and USSR/Russia, the two countries who do not recognise any territorial claims but reserve the right in future to make their own. These two countries’ bases also follow a shared pattern of being fanned out across the continent throughout the different sectoral claims and occupy both the South Pole (USA) and the Pole of Relative Inaccessibility<sup>12</sup> (USSR/Russia). The other three initial non-claimant signatories – Japan, South Africa and Belgium – are much more clustered together and appear to be geographically positioned based on their port of entry to Antarctica (likely via South Africa). Map 4 only shows the location of stations built by the seven claimants. It is noteworthy that no claimant nation has built research stations outside its own territorial claim, and that again the highest clustering of stations occurs in the contested Antarctic Peninsula, with the three claimants with overlapping territories placing multiple stations, both current and historical, in these areas.

When comparing the locations of countries’ stations with land claims, it becomes clear how the built environment is utilised as a means to legitimise territorial interests. The fact that no claimant nation has ever built a station outside of their own territorial claim is no accident; it suggests that research stations are the metaphorical equivalent for the colonial act of planting flags in the ice, staking foothold claims in such a way that is allowed by the Treaty, facilitated by its casting of Antarctica as *terra scientifica*. The clustering of stations in the contested sector by the three countries who make these claims is also significant, reflecting the geopolitical tension between these nations, the placing of research bases as simultaneously a “neutral” scientific Treaty-sanctioned act, yet also a power-laden political move to give weight to their land claims.

Furthermore, the maps demonstrate that in the case of the USA and Russia, the location of research stations “influences the reinforcement or obstruction of claims by establishing bases on territory claimed by others” (Bray, 2016). This is evidenced by

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<sup>12</sup> The Pole of Relative Inaccessibility is defined as the location that is the furthest point from any coast in Antarctica.

the fact that only the USA and Russia have stations in the unclaimed sector, as well as in every single other land-claim. This territorial appropriation and colonial foot-holding is clearly exemplified by the USA's Amundsen-Scott South Pole Station (ASSPS), positioned on the South Pole, at the apex of each claim and hence intersecting and overlapping each of them. This is particularly apposite when one considers that the station is open year-round with a permanent population – a feature that Dodds & Collis (2017) attribute to the final stage in the establishment of a colony. It also works to signify an act of aggression on the part of the USA to demonstrate power over territory, a metaphorical obliteration of other land claims and as a status symbol proclaiming proto-ownership over the South Pole, the centre of the continent.

The fact that clustering occurs on the edges of the continent is firstly because of the cost and logistical difficulty of situating and maintaining research stations in Antarctica. However, if one returns to a world-systems perspective, it can be said that states are currently only able to maintain a presence at Antarctica's coasts, because Antarctica remains too peripheral at present to the world-system to be able to sustain a permanent territorial presence further inland. This is corroborated by the fact that most of the stations inland are now closed or summer-only bases. It is also interesting that most research bases are located on the Antarctic Peninsula, the most accessible part of the Antarctic continent, to the extent that on King George Island, some bases are only 1km apart (IR-1). Scientific research aside, one can argue that this is a form of territorial claiming, staking a claim on the continent as a gateway for when the continent becomes more accessible.

These maps not only demonstrate that science in Antarctica is inherently political but show how the constitution of Antarctica as *terra scientifica* by the Treaty serves to legitimise neocolonial interests. This occurs firstly by allowing the claimant countries to consolidate their territorial claims by reasserting and maintaining their physical presence through science, but secondly permits new Treaty countries without claims to stake their own footholds in Antarctica by building research stations.

#### 6a.ii. Spatio-Temporal Patterns of Treaty Signatories

Map 5 shows the geographical location of every signatory to the Antarctic Treaty, both Consultative and non-Consultative, while maps 6a and 6b highlight trends showing the geographical distribution of countries that have research stations in Antarctica. The majority of European countries have at least one station, whereas South Africa is the only African nation with a station, and only China, Japan and South Korea, the richest countries in the Asia-Pacific region, have bases. Central America and the Middle East have no stations at all. These trends are reinforced by Graphs 1a and 1b, which show the original signatories dominating the number of historical and currently active stations. South America and Europe are two continents who have consistently built stations between 1904-2014, whilst the peaks in the 1950s-1980s from Asian countries was largely driven by the USSR/Russia<sup>13</sup>, with a subsequent decline after the collapse of the Soviet Union. However, Asia saw a resurgence post-2008 of stations, largely driven by interest from China.

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<sup>13</sup> In this analysis, USSR/Russia is grouped with the Asian continent.

Examining the spatial distribution of countries who have bases shows a clear division between the Global North and Global South, with the exception of Argentina and Chile, who are original signatory claimant nations. These spatial patterns of research stations, land claims and countries in the ATS are also particularly interesting when compared with scientific research outputs. The data shown in Graph 1b demonstrates that scientific interest in Antarctica is increasing, combined with the fact that the number of published peer-reviewed articles saw a 335% increase between 1980 and 2002 (Dastidar & Persson, 2005). In corroboration with the inequality between the number of stations built and the owners of these stations, the increase in the number of scientific papers written about Antarctica is also unequally distributed. Data shows that the seven claimant nations, along with Russia and the USA generate the majority of scientific research (see Figure 5), and that half of Consultative Nations collectively only produce 7% of total research outputs (Dudeney & Walton, 2012). Australia, the UK and New Zealand produced 42% of working papers submitted to the Treaty between 1992-2010 (ibid). This relationship demonstrates that predominantly Global North and original signatory nations not only have access to the territory through their scientific stations as the means of production of knowledge, but also the means to maintain a knowledge hegemony via the dissemination of this knowledge.

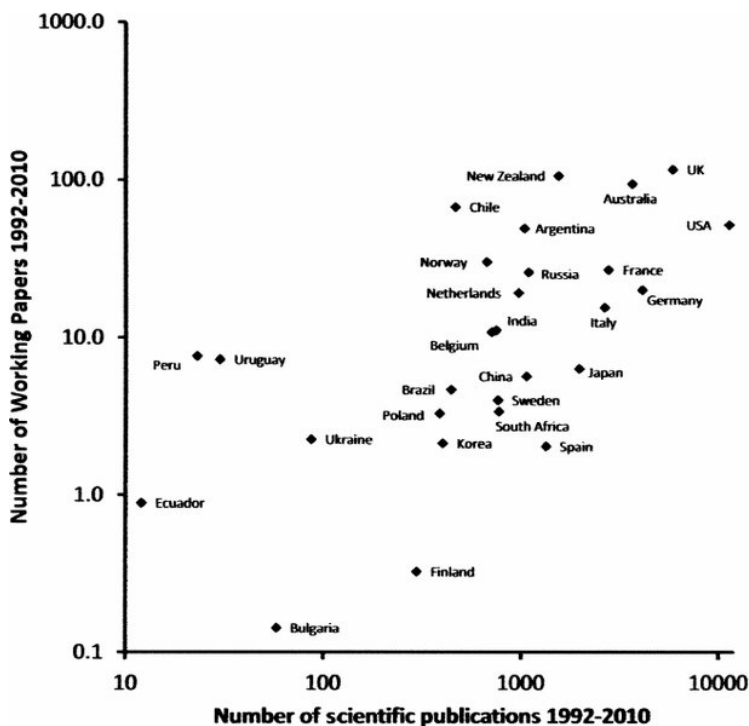


Figure 5: Log/log plot of the number of Working Papers produced by all Consultative Parties compared with their output of science papers from 1992 to 2010.  
*Original figure by Dudeney & Walton (2012).*

6aiii. Temporal Treaty Trends

Graph 2a shows the number of stations that have been built on Antarctica between 1904-2014, while Graph 2b shows the number of signatories to the Treaty over time. There has been a slight increase in the number of stations built over this time period, a trend distorted in large part due to the spike around the International Geophysical



Year (IGY) in 1957-8 and the subsequent Antarctic Treaty signing in 1959. Other peaks occur in the late 1980s, coinciding with the increase in observer and consultative memberships as a result of global interest in the Madrid Protocol and its predecessor, CRAMRA, related to resources in the Antarctic, and again in 2007-9, the International Polar Year (IPY). It is interesting to note the sharp increase in station building by South America, Europe and Asia, as shown by Graph 1b, coincides with an increase in both Consultative and Acceding nations to the Treaty between 1980 and 1995. This suggests that discussions regarding the potential opportunity to exploit mineral resources provoked a flurry of station building. This trend provides a tentative link between resources and territorial interests, which will be discussed in further sections. Furthermore, during the IPY, which was posited as “an unprecedented opportunity to get involved with polar science” (IPY, 2007), only European nations built more research stations during this time. This reinforces the link between territory and knowledge hegemonies generated by western, Anglophone countries as discussed above. Overall, these trends show demonstrative links between geopolitical events, such as the IGY, IPY and the Madrid Protocol, increased station building and global interest in the Antarctic Treaty, forging a connection between science being used as a front through which to gain geopolitical power.

#### 6aiv. Summary

When drawing the threads from each of the maps and graphs together, the results provide evidence for the neocolonial present that continues to operate in Antarctica as a result of the legitimising power of science. Dominant core nations (as well as Argentina and Chile) not only lead the appropriation of territory through their land claims and strategic placements of research stations, reproducing patterns of occupation similar to the colonial period, but also by maintaining knowledge hegemonies through the production of science about Antarctica. This establishes empirical evidence in favour of the hypothesis that the built environment as scientific research stations acts to enable the legitimisation of neocolonial territorial claims, as well as providing a foothold for future resource interests.

#### 6b. Critical-Political Content Analysis

This section of the results will present and discuss the findings from the CPCA. It examines the intersection between colonialism, capitalism and the textual discourses of scientific programmes and policies in order to answer research question 1b. It begins by presenting themes that arose in the CPCA, discussing these in relation to the narratives that each country’s programmes present and what purposes these serve, drawing them together into a combined discussion.

Thematic results are presented in the table below:

| <u>Thematic Category</u>   | <u>Sub-Theme</u>                         | <u>United Kingdom</u> | <u>USA</u> | <u>Germany</u> | <u>South Korea</u> | <u>Netherlands</u> | <u>Ukraine</u> |
|----------------------------|--|-----------------------|------------|----------------|--------------------|--------------------|----------------|
| <b>Scientific Research</b> | <i>Status</i>                            | ✓                     | ✓          | ✓              | ✓                  | ✓                  | ✓              |
|                            | <i>Politics</i>                          |                       | ✓          | ✓              | ✓                  | ✓                  | ✓              |
|                            | <i>Territory</i>                         | ✓                     | ✓          |                |                    |                    |                |
|                            | <i>Benevolence</i>                       | ✓                     | ✓          | ✓              | ✓                  | ✓                  |                |
|                            | <i>Economy</i>                           |                       |            | ✓              | ✓                  | ✓                  | ✓              |
| <b>Longevity</b>           | <i>Heritage</i>                          | ✓                     | ✓          |                |                    | ✓                  |                |
|                            | <i>Research</i>                          | ✓                     | ✓          | ✓              |                    | ✓                  | ✓              |
| <b>Nature</b>              | <i>Pristine</i>                          | ✓                     |            |                |                    | ✓                  |                |
|                            | <i>Wilderness</i>                        | ✓                     | ✓          |                |                    | ✓                  |                |
| <b>Responsibility</b>      | <i>Environmental Stewardship</i>         | ✓                     | ✓          | ✓              |                    | ✓                  | ✓              |
|                            | <i>Necessity/ Obligation of Research</i> | ✓                     | ✓          |                | ✓                  | ✓                  |                |
|                            | <i>Pacifying</i>                         |                       | ✓          |                |                    | ✓                  |                |
| <b>Resources</b>           | <i>Explicit: Living</i>                  |                       | ✓          |                | ✓                  | ✓                  | ✓              |
|                            | <i>Explicit: Non-Living</i>              |                       |            |                | ✓                  | ✓                  | ✓              |
|                            | <i>Explicit: Conceptual</i>              |                       |            |                |                    | ✓                  | ✓              |
|                            | <i>Implicit/ Not Specified</i>           | ✓                     |            | ✓              |                    |                    |                |
| <b>Territory</b>           | <i>Strategic</i>                         | ✓                     | ✓          |                |                    |                    |                |
|                            | <i>Historical</i>                        | ✓                     |            |                |                    |                    |                |
|                            | <i>Non-Recognition</i>                   |                       | ✓          | ✓              |                    | ✓                  |                |

**Table 3:** Results from the CPCA divided into themes and countries.

The categories and their sub-themes are outlined here in more detail.

1) The category of **scientific research** here is divided into five sections;

- *Status* denotes a discourse connecting with ideas of leadership within Antarctic science.
- *Politics* denotes a discursive connection between science and the achievement of political goals.
- *Territory* denotes a connection between science and the achievement of territorial goals.
- *Benevolence* denotes science as being linked with ideas of serving society, acting on behalf of a greater good and generating knowledge to benefit the global community.
- *Economy* denotes a connection between science and the achievement of economic goals.

2) The category of **longevity** is divided into two sections;

- *Heritage* denotes links between longevity in Antarctica as a matter of historical or cultural importance.
- *Research* denotes links between history and the longevity of a nation's scientific programme.

3) The category of **nature** is divided into two sections;

- *Pristine* denotes Antarctica as an environment which is free from pollution and contamination caused by humans
- *Wilderness* denotes Antarctica as an environment that is free from human activities.

4) The category of **responsibility** is divided into three sections;

- *Environmental Stewardship* denotes a link to the responsibility towards Antarctica and its environment as felt by nation states.
- *Necessity/Obligation of Research* denotes a link to the vital contribution that Antarctic research makes towards understanding climate change and the Earth system as felt by nation states.
- *Pacifying* denotes a reference towards being a balancing force in the Antarctic Treaty against opposing or unfavourable interests, as felt by nation states.

5) The category of **resources** is divided into four sections;

- *Explicit: Living* denotes explicit references to living resources, here defined as any biotic resource which constitutes a part of the Antarctic ecosystem.
- *Explicit: Non-Living* denotes explicit references to non-living resources, here defined as abiotic components of the Antarctic environment, including minerals and fossil fuels.
- *Explicit: Conceptual* denotes explicit references to other forms extraction of use or value from the Antarctic environment, including tourism.
- *Implicit/Not specified* denotes an implicit or non-specific reference to the economic benefits of a presence in Antarctica.

6) The category of **territory** is divided into three sections;

- *Strategic* denotes links to territory as being strategically important.
- *Historical* denotes references to territory as being part of a nation's history or heritage.
- *Non-recognition* denotes links to territorial claims being officially unrecognised.

#### 6bi. United Kingdom

For the UK, science is framed as the *raison-d'être* for being in Antarctica, but is also used to cement territorial claims and promote its political and scientific dominance.

The CPCA analysis showed high prevalence of the scientific *status* discourse, with numerous references to the UK's position at the "forefront" of "world-leading scientific advances" and its contribution to "influential reports and high-level policy advice". This idea of scientific status, particularly in the ATS, is also linked to territorial preservation, whereby "long-term security of the British Antarctic Territory (BAT) is ensured by supporting the UK's high profile in the ATS". Despite the linkages between science and political status, the UK's discourse is also centred on *benevolence*, utilising the notion of shared science and inclusive, open language, positing that UK science operates "for planet Earth" and for the "benefit of our society". It is unclear however whose "society" the science is supposed to be benefitting. This situating of Antarctic science in the nexus of status, territory and benevolence is suggestive of a contiguous pathway, whereby benevolent science is used as a mechanism for gaining political status within the ATS, power which can then be reconstituted as way to promote national interests, which in the case of the UK, signifies sovereignty over BAT.

Culture and heritage are also utilised as justifications for the continuing claim over BAT, invoking the discourse of *longevity* with regards to the UK's presence in Antarctica. Language such as "the oldest territorial claim" and "rich British cultural heritage", both gives legitimacy over the claim, and is also used to evoke within British people a sense of attachment and an emotional response towards the Antarctic: it is

explicitly stated in the texts that history and culture are useful for “promoting UK sovereignty by increasing awareness of interests in the region”. This is juxtaposed with the discourse of a continuing scientific presence, which combined with heritage, gives a sense of a timelessness, whereby “Britain will continue to play its leading role (in science)”, as if Britain always has, and always will be present in the Antarctic. This idea is reinforced by the use of the term “Antarctica: Global Britain”, which serves to place the continent within the UK’s periphery, as an extension of the British physical and conceptual notion of overseas territories. For the UK in particular, the consistent discourse of *longevity* and *heritage* is perhaps employed to add substance to its territorial claim against its counter-claimants of Chile and Argentina (Dodds & Hemmings, 2013).

It is also interesting to note that BAT and British presence in Antarctica has its roots in military action. Operation Tabarin, launched in 1943 had a dual militaristic and scientific role (BAS, 2015), used to “reinforce British territorial claims”, which positions historical British science as a cover for, or even complicit with more insidious aims. Though this is framed as being “in the past”, it can be argued given the above references to territorial and political aims that this complicity is just as tangible in the present.

References to mineral *resources* were sparse and implicit, only alluded to in a broader economic sense, in that involvement in Antarctica would have “lasting benefits for the UK economy”. It is unclear what this involvement is in reference to, however the statement that the UK would “benefit responsibly from natural resources” infers that its interests in the region extend beyond science. The idea of “benefitting responsibly” links with the discourse that the UK promotes of *stewardship* and *responsibility*, in that environmental regulations are stringently applied, with every effort made to have minimal impact on Antarctica, and as such they would be a responsible actor in the extraction of resources, should this be allowed.

The omissions in the UK’s discourse are also crucial to highlight. There is only one reference to the territorial claim overlap with Argentina and Chile, as well as no mentions of the ongoing geopolitical tension surrounding the Falkland Islands or BAT. In addition, there are only generic mentions of historical ecosystem collapse which occurred, with no acknowledgement that British whalers and sealers were instrumental in the destruction of the Antarctic marine habitat at that time (Jackson, 1978). This suggests either a cognitive disconnect with the UK’s extractive polar history, a deliberate omission to avoid tension between countries, or an avoidance of negative self-portrayal which could threaten sovereign ambitions.

#### 6bii. USA

The USA creates its narrative throughout the discourse by drawing on its long “active and influential presence” that has operated “without interruption since 1956”, contributing to its scientific and political prowess within and exterior to the region. By using a series of absolutisms, combined with frequent militaristic language, such as “*the leadership role*” and “*unequaled by any other nation*”, alongside “*strategic location*”, “*year-round occupation*” and “*right to assert a claim*” the *status* discourse used by the US contributes to an aggressive form of dominance staking. By

referencing its “leadership in Antarctica and world affairs”, this makes an implicit connection that domination in one is tied to domination in the other. It is also alluded to that the Treaty is the mechanism through which there can be “the successful pursuit by the US of unique opportunities”, particularly interesting when one considers that the US were the initial instigators of the ATS, suggesting that the Treaty may be engineered to protect the interests of the original signatories. In this manner, like the UK, US science is placed as central to gaining status and territory, again providing evidence for the complicity of science in achieving national goals in the Antarctic.

It also ties its research to *benevolence*, highlighting how “the interests of mankind would be best served” by US research results, but also simultaneously casts itself as a *pacifier* within Antarctic affairs. As evidenced by references to the “increased importance of US leadership in maintaining a political balance”, the US emphasises the necessity of its governance in order to ensure that the Treaty is followed, yet this raises the question of who, or what, the US is required to be a balancing force against. This idea is interesting when contrasted with the discourse of aggressive politics and dominance that is portrayed throughout, and why the US feels so strongly that there is a “need” for its presence in Antarctica.

The discourse of *territory* in the US texts is complex. Although the US repeatedly emphasises that it recognises no territorial claims, the militaristic language throughout suggests that the US is positioned to act on their “right to assert a claim” in the future. This is also reinforced by the maps discussed in the above section. The reference to their research stations as being “strategically located” and the ASSPS as a vehicle for “year-round occupation of the South Pole” again links science as being utilised to legitimise a territory-staking agenda. Therefore, although the US officially does not recognise land-claims, it appears that implicitly there are connections with the US research programme being utilised to create footholds in the ice for a potential future claim, anywhere in Antarctica.

Much like the UK, none of the US documents make explicit reference to mineral resources, instead focussing on the notion that “permanent presence of the US in Antarctica has major political and security benefits”, without explicitly defining what these benefits are. One reference however was made to the idea that “US commercial fishing interests are growing”, which was linked to the US management of fishing activities in Antarctica, indicating an economic motive to the country’s permanent presence and its desire to maintain influence in the ATS.

#### 6biii. Germany

Germany also invokes a discourse of *longevity* and *status* within its research programme, placing itself “at the forefront of modern research” with “years of expertise”. There is much emphasis on the high quality of German research and the links this has to it “assuming leading positions”, in a similar manner to the US and the UK. The German narrative is nearly wholly centred on the excellence of its scientific research, its importance and the contributions this makes to global society, “meeting the challenges of tomorrow”, which, like the previous two countries examined, utilises the *benevolence* discourse, to position its science programme’s aim of benefitting the world at the fore. However, like the US, Germany designates scientific research in

Antarctica as a political and economic endeavour, connecting prestige in science as a way to “safeguard Germany as a modern, high-tech nation”, again suggesting that leadership in Antarctica is somehow linked to leadership in the global economy.

With regards to resources, some implicit particularities emerge through its ascription of the terms “use” and “value” to Antarctica, noting the “technology transfer from research into the private sector”, which highlights the connection of Antarctic science to capital interests within the German programme. It also draws on the discourse of politics and economy within science, by stating how “policy and economic decisions made have a profound impact on our future economy”, positing present-day interest in Antarctica as a foothold for a long-term investment.

However, with the focus of the discourse primarily being on climate change and environmental concerns, this overall suggests that scientific excellence and global leadership within German science has less ulterior motives than the UK or the USA. This is perhaps due to Germany not recognising territorial claims or having any of its own in the Antarctic; neither is it an original signatory member.

#### 6biv. South Korea

As with the previously-examined nations, the concept of *status* is also key in South Korea’s discourse, and although it does not currently assert leadership, it “strives to be the leading polar institute” in future, increasing national scientific competitiveness. Like Germany, Korea seeks to “fortify its global impact” through its polar programme, once again linking Antarctic research with political prowess in a wider geopolitical context. However, Korea explicitly acknowledges the “massive amounts of mineral and marine resources” present in Antarctica, and the “opportunities” this will create in the future. Language such as “opening up a better future from the ends of the world” also firmly places both the Arctic and Antarctica as extractive peripheries to be opened up for exploitation, which will initiate a flow of resources from these areas to the benefit of the world-cores.

The use of the phrase “future values (will be created) based on top-class science” conveys the idea that science generated in Antarctica can be utilised by nations as a form of metaphorical currency to buy status, that will enable them to have a stronger voice with which to direct future decisions taken by the ATS. Furthermore, as a newer Antarctic player, the Korean discourse does not focus on *longevity*, and neither is there any reference to *territory* or territorial dispute. This suggests that as it has no historical claim, South Korea intends instead to utilise scientific research over territorial assertions to legitimise its resource-related aspirations. The future is also frequently invoked to justify its presence, alongside its self-certified *benevolence*, through the idea that Korean science will “create a better tomorrow for the world” by pursuing a sustainable future through resource development. This highlights a cognitive disconnect in the discourse between wanting to “respond to climate change” and “address global environmental issues”, and the desire to extract mineral resources from the polar regions.

Overall, the South Korean narrative is explicitly centred on the value of the polar regions, economically, politically and scientifically, and how its polar programmes can help the nation position itself beneficially to take advantage of future agreements.

### 6bv. Netherlands

The Dutch discourse frequently refers to its programme's *longevity*, whereby they have both "strong historical connections" and "continuously amassed knowledge", leading to the achievement of excellence in polar science. Its policy document, named Pole Position, places knowledge about Antarctica as vital for gaining the *status* needed to be a leader in Antarctic affairs, enforced by the idea that "knowledge about change and its consequences remain strategically important". The CPCA again revealed how science is linked to *geopolitics*, as shown by the statement that "Netherlands must be able to influence international management regimes", demonstrating the connection between leadership in Antarctic science and its role in geopolitical arrangements and economic decisions.

The Dutch discourse affirms that it does not recognise any territorial claims in the Antarctic, and as such this position renders them an effective *pacifier* within the Treaty. The narrative presents its operations in the Antarctic as largely *benevolent*, whereby the discourse emphasises its "obligation for the responsibility and protection of Antarctica, to carry out scientific research". The reason for this obligation is not explained; however, if read in conjunction with its desire to protect Antarctica as "an unspoilt wilderness" and its perceived benevolence in Antarctic affairs, this suggests that the Dutch programme posits itself, in the same manner as the US, as a balancing force in the Treaty against insidious interests.

This is an interesting stance when considering that this is diametrically opposed to their discourse of the Arctic, whereby it has broadened its perspectives from a focus on scientific research and environmental issues to include "political, strategic, economic and legal" contexts. CPCA analysis of policy documents revealed that the Dutch are proponents of Arctic "sustainable exploitation" with "interests in both mining activities and fisheries". Furthermore, science and knowledge at both poles are perceived to be key to engaging businesses, providing benefits and opportunities for Dutch companies, particularly the "maritime and offshore services sectors". Like the UK, the Dutch discourse also deems itself to be capable of "safe, responsible decisions with respect to activities" as a result of its environmental stewardship in the Antarctic, which means that should resource extraction be allowed in future, they would also be a qualified nation in this respect.

The narrative overall is centred on the responsibility the Netherlands has for protecting and managing the Antarctic, seeing itself as a benevolent force in the Treaty due to its lack of territorial claims. However, this narrative of benignity in Antarctica is juxtaposed with a discourse of the "value" and "use" of the polar regions, the resources that are on offer particularly in the Arctic, and the economic benefits that science will provide to the nation and its industries.

### 6bvi. Ukraine:

Ukraine, despite having been an Antarctic nation for only 15 years, has adopted a discourse of *longevity* in a similar vein as the other nations analysed, emphasising their "23 Ukrainian expeditions and continuous work" and the scientific value of their research. Although there are no mentions of being world-leading, the meritocratic language and *status* discourse is present, lauding their "experts in all fields of polar



research and “highly skilled specialists”. There is also an acknowledgement of the value of scientific prowess and visibility in generating political currency, and what is to be gained from this currency – “a means to substantiate and realise national interests in the region”.

Like South Korea, Ukraine explicitly refers to its “state interests in the near (biological resources) perspective, and the remote (mineral resources) perspective, as well as acknowledging their presence as a means to “substantiate the national interest in the region”. There is also frequent reference to tourism, with what appears to be advertisements for their Vernadsky station as a tourist destination, with linguistics and imagery to be expected from a travel guide, such as “comfortable yacht moorings”, and “camping on the shores of the picturesque island”. This demonstrates Ukraine’s desire for growth in the tourist sector, and a clear sign of action being taken towards permanent tourism infrastructure on the continent. As with the other nations, Ukraine portrays its presence as *benevolent*, lauding its “efforts to minimise impact and cares for environmental issues”, yet again demonstrating the cognitive dissonance between maintaining a pristine environment and wanting to extract resources from it.

The Ukrainian narrative overall is focussed explicitly, like South Korea, on the economic and political potential of Antarctica with specific regards to both the short- and long-term possibilities of extracting resources, utilising science as a means to conduct both climatic and environmental studies as well as to “evaluate resources based on scientific research”.

#### 6bvii. Overarching Themes from CPCA

A key finding from the CPCA, shared by all nations analysed, were the high number of references to *status* in the form of leadership and scientific excellence. These references were combined with allusions within the discourse to world-leading scientific research as a means to gain status within the ATS, an investment which is then returned by an enhancement or protection of national interests in the region. Each of the countries analysed also emphasised their *benevolence*, either with regards to the outputs of their science or their stewardship towards the environment. This relates to the discourse of *status*, whereby compliance with regulations creates a sense of entitlement to be rewarded for their efforts, by being construed as actors who would be best-placed to extract resources in a responsible manner, should the opportunity arise in future.

Much of the discourse disseminated by the ATS charts a somewhat linear progression of the mentalities of countries acceding to the ATS, moving from territorial motivations pre-Treaty, towards resource aspirations in the 1980s, and now ending firmly on countries’ scientific and environmental aspirations. However, the CPCA results challenge this linear progression, instead finding that although territory was indeed a key motivation for states pre-Treaty, resources have always been an underlying factor in countries’ interests towards Antarctica.

The extent to which this is explicitly alluded to varies, for example the UK and US discourses are dominated with references to sovereignty, historical longevity and territory, and only implicitly refer to resource interests. This contrasts with Germany, which is focussed mainly on science, with a discursive undercurrent of Antarctica’s

economic value, through to South Korea and Ukraine, whose discourses, although predicated on scientific research, contain explicit references to furthering their national interest by exploiting resources in the Antarctic. The Netherlands is somewhat anomalous – being both a relatively new country in the ATS but also an ex-colonial nation – and positions itself simultaneously as a protector of the environment in the Antarctic but as contender for resource exploitation at both poles. Nevertheless, the message which emerged from the CPCA is that all the nations analysed had an eye upon the resources that Antarctica has to offer, and confirms the hypothesis that science is a key legitimiser through which political and economic aims can be achieved.

Lastly, one theme which was not categorised in the CPCA was the referral to the Arctic, which was cast as a parallel or analogue to the Antarctic, in terms of attitudes to resources, the environment and politics. This idea will be discussed in more depth in section 7e.

### 6c. Interviews

This section will present the results of the eight expert interviews conducted with representatives from scientific organisations, divided into categories uncovered by the analysis of the interviews. These results seek to add depth to both research questions 1a – how state interests are legitimised via science – and 1b – what are the purposes of Antarctic narratives as constructed by states.

#### 6ci. Science as Politics, Politics as Science

*“You could say that all science has been used to build a narrative, it just depends on who’s building the narrative and what the objective is – IR-8”*

One theme explored in the interviews was the relationship between science and politics, to find out if in the eyes of Antarctic scientists, they mutually constitute and reinforce each-other.

Most respondents recognised a connection between science and politics, stating that “all countries are involved in using science as a means to have political influence (IR-2), as there is a “strategic element for having a presence in Antarctica” (IR-6). When questioned about how this political influence operates through science, 75% of interview respondents discussed how higher levels of funding, research and co-operation in some way led to increased recognition and status within the Antarctic scientific community. This recognition in turn translated to higher political status. As one respondent put it, “if you don’t have a station or science programme, you can’t sit at the (decision-making) table – science delivers the contribution that gains respect, and then you’re entitled to have a serious say in negotiations” (IR-7), while another acknowledged that “if you’re there (in Antarctica) and you have a big presence, you definitely have an influence in what goes on” (IR-8).

Following the theme of status and leadership in science which emerged from the CPCA, respondents discussed this as being important in justifying a country’s presence on the continent, as “there is political stock to be made from saying you are a world leader in Antarctic science, (it) strengthens your claim” (IR-3). This interpretation of leadership also forges a link between scientific status and territorial

claims, and adds weight to the trends of research station locations shown by the maps in section 6a.

It is also of interest that two respondents indicated that some countries give less weight to being Antarctic leaders, with one mentioning that “some countries just want to do research because it gives them a presence...(do they) really care what the research or its quality is” (IR-6), and the other linking this to the spatial clustering shown by Map 1, 2 and 3 in the Antarctic Peninsula, as it is the “most easy place to get where countries will go and say they’ve got a base” (IR-1). This idea reinforces the themes which arose in Sections 6a and 6b, whereby scientific presence is utilised as a foothold for some countries, not to conduct benevolent science, but as a means to safeguard future interests on the continent.

#### 6cii. History, Territory and Neocolonialism

*“People will invest heavily because they have to substantiate their clam” (IR-7)*

Once it was confirmed that science and politics were inherently intertwined in the Antarctic context, the next step was to understand, from the interviewees’ perspective, what national interests were being enacted and legitimised through the pursuit of scientific research.

Although the discourse of *longevity* consistently emerged as a theme from the CPCA as a means to justify interest in Antarctica historical legacy was only important for two respondents. These interviewees acknowledged that “how long we’ve been there is absolutely used as a tool to legitimise interest” (IR-6), and that “(early) expeditions put us on the map and were important for later Antarctic involvement” (IR-2).

The CPCA revealed that territory was a core interest of particularly the older signatory nations. Complementary to this, it was recognised by 75% of respondents that the positioning and maintenance of scientific bases was in some way politically and geographically important, especially for claimant nations. One interviewee stated that claimant nations “need to maintain their position, and that is (achieved) by having a strong presence, many stations and ships” (IR-7), while another said that “if you put your station there, you’re almost claiming (the land)” (IR-8). Nevertheless, it must be noted that two respondents explicitly stated and nearly all others touched upon the idea that “territorial claims are not currently a barrier to science” (IR-1).

With regards to the question of the Antarctic Treaty enabling the protection of interests of original signatories and developed countries by giving political weight to scientific leadership, only one respondent explicitly stated that they believed it was a due to a form of neocolonialism. Most respondents denied that the Treaty was “deliberately exclusionary” (IR-8), while others cited that they were “not aware of any country who was refused membership”. However, many of these same respondents later went on to acknowledge that “the Antarctic Treaty does make it difficult for nations that aren’t included in it (to be involved in governance)” (IR-3), and that “poor countries, they simply can’t afford to do research in Antarctica” (IR-5).

### 6ciii. Science: A Proxy for Resources and Private Interest?

In addition to territory, resources were revealed by the CPCA to be an interest to each of the analysed nations and were consistently alluded to, both explicitly and implicitly within country policies and websites.

Despite this occurrence in the textual analysis, questions on Antarctica and its resources proved a divisive subject for the interviewees. One respondent strongly disagreed that Antarctica is viewed as a resource, stating that “the only way we would regard (Antarctica) as a resource is as a platform to do scientific work... that’s not something we would ever have a discussion about” (IR-1), while another denied that countries’ interests were resource-orientated, stating that “the main motivation for interest is the role that Antarctica plays in the climate system” (IR-5). On the other hand however, one respondent stated that “(although) natural resources (in Antarctica) are not that important yet on a global perspective, science is the reason we have to go there and build our little huts and claim land”, and that “(Antarctica) has always been considered as a resource... fifty years ago it was mineral resources, one hundred years ago it was whales” (IR-2).

As in the CPCA, temporal factors were key when resources were discussed. Half of the respondents discussed fisheries as an Antarctic resource, which were framed as an emerging and more pressing problem due to looming “food security” issues. Three also alluded to bioprospecting as a commercial activity which is gaining interest in Antarctica. On the other hand, mineral resources were either dismissed as not ever being a possibility, or posited as a historical interest, or a more distant future problem. With regards to conceptual resources, every respondent mentioned tourism as an activity which is seeing large growth in the present.

### 6civ. Opposite Poles, Opposite Policies

*“Countries are more interested in the Arctic than the Antarctic as a resource haven”  
(IR-3)*

Lastly, despite the interview question guide only focussing on Antarctica, six respondents brought up the Arctic as a comparison when answering questions. One key reoccurring idea was that human presence in the Arctic “is very much a commercial and military strategy” (IR-8) and that there is “more conflict potential in terms of natural resources” (IR-4), in part due to the fact that it is “known to have huge oil and gas reserves and is generally very accessible” (IR-3). This resource-based understanding of the Arctic was starkly contrasted with Antarctica, which was deemed by the interviewees to be off-limits for resources. While the Arctic was almost confirmed to be exploited for resources by some respondents, with regards to Antarctica, three respondents were reassured that “there will be every effort to preserve (it) going forwards” (IR-6), with “significant pushback from the scientific community... if people started extracting things” (IR-8).

It was also highlighted that scientists “operate in Antarctica as conscientiously as possible” (IR-1), in order to minimise environmental impact. However, it was mentioned by one respondent that “there is a perception among countries that have been traditionally engaged in Antarctic research that they are better at protecting it”, linking to potential conflicts over environmental stewardship between Treaty countries.

This conflicting perception of the two poles, as well as the sense of scientific benevolence and environmental stewardship, which was repeatedly found in the CPCA, will be discussed further in section 7.

### 6cv. Overall Interview Themes

The findings from the interviews corroborate evidence found by the GIS and CPCA analyses, demonstrating that the conduction of science in Antarctica is politically motivated, in the sense that a scientific presence and the quality of research outputs translates into higher political status. Overall, the interviews show how science is utilised as a vehicle to legitimise national interests, and how state narratives of status and leadership within their scientific discourses are used to reinforce this in Antarctica.

The interviews support the finding that longevity is used to justify territorial interests, and that the locations of scientific bases are a way to substantiate land-claims. Although the interviewees mostly disagreed that the governance of Antarctica was exclusionary or founded on a neocolonial premise, there is evidence of cognitive disconnect, as most also acknowledged the lack of developing countries represented in the Treaty and the financial barriers to conducting Antarctic science. In addition, it is also interesting to note that although most states and scientists were perceived to operate benevolently, some newer countries are understood to have less environmentally-benign intentions, instead locating their scientific interest as a preface to other uses for Antarctica in future.

Further to this, a key finding here was the contrast between the resource-orientated discourses uncovered in the CPCA and the denial from interviewees about this perspective. This was particularly interesting when contrasted with perspectives on the Arctic, which were centred on the northern pole as inevitably being opened up for exploitation, while Antarctica remained a pristine, protected wilderness. Nevertheless, the respondents indicated that as the world continues to change, it may become a question of ethics as to whether humanity should use Antarctic resources, whether “we as a society can afford to have a big natural park for the minority, or if more people in the world take benefit of this continent and use its resources”. This raises an element of uncertainty over the future use of the continent, as to whether science will continue being the benevolent activity it is perceived to be now, or whether its findings will be used as a stepping-stone to extracting much-needed resources, as the demands of a rising consumerist population continue to increase.

## 7. Discussion

This section will discuss the main themes which emerged from the data in Section 6, engaging with the theoretical and analytical framework outlined in Section 4. It will triangulate the answers to the two sub-research questions to answer the overarching research question: how neocolonialism and the prospects of capital accumulation are legitimised by scientific research in Antarctica.

The four key findings which emerged from the component methods were that

- Science is inherently political, operating as a vehicle for national interests. Through the casting of the continent as a *terra scientifica*, these interests are able to play out on a continent which is effectively off-limits to resource extraction and territorial claims due to its prohibition under the ATS;
- The prioritising of science leads states to create a discourse of *status* and scientific and environmental *benevolence* in order to gain power in the ATS, resulting in the interests of certain nation states being privileged through the crystallisation of knowledge hegemonies and cementing a neocolonial order;
- That resources have always been at the centre of Antarctic interest for states, yet scientists themselves believe in the benevolence of research, creating a cognitive disconnect and possibly preventing meaningful engagement in Antarctic conservation efforts;
- The Arctic is anticipated to be the next frontier for the exploitation of natural resources as a result of a climate-induced increase in accessibility, prompting questions over whether Antarctica will be protected from this trajectory of climate change-induced accessibility to resource extraction.

Drawing these ideas together, some light can be shed on how scientific research has legitimised and hence enabled processes of capital accumulation and colonialism to take place in Antarctica. In the first instance, the author acknowledges and appreciates that scientific knowledge about Antarctica, its impact on and interconnections with the geophysical and biological Earth system is vitally important, contributing to governance and policy planning, such as appropriate coastal defences against sea-level rise (IR-7). Nevertheless, despite its benevolent aspirations, Hemmings (2017) contends that science in Antarctica is a preface and only part of the justification for state engagement in Antarctica. He states that under the surface, it is resources that are at the heart of the debate, while Neufeld et al. (2013) argue that sovereignty and territory have also always been a crucial motivation for state involvement. The results of this thesis however found that the reality is a combination of both statements; that science is a key mechanism for legitimising and maintaining territorial interests as well as future resource assets.

#### 7a. Leadership, Prestige and Exclusion – Cementing Neocolonial Hegemonies

A key step in this legitimisation process lies in the global scientific prestige and leadership that is generated by producing world-class science about Antarctica. The ATS attributes to science a privileged position in Antarctica and is cast as necessary for its protection and management, directly linked to the notion that the conduction of science transcends politics, a project that is both neutral and objective with regards to geopolitical interests (Hemmings, 2010). However, the findings of this thesis contend that science on the continent is anything but apolitical. The number of references to leadership and scientific excellence were numerous within each nation's discourse, as highlighted by the CPCA results, and many interviewees corroborated this, linking it to the fact that scientific excellence translates to increased engagement within the Treaty system. Antarctic power can be acquired by holding leadership positions in governance bodies such as the ATS or its working parties, making major investments in logistics and capacity-building, or producing world-class science on key polar

issues, thus casting science as the currency of influence (Brady, 2014; Herr & Hall, 1989).

However, this process of legitimisation through science leadership necessarily leads to the exclusion of those who cannot “buy” the currency of influence. Antarctica is theoretically open for all nations to partake in science, a fact acknowledged by nearly all interviewees and referenced to by the analysed websites. Most national programmes have policies in place which facilitate collaboration and logistical arrangements with any country, for example allowing scientists to conduct research at other bases or filling available spaces on a research vessel (IR-1). Nothing either stops a given country applying for non-Consultative status within the ATS. Nonetheless, a presence of scientists from non-Treaty countries does not negate the fact that to actually get a vote in Antarctic affairs, the caveat for countries to be conducting “significant scientific research” to achieve Consultative Status must be fulfilled. This relies on the country in question having infrastructure in Antarctica, such as research stations and/or ships, or else have a well-funded, world-class polar research programme. Therefore, this automatically excludes the majority of the developing world, due to the fact that an investment in Antarctic science of the magnitude required to be a consultative nation is financially impossible. This is starkly reflected by the spatial distribution of countries shown in Maps 5, 6a and 6b; there is a dearth of countries from Africa, Central America, the Middle East and South-East Asia, whilst those with the most research stations are the original signatories, European nations and China – the same countries who claim scientific leadership. To achieve the scientific excellence that these nations claim they possess, a country must necessarily already have significant existing reserves of domestic funding, logistical infrastructure and institutions through which to generate research. It is no coincidence therefore that the countries analysed which claim world-class science in Antarctica – USA, UK, Germany, Netherlands - are also those that are global leaders across many other fields, from genetics to robotics (IR-6).

Once established as Antarctic leaders, powerful groups are able to utilise science as a facilitator for capital accumulation: scientific research is indirectly beneficial to national economies as a result of its applicability and transferability to the private sector, as emphasised by the Dutch and German CPCA results. In this sense, even climate science is not as benevolent as it may appear; as “climate changes have economic consequences... these create new opportunities”, acknowledged in the case of the Netherlands, for their maritime and offshore services sector (NOSR, 2015). This was further reflected upon by two respondents, who recognised the use of science as an asset which yields economic information, such as the locations of mineral deposits and fisheries data, as well as for grounding territorial claims (Neufeld et al., 2013). This demonstrates how science can be used as a tool through which capital accumulation can operate and work to create a flow of non-tangible resources – knowledge – extracted from the periphery, which accumulates in core countries who hold power within the ATS, and which can then be reconstituted as hard power over future physical resource opportunities. The structure of the ATS therefore maintains the dominant knowledge hegemonies prevalent in the world-system. In this sense, Antarctica has been reduced to a closely-monitored space of privilege under the

banner of scientific research, which prevents a truly global cultural engagement as a result (Glasberg, 2011).

The policies lauded by the ATS, which work to promote Antarctica as an apolitical *terra scientifica*, held up as beacons of the success of the Treaty by national programmes hence can be argued to reward those with pre-existing scientific capital, by granting them increased power Antarctica. Simultaneously, these policies and scientific structures act as a barrier, regulating those who can and cannot access the Antarctic; one interviewee related their experience of “white, Anglophone, mainly men” being the predominant speakers in Treaty meetings. Further to this, it was recounted that countries who do not conduct or publish research in English are disadvantaged within the operating groups of the Treaty, including SCAR (IR-6). In this way, Anglo-European power continues to hold fast over and within the ATS, as a result of the dominance of science-centred management, allowing Antarctica to continue to be articulated to historically dominant power and knowledge structures (Glasberg, 2011; Dodds & Collis, 2017).

From this data, it can be seen how the emphasis placed by the ATS on scientific research leads to the production of *status* discourses by consultative nations, as a result of the value of the political power which stands to be gained from this leadership. By constituting knowledge as power, the promotion of *terra scientifica* in Antarctica reifies a neocolonial hegemony of knowledge production. Through this hegemony, the states who generate knowledge about Antarctica are the ultimate beneficiaries of it, whether through the cementation of their political positions, or future resource access that is yielded as a result of science. This operates whilst simultaneously excluding those that are not able to produce scientific knowledge congruent with the Western scientific episteme. In future, should the ATS dissolve, this could work to ensure that those who are already privileged in the hegemonic global order are rewarded by the ability to harvest resources to further their own wealth (Bray, 2016).

Science in Antarctica can also be seen as an inherently political proxy for colonial interests, as hegemonic states engage in the appropriation of land, jostling for political power over space to recreate colonial past in a neocolonial setting. This thesis hence argues that Antarctica is in the midst of a neocolonial present; the exclusionary nature of the Treaty means that poorer countries are effectively shut out of decision-making, as they cannot afford to conduct “significant science”. The history of colonialism is still inscribed within the Antarctic Treaty, through the existence of Article IV, allowing claimant nations to continue to assert sovereignty and maintain hegemony through the access to, and control over knowledge and resources (Howkins, 2010).

#### [7b. Managerial Necessity in Terra Scientifica](#)

It is not only *status* discourse and its relationship to Antarctic power that operates to exclude certain groups from the continent. Using soft power gained by being leaders within the ATS, dominant states can discursively construct Antarctica as a pristine and unpolluted environment. This narrative operates as a mechanism to enact the colonial practice of “managerial necessity”, or environmental stewardship, which serves to defend both resource and territorial interests by excluding states which are perceived to be environmentally harmful (Dodds, 2015; Hausknot, 2017). The narrative also



emerges through discourses produced by original signatory nations of a dichotomy between the older treaty signatories, portrayed to have scientifically benevolent and environmentally-conscious aspirations and the newer Antarctic countries, who are represented as having damaging 'resource-grabbing' motivations.

It is often newer Consultative states, as well as China and Russia, who are perceived to be the key actors threatening the Madrid Protocol. This was raised by three interviewees, who identified these countries specifically as parties which disrupt the Treaty's environmental aspirations, an opinion which was evidenced by these nations vetoing further Marine Protected Areas (MPAs) in Antarctica, including a notable proposal for the Weddell Sea (IR-2). Another interviewee referenced that there is also a belief that newer nations in the ATS are not as rigorous with regards to environmental protection at their research stations as the older states, and that these countries do not care about what research is done, instead utilising the preface of science as a foothold for other interests. This perception of newer countries by original Antarctic Treaty countries as a threat to the unspoilt Antarctic environment provides a justification and legitimisation towards the continued exclusion of developing countries. It also invokes the need for managerial necessity in order to protect the environment from those who are perceived to be damaging it. This is traditionally enacted by excluding indigenous peoples from their lands, however, in Antarctica this is achieved by excluding supposedly resource-hungry developing nations, working to consolidate both territorial claims and future resource assets of powerful countries over Antarctica.

This perception of newer states causing more environmental harm however can be argued to be paradoxical. Firstly, as the older nations never reference their own role in the historical ecological destruction of Antarctica's marine environment, but also because these states position themselves in relation to contemporary resource opportunities, as evidenced by the CPCA (IR-2), for example, the explicit reference in the US discourse that ecosystem research could benefit American companies' increasing interest in Antarctic fisheries. Further to this, the global corporations tracking geological and fisheries potential in Antarctica are predominantly based in the west, alongside the majority of tourism and bioprospecting industries (Dodds & Hemmings, 2013). This exposes a hypocrisy in the discourse, one which is largely ignited by the representational struggles around Antarctica created by the increase in Global South nations acceding to the ATS (Dodds, 2017).

Dominant Treaty countries emphasise the inference that environmental responsibility with regards to science also means that resource extraction would be conducted with the same degree of responsibility. This thereby legitimises the positioning of themselves in such a way that facilitates access to future capital accumulation (Howkins, 2017). One interviewee went as far as to say

*“Are we better trying to support and stimulate responsible industry, a responsible oil company like Shell to develop oil and gas resources or would you like a cowboy industry that ignores safety regulations with a greater risk of spills in the region. We can't reduce risks to zero, but if you're going to let it happen, you'd better do it in the most responsible way. We would be stupid by leaving it up to parties that will do*

*more damage to the environment than we will do ourselves... if you're going to do it in a responsible way you may as well take some benefits for the private companies as well." (IR-6)*

This quotation shows that even within the scope of conducting damaging extractive activities, the legacy of managerial necessity endures, supporting the perception that Western countries and their industries are somehow more responsible towards the environment and are therefore best placed to protect it. On a broader scale, another cognitive disconnect emerges between countries who hold up their environmental actions in Antarctica as examples of their excellent conduct, yet do little domestically to combat the more urgent and existential threat that Antarctica faces; climate change. This ignores the cognitive dissonance that any resource extraction, particularly of fossil fuels would be devastating to the Antarctic and on global climate, regardless of who conducts it<sup>14</sup>.

In this way, the discourses of environmental protection and scientific benevolence offer a means for the dominant Antarctic Treaty countries to exert their political control, which both works towards the exclusion of other countries from Antarctica, as well as enacting a discourse of legitimacy for future capital accumulation.

### 7c. The Emergence of Capital Accumulation

While Antarctica was the last place on Earth to be discovered, it was also a novel place for the development of “new representational practices, new modes of knowledge and ways of tying the Earth to the engines of capital accumulation” (Glasberg, 1998). As the traditional workings of capitalism and colonialism did not apply, due to the lack of indigenous populations, world-core nation states needed to find a new way through which to exploit the Antarctic environment. Historically, this operated through territorial flag-planting and a subsequent boom-bust approach to living resource exploitation (Collis, 2017). However, with the advent of the Antarctic Treaty, the primary mechanism for these processes to occur have been through science, as discussed above. Whilst evidence points towards mineral resource extraction being a more distant prospect, ever-growing technological capacities and an increase in accessibility to the continent means that alternative forms of commercial exploitation are becoming a more tangible reality in Antarctica (Hemmings, 2017).

One such example is bioprospecting, raised by three interviewees as an increasing interest from states and companies alike in Antarctica. Bioprospecting is the commercialisation of new products based on biological resources from which new compounds are derived, with uses in pharmaceuticals, agriculture and nanotechnology products (UNDP, 2019). Bioprospecting causes a particular threat to the Treaty’s conviction that the conduction of science transcends politics, as science is no longer external to resource activities but is central to it. This blurs Articles II and III of the Treaty, which state that parties must abide by freedom of information, with scientific results being freely available, and leads to a conflict between obedience to Treaty statutes and protecting commercial interests.

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<sup>14</sup> Figures show that Shell annually spends \$49m on climate lobbying (McCarthy, 2019), highlighting the cognitive disconnect in describing the company as ‘responsible’.

In addition, other interests like tourism are increasingly prevalent and penetrating further into Antarctica over time, evidenced by 63% of interview respondents discussing tourism as one of the key private interests that is gaining prevalence on the continent. The number of tourists per year currently totals 40,000 but is increasing year on year, with manifold activities, including marathons, cruises and wildlife tours (Liggett et al., 2017). The increasing trend of resource-sharing between scientific bases and tourist operators have led some scholars to believe in an increasing likelihood of permanent tourist infrastructure such as hotels (Chown et al., 2012), whereby such projects are defended with a discourse of safety, which is hard for scientists to argue against (IR-7). The sharing of resources shows how existing infrastructure, originally in place for purposes of science, is helping to increase the accessibility of Antarctica for other commercial interests. This link is exemplified by the tourism page shared by the Ukrainian Antarctic programme, which reads as an advertisement for visiting Vernadsky station (see UAC, 2019). Furthermore, this consolidates the permanent presence of a group of people in an area of “claimed” land, a key stepping-stone in land appropriation and colonial techniques, and also explains why each claimant state has at least one permanent research station in its territory (Dodds & Collis, 2017).

Therefore, as exemplified through bioprospecting and tourism, it can be seen that science is not just a legitimising tool for capital interests, but could become an integral part of the process.

#### 7d. Science and Politics – A Cognitive Disconnect?

Despite the evidence for science being a means to legitimise capital accumulation as presented above, 75% of interviewees disagreed that resources would ever be commercially exploited in Antarctica, with three citing the backlash that would ensue from the scientific community if did indeed take place. This contradicts the CPCA, which suggests that nearly all states are preparing for some degree of resource extraction. On closer inspection, what became apparent from the CPCA and the interviews was a dichotomy between the operations and politics of the scientific programmes and scientists themselves, despite the spatial data suggesting that science is objectively a political strategy.

Many interviewees felt that science “had too much integrity”, holding faith in the discipline as a benevolent structure, pitting it against the messiness of the political situation. Interviewees confirmed that in the majority of cases, – except for calls for proposals on specific topics – scientists are the ones who decide their research pursuits, suggesting that politics does not encroach upon the integrity of scientific research itself, at least for the representatives of countries that were involved in this study. It appears that the “politicking” (IR-3) occurs instead at the entry point of science – how countries came to do the science in the first place – and at the point of dissemination – how knowledge hegemonies operate within the modern world-system. This benevolent-insidious complex coincides with Hemmings’ findings (2017), who states that “it is unlikely that engaged states have entirely selfish or entirely benign aspirations towards Antarctica”.

Taking this convergence in findings into consideration, it can be argued that colonial and capitalistic interests are in fact enabled and continued by the separation of the two spheres. This was corroborated by the interviews, as most respondents initially denied, or were simply not aware of the liaison between science and politics, capitalism or colonialism, yet when probed further, revealed more “cynical” experiences and understandings of the engagement of science on the continent. This separation of the spheres of science and politics may be linked to the idea that “discussions over (resources) are taboo in the scholarship of more-established powers” (Brady, 2010), something which was highlighted in the interviews, where several respondents claimed that resource extraction and science would never collaborate with each-other in Antarctica. The patterns found in the CPCA however suggests a movement away from science as the exclusive Antarctic activity, towards more resource-orientated aims of states. Indeed, this division between the framings of Antarctica reinforces the two dominant conceptual visions of the continent, the first of Antarctica as a pristine wilderness to be protected, the second as a resource that should be sustainably managed to provide economic benefit (Nielsen, 2017).

The interview findings demonstrate a lag in the narratives and imaginings of the scientists themselves, whose positions are perhaps at stake from this progression. It can be argued that this taboo is limiting scientists’ critical engagement with how science can be utilised as a vector for the furthering of corporate and national interests. If states openly and explicitly discussed their intentions for resource exploitation, scientists could form appropriate resistance against these industries and their interests, and promote open dialogue with regards to preventing the encroachment of capitalism into Antarctica. Therefore, the more implicit undercurrent of capital interests within the older nations’ discourses, as opposed to the explicit resource discourse of newer nations, is arguably a means of maintaining scientists as their proxies without resistance.

This dichotomy of views therefore is the key mechanism by which science acts as a facilitator in Antarctica for both neocolonial and capital accumulation aspirations. It allows scientists to carry out vital research on the ground in the belief that it is for apolitical purposes, whilst states can operate through these actors to create and legitimise footholds for their own political interests.

#### [7e. Arctic Present, Antarctic Future](#)

The consistent drawing of parallels between Antarctica and the Arctic as a recurring theme throughout the CPCA and interviews raises an important question about these two cryospheric environments. As one interviewee stated, the fact that nations that conduct research in the Arctic also gain a form of political status from this scientific knowledge, shows that the process of science leading to political power occurs within the governance of both poles (IR-3). Further to this, the discourse used to describe the Arctic by non-Arctic states is to situate it as “common heritage of mankind”, the exact words used to describe Antarctica by non-claimant states as a justification for their resource interests (Blunden, 2012). If scientific research and heritage discourses are invoked as stepping-stones for resource claims in the Arctic, how likely is it that this process will also occur in the Antarctic?

Perhaps it is simply a matter of proximity, as extractive Global North and world-core states are much closer to the Arctic, and therefore less time and resources are needed to access the region. However, northern latitudes are warming 3-4 times faster than the rest of the globe, with predictions that the north pole could be ice-free in summer as early as 2020 (Overland & Wang, 2013). Hence it is not just geographical proximity – climate change is acting as an accelerant to time-space compression, whereby a lack of summer sea-ice will make the region increasingly accessible and less dangerous for shipping, fishing and fossil fuel extraction, and therefore attractive for nation states to commence their economic involvement in the region (Ebinger & Zambetakis, 2009). Utilising this capitalistic logic, the next periphery, and also the last periphery on Earth, is the Antarctic and as a consequence, the prospecting and exploitation of its resources. Returning to Moore (2000)'s claim that every phase of capitalism emerges from restructuring society-nature relations, it can be argued that climate change, exacerbated by the growth-driven processes of capitalism, as in the Arctic, is also creating this restructuring of society's relationship with Antarctica. However, it is yet to be prospected for imminent resource extraction to the same extent as the Arctic. Time-space compression and increasing accessibility is enabling the transition of Antarctica from what Wallerstein might term an external arena, to a periphery within the world-system, facilitated by the engagement of science as an effective foothold for the interests of capital, and potentially exacerbated by climate change in future. As a result of scientific activity, Antarctica can be argued to be embedded in the world-system in numerous ways. The question is, therefore, when and if Antarctica will be exploited in the way that its current trajectory according to world-system theory suggests.

As Hemmings (2017) states, the Antarctic is “perhaps only a generation behind the rest of the world in terms of resource, commercial and strategic activity”. The truth of this statement remains to be seen: it is perhaps too pessimistic, as the data collected by this thesis suggests that Antarctica remains in some ways too peripheral to the world-system cores at present. Several academic sources, as well as every interviewee, contend that resources, at least non-living resources, are unlikely to be commercially viable for the foreseeable future, due to the immense difficulties of extracting minerals from the Antarctic environment (Peterson, 1980). This is reinforced by the spatial clusterings of stations at the Antarctic coast and the few remaining permanent stations inland. This uncertainty for the future also ran through the interviewees' ideas of what is to come; some were positive, saying that Antarctica will continue to be protected, whilst others revealed scepticism about this, suggesting that as technology improves it will be inevitable that Antarctica begins to be opened up for exploitation. Nonetheless, with the storm of climate change on the horizon, the unpredictability of the extent of ice-melt, sea-level rise and resource scarcity elsewhere on the planet, Antarctica and its resources may see themselves becoming more commercially attractive and cost-effective as they become more accessible (Nyman, 2017), regardless of the scientific community's views. This raises an important question of what will happen when the Madrid Protocol is subject to review in 2048. Should climate change or technologies drastically increase the accessibility of Antarctica, or if geopolitical frictions lead to the disintegration of the ATS, then it may be likely that national economic interests will prevail, much as they have done in the Arctic.

The Arctic case here provides an important analogue for this thesis; the same discourses appear in the Arctic context as they do in Antarctica, of wilderness, pristine environments and conservational importance, alongside the strategic use of science to gain political status, yet states are approaching the north pole with explicit political and resource-based intents. As this thesis has shown, Antarctica is not exempt from the processes of global capitalism or colonialism, despite its protected status under the Antarctic Treaty. Therefore, scientists and conservationists alike must prepare for the next phase of capitalism to materialise in Antarctica, as it is happening now in the Arctic, in order to best engage with its protection for the future.

## **8. Further Research Reflections**

The disconnect of views between interviews and the CPCA identifies an area for further research. It is acknowledged here that the findings and conclusions in this thesis are drawn from the analysis of a small sample of Antarctic Treaty countries, and that there is more nuance to unpack if given a larger scope. For example, it is thought-provoking that Japan, South Africa and Belgium, although non-claimant original signatories, are quiet with regards to sovereignty and territorial claims, in contrast to the Russia and the USA. It is also interesting how Chile and Argentina assert their claims in a colonial manner, despite not being traditional colonial countries, in a manner that could be termed colonial mimicry. These findings therefore merit a holistic comparative study between all Antarctic Treaty nations and their scientists, to fully understand the nuances and approaches that states are taking in relation to Antarctica within their national discourses.

The attitudes of states towards the Arctic as a more attractive peripheral zone for resource extraction also calls into question the inhabited Arctic versus the uninhabited Antarctic. Hemmings (2017) argues that an absence of indigenous peoples weakens the Antarctic's position with regards to international relations: the continent is voiceless and relies on other sovereign states to advocate for its best interests. This viewpoint contrasts considerably with one interviewee, who asserted "there are no human settlements in Antarctica which makes it very different from the Arctic...this is a genuine environmental wilderness, we don't want that to change and we want to protect it, whereas as in the Arctic it's very different, because there are large amounts of indigenous and non-indigenous people who live there, there's infrastructure, there are roads, airports, there are ports" (IR-3). Is exploitation and appropriation able to occur more readily in the Arctic because the mechanisms of capitalism are able to play out there in the same way that they have elsewhere? The fact that there are people - an availability of labour and space for extraction - means that fossil fuel projects in the Arctic can be sold as "very beneficial for the local populations (in terms of economic development) (IR-7)." With this in mind, is the Antarctic better protected or worse off because there are no people able to advocate for their environment and rights to be protected? Exploring this contradiction in more detail goes beyond the scope of this thesis, but may prove a fruitful avenue for a future comparative study.

## **9. Conclusion**

In conclusion, this thesis has conducted an interdisciplinary study into how science in Antarctica operates to legitimise capitalist and neocolonialist interests. Using the core Human Ecology concepts of Culture, Power and Sustainability, a theoretical

framework was created by drawing on political ecology, world-systems, neocolonial and politically-situated science perspectives. In order to answer the overarching research question, this thesis also sought to understand how the spatialities of Antarctic research stations and the scientific discourses of Consultative Nations reflected their national political interests.

Three methods were applied, namely GIS, to generate quantitative and cartographic data, Critical-Political Content Analysis and semi-structured interviews, which were then triangulated to create a case study, drawing on multiple lines of evidence to increase the reliability of results. These methods explored the intersections between the discourses of six national scientific programmes, policies and eight interviews, the built environment as scientific stations, observed spatially through GIS maps, and political power structures within the Antarctic Treaty, to understand how dominant states utilise science to legitimise and consolidate power over land, resources and knowledge.

The results found that science is the key legitimising force for both colonial and capitalist endeavours in Antarctica, providing a foothold for countries on the continent through the strategic spatial placing of research bases, as well as through the science and knowledge-privileging mechanisms of the Treaty. From their privileged position as scientific leaders, powerful nations are able to crystallise the neocolonial hegemony through its operative mechanisms in order to generate economic benefit for their nations via science. Furthermore, using the discourse of managerial necessity, powerful countries within the current world-system can continue to exclude developing Global South countries from partaking in Antarctic governance.

The dichotomous separation of science and political spheres has effectively enabled science to be a proxy for more insidious interests to gain a foothold in Antarctica, whilst preventing effective engagement from scientists and is thus the principal means by which colonial and capital interests operate in Antarctica. Therefore, this thesis surmises that the ATS, which through its casting of the continent as *terra scientifica* is an enabler for richer countries, who have the resources and power to be able to conduct scientific research in Antarctica. This allows them to effectively have both access and control over the production of knowledge and the potential for future resource extraction on the continent, serving to heighten the socio-economic disparities already present in the modern world-system, by cementing neocolonial power flows and allowing the continuation of Western-centric knowledge hegemonies.

This thesis constitutes an important contribution to the field of Human Ecology, firstly by intersecting it with critical Antarctic studies, something which has not previously been attempted, but also by expanding the application of a world-systems perspective to a continent very rarely included in this field's scholarship and literature. It also highlights the importance of conducting interdisciplinary research, demonstrating the utility of applying and connecting multiple theories and methods to an individual context to draw out nuance within a case study. It has also demonstrated the relevance of applying a political ecology approach to the Antarctic context, by shedding light upon the unequal power relations between stakeholders as created by the structures in ATS. It is hoped that by exposing these inequalities and their consequences, a

contribution has been made in taking a step towards a more equitable and sustainable governance of the Antarctic.

Finally, Antarctica's future is uncertain. With regards to climate change, every interviewee gave negative responses, with indications that "really worrying measurements" and "major changes" (IR-1) will continue to be recorded on the continent. One of the key knock-on impacts of ice-melt is an increase in sea-level, which will have enormous ramifications on the 1 billion people living in coastal areas around the globe, including ecosystem destruction, threats to food security and economic losses (WOR, 2010), which may cause Antarctic fisheries to look increasingly attractive to nation states as these processes progress. Exploration for fossil fuels is currently commercially insignificant as a result of costs, extractive issues and large distances from consumer markets, however, the opening up of the Arctic to mineral exploitation may generate incentives for technological progress in extraction from deep-water and cryospheric environments, potentially opening up new, previously inaccessible land or waters for exploration (Dieter, 2017). It is only Antarctica's isolation from the world's cores, and its inhospitable climate that have protected it thus far from the economic exploitation and environmental degradation seen elsewhere on the planet (Bulkeley, 2010). These technologies would contribute to the ability to encroach and exploit the last untapped resources at the furthest of the peripheries and may expose Antarctica, the final frontier on planet Earth, to the full effects of the modern capitalist world-system.



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## 11. Annexes

### Annexe 1: Full List of Parties to the Antarctic Treaty

| <b>Consultative Nations</b> | <b>Non-Consultative Countries</b> |
|-----------------------------|-----------------------------------|
| Argentina                   | Austria                           |
| Australia                   | Belarus                           |
| Belgium                     | Canada                            |
| Brazil                      | Colombia                          |
| Bulgaria                    | Cuba                              |
| Chile                       | Denmark                           |
| China                       | Estonia                           |
| Czech Republic              | Greece                            |
| Ecuador                     | Guatemala                         |
| Finland                     | Hungary                           |
| France                      | Iceland                           |
| Germany                     | Kazakhstan                        |
| India                       | North Korea                       |
| Italy                       | Malaysia                          |
| Japan                       | Monaco                            |
| South Korea                 | Mongolia                          |
| Netherlands                 | Pakistan                          |
| New Zealand                 | Papua New Guinea                  |
| Norway                      | Portugal                          |
| Peru                        | Romania                           |
| Poland                      | Slovakia                          |
| Russia                      | Switzerland                       |
| South Africa                | Turkey                            |
| Spain                       | Venezuela                         |
| Sweden                      |                                   |
| Ukraine                     |                                   |
| United Kingdom              |                                   |
| USA                         |                                   |
| Uruguay                     |                                   |

Annexe 2: Compiled Database of Antarctic Research Stations

| <b><u>Station Name</u></b>        | <b><u>Country</u></b> | <b><u>Status</u></b> | <b><u>Date Built</u></b> | <b><u>Continent</u></b> | <b><u>Operator</u></b> |
|-----------------------------------|-----------------------|----------------------|--------------------------|-------------------------|------------------------|
| Aguirre Cerda                     | Chile                 | Closed               | 1955                     | South_America           | Res_Prog               |
| Amundsen_Scott_SP                 | USA                   | Permanent_Active     | 1957                     | North_America           | Res_Prog               |
| Arctowski                         | Poland                | Permanent_Active     | 1977                     | Europe                  | Res_Prog               |
| Arrival_Heights_Laboratory        | New_Zealand           | Permanent_Active     | 1959                     | Oceania                 | Res_Prog               |
| Arrival_Heights_Satellite_Station | New_Zealand           | Permanent_Active     | 1959                     | Oceania                 | Res_Prog               |
| Artigas                           | Uruguay               | Permanent_Active     | 1984                     | South_America           | Res_Prog               |
| Arturo_Parodi                     | Chile                 | Closed               | 1999                     | South_America           | Res_Prog               |
| Arturo_Pratt                      | Chile                 | Permanent_Active     | 1947                     | South_America           | Military               |
| Asuka                             | Japan                 | Closed               | 1985                     | Asia                    | Res_Prog               |
| Beaver_Lake                       | Australia             | Seasonal_Active      | 1996                     | Oceania                 | Res_Prog               |
| Belgrano_1                        | Argentina             | Closed               | 1955                     | South_America           | Res_Prog               |
| Belgrano_2                        | Argentina             | Permanent_Active     | 1979                     | South_America           | Res_Prog               |
| Belgrano_3                        | Argentina             | Closed               | 1980                     | South_America           | Res_Prog               |
| Bellingshausen                    | Russia                | Permanent_Active     | 1968                     | Asia                    | Res_Prog               |
| Bharati                           | India                 | Permanent_Active     | 2012                     | Asia                    | Res_Prog               |
| Borga                             | South_Africa          | Closed               | 1969                     | Africa                  | Res_Prog               |
| Brockton                          | USA                   | Closed               | 1965                     | North_America           | Military               |
| Brown                             | Argentina             | Seasonal_Active      | 1951                     | South_America           | Res_Prog               |
| Byrd                              | USA                   | Closed               | 1957                     | North_America           | Res_Prog               |
| Camara                            | Argentina             | Seasonal_Active      | 1953                     | South_America           | Res_Prog               |
| Carvajal                          | Chile                 | Seasonal_Active      | 1984                     | South_America           | Res_Prog               |
| Casey                             | Australia             | Permanent_Active     | 1957                     | Oceania                 | Res_Prog               |
| Charcot                           | France                | Closed               | 1957                     | Europe                  | Res_Prog               |
| Collins                           | Chile                 | Seasonal_Active      | 2006                     | South_America           | Res_Prog               |
| Comandante Ferraz                 | Brazil                | Permanent_Active     | 1984                     | South_America           | Res_Prog               |
| Concordia                         | Italy_France          | Permanent_Active     | 2005                     | Europe                  | Res_Prog               |

|                                    |                  |                  |      |               |          |
|------------------------------------|------------------|------------------|------|---------------|----------|
| Dakshin_Gangotri                   | India            | Closed           | 1983 | Asia          | Res_Prog |
| Dallmann                           | Germany          | Seasonal_Active  | 1994 | Europe        | Res_Prog |
| Davis                              | Australia        | Permanent_Active | 1957 | Oceania       | Res_Prog |
| Deception                          | Argentina        | Seasonal_Active  | 1948 | South_America | Res_Prog |
| Dirick_Gerritsz_Lab                | Netherlands      | Seasonal_Active  | 2013 | Europe        | Res_Prog |
| Dobrowolski                        | Poland           | Closed           | 1959 | Europe        | Res_Prog |
| Drescher                           | Germany          | Closed           | 1986 | Europe        | Res_Prog |
| Druzhba                            | Russia           | Closed           | 1960 | Asia          | Res_Prog |
| Druzhnaya_1                        | Russia           | Closed           | 1975 | Asia          | Res_Prog |
| Druzhnaya_2                        | Russia           | Closed           | 1982 | Asia          | Res_Prog |
| Druzhnaya_3                        | Russia           | Closed           | 1982 | Asia          | Res_Prog |
| Druzhnaya_4                        | Russia           | Closed           | 1987 | Asia          | Res_Prog |
| Dumont_dUrville                    | France           | Permanent_Active | 1956 | Europe        | Res_Prog |
| E_Base                             | South_Africa     | Permanent_Active | 1985 | Africa        | Res_Prog |
| East_Base                          | USA              | Closed           | 1941 | North_America | Res_Prog |
| Eco_Nelson                         | Czech_Republic   | Permanent_Active | 1989 | Europe        | Private  |
| EduardoFrei_VillaLasEstrellas      | Chile            | Permanent_Active | 1969 | South_America | Military |
| Eights                             | USA              | Closed           | 1963 | North_America | Res_Prog |
| Elichiribehety                     | Uruguay          | Seasonal_Active  | 1997 | South_America | Res_Prog |
| Ellsworth                          | Argentina        | Closed           | 1957 | South_America | Res_Prog |
| Escudero                           | Chile            | Permanent_Active | 1994 | South_America | Res_Prog |
| Esperanza                          | Argentina        | Permanent_Active | 1953 | South_America | Res_Prog |
| Faraday (now Vernadsky)            | UK (now Ukraine) | Permanent_Active | 1947 | Europe        | Res_Prog |
| Filchner                           | Germany          | Closed           | 1982 | Europe        | Res_Prog |
| Fossil_Bluff                       | UK               | Permanent_Active | 1961 | Europe        | Res_Prog |
| Gabriel_de_Castilla                | Spain            | Seasonal_Active  | 1989 | Europe        | Res_Prog |
| General_Bernardo_OHiggins          | Chile            | Permanent_Active | 1948 | South_America | Military |
| Georg_Forster                      | Germany          | Closed           | 1976 | Europe        | Res_Prog |
| German_Antarctic_Receiving_Station | Germany          | Permanent_Active | 1991 | Europe        | Res_Prog |
| Gondwana                           | Germany          | Seasonal_Active  | 1983 | Europe        | Res_Prog |

|                      |                     |                  |      |               |          |
|----------------------|---------------------|------------------|------|---------------|----------|
| Gonzalez_Videla      | Chile               | Seasonal_Active  | 1951 | South_America | Military |
| Great_Wall           | China               | Permanent_Active | 1985 | Asia          | Res_Prog |
| Guillermo_Mann       | Chile               | Seasonal_Active  | 1991 | South_America | Res_Prog |
| Halley               | UK                  | Temporary_Closed | 1956 | Europe        | Res_Prog |
| Jang_Bogo            | South_Korea         | Permanent_Active | 2014 | Asia          | Res_Prog |
| Jinnah               | Pakistan            | Seasonal_Active  | 1991 | Asia          | Res_Prog |
| Juan_Carlos_Primerio | Spain               | Seasonal_Active  | 1988 | Europe        | Res_Prog |
| Jubany               | Argentina           | Permanent_Active | 1953 | South_America | Res_Prog |
| Julio_Ripamonti      | Chile               | Seasonal_Active  | 1982 | South_America | Res_Prog |
| King_Baudouin_1      | Belgium             | Closed           | 1957 | Europe        | Res_Prog |
| King_Baudouin_2      | Belgium_Netherlands | Closed           | 1964 | Europe        | Res_Prog |
| King_Sejong          | South_Korea         | Permanent_Active | 1988 | Asia          | Res_Prog |
| Kohnen               | Germany             | Seasonal_Active  | 2001 | Europe        | Res_Prog |
| Komsomolskaya        | Russia              | Closed           | 1957 | Asia          | Res_Prog |
| Kunlun               | China               | Seasonal_Active  | 2009 | Asia          | Res_Prog |
| Law                  | Romania             | Seasonal_Active  | 1986 | Europe        | Res_Prog |
| Lazarev              | Russia              | Closed           | 1959 | Russia        | Res_Prog |
| Lenie                | USA                 | Seasonal_Active  | 1985 | North_America | Res_Prog |
| Leningradskaya       | Russia              | Closed           | 1971 | Russia        | Res_Prog |
| Little_America       | USA                 | Closed           | 1929 | North_America | Res_Prog |
| Little_Rockford      | USA                 | Closed           | 1958 | North_America | Res_Prog |
| Machu_Picchu         | Peru                | Seasonal_Active  | 1989 | South_America | Res_Prog |
| Maitri               | India               | Permanent_Active | 1989 | Asia          | Res_Prog |
| Maldonado            | Ecuador             | Seasonal_Active  | 1990 | South_America | Res_Prog |
| Marambio             | Argentina           | Permanent_Active | 1969 | South_America | Res_Prog |
| Mario_Zucchelli      | Italy               | Seasonal_Active  | 1986 | Europe        | Res_Prog |
| Matienzo             | Argentina           | Seasonal_Active  | 1961 | South_America | Res_Prog |
| Maudheim             | Norway_Sweden_UK    | Closed           | 1949 | Europe        | Res_Prog |
| Mawson               | Australia           | Permanent_Active | 1954 | Oceania       | Res_Prog |
| McMurdo              | USA                 | Permanent_Active | 1956 | North_America | Res_Prog |

|                         |                |                  |      |               |          |
|-------------------------|----------------|------------------|------|---------------|----------|
| Melchior                | Argentina      | Seasonal_Active  | 1947 | South_America | Res_Prog |
| Mendel                  | Czech_Republic | Seasonal_Active  | 2006 | Europe        | Res_Prog |
| Mir                     | Russia         | Closed           | 1958 | Asia          | Res_Prog |
| Mirny                   | Russia         | Permanent_Active | 1956 | Asia          | Res_Prog |
| Mizuho                  | Japan          | Seasonal_Active  | 1970 | Asia          | Res_Prog |
| Molodyozhnaya           | Russia         | Seasonal_Active  | 1962 | Asia          | Res_Prog |
| Neumayer_1              | Germany        | Closed           | 1981 | Europe        | Res_Prog |
| Neumayer_2              | Germany        | Closed           | 1992 | Europe        | Res_Prog |
| Neumayer_3              | Germany        | Permanent_Active | 2009 | Europe        | Res_Prog |
| Norway                  | Norway         | Closed           | 1957 | Europe        | Res_Prog |
| Novolazarevskaya        | Russia         | Permanent_Active | 1961 | Asia          | Res_Prog |
| Oazis_2                 | Russia         | Closed           | 1987 | Asia          | Res_Prog |
| Orcadas                 | Argentina      | Permanent_Active | 1904 | South_America | Military |
| Palmer                  | USA            | Permanent_Active | 1968 | North_America | Res_Prog |
| Petrel                  | Argentina      | Seasonal_Active  | 1952 | South_America | Res_Prog |
| Pionerskaya             | Russia         | Closed           | 1956 | Asia          | Res_Prog |
| Plateau                 | USA            | Closed           | 1965 | North_America | Military |
| Pobeda                  | Russia         | Closed           | 1960 | Asia          | Res_Prog |
| Pole_of_Inaccessibility | Russia         | Closed           | 1958 | Asia          | Res_Prog |
| Port_Martin             | France         | Closed           | 1950 | Europe        | Res_Prog |
| Primavera               | Argentina      | Seasonal_Active  | 1977 | Europe        | Res_Prog |
| Princess_Elizabeth      | Belgium        | Seasonal_Active  | 2007 | Europe        | Res_Prog |
| Progress                | Russia         | Seasonal_Active  | 1988 | Asia          | Res_Prog |
| Risopatron              | Chile          | Seasonal_Active  | 1954 | South_America | Res_Prog |
| Rothera                 | UK             | Permanent_Active | 1975 | Europe        | Res_Prog |
| Russkaya                | Russia         | Seasonal_Active  | 1980 | Asia          | Res_Prog |
| Salyut                  | Russia         | Closed           | 1978 | Asia          | Res_Prog |
| San_Martin              | Argentina      | Permanent_Active | 1951 | South_America | Res_Prog |
| SANAE_I                 | South_Africa   | Closed           | 1960 | Africa        | Res_Prog |
| SANAE_IV                | South_Africa   | Permanent_Active | 1960 | Africa        | Res_Prog |

|                     |              |                  |      |               |          |
|---------------------|--------------|------------------|------|---------------|----------|
| Sarae_Marais        | South_Africa | Closed           | 1982 | Africa        | Res_Prog |
| Scott_Base          | New_Zealand  | Permanent_Active | 1957 | Oceania       | Res_Prog |
| Shirreff            | USA          | Seasonal_Active  | 1991 | North_America | Res_Prog |
| Signy               | UK           | Seasonal_Active  | 1947 | Europe        | Res_Prog |
| Siple               | USA          | Closed           | 1973 | North_America | Res_Prog |
| Site_2              | USA          | Closed           | 1957 | North_America | Unknown  |
| Sobral              | Argentina    | Closed           | 1965 | South_America | Res_Prog |
| Sodruzhestvo        | Russia       | Closed           | 1971 | Asia          | Res_Prog |
| South_Ice           | UK           | Closed           | 1957 | Europe        | Res_Prog |
| Sovetskaya          | Russia       | Closed           | 1958 | Asia          | Res_Prog |
| Soyuz               | Russia       | Closed           | 1982 | Asia          | Res_Prog |
| St_Klement_Ohridski | Bulgaria     | Seasonal_Active  | 1988 | Europe        | Res_Prog |
| Station_A           | UK           | Seasonal_Active  | 1944 | Europe        | Res_Prog |
| Station_B           | UK           | Closed           | 1944 | Europe        | Res_Prog |
| Station_C           | UK           | Closed           | 1946 | Europe        | Res_Prog |
| Station_D           | UK           | Closed           | 1945 | Europe        | Res_Prog |
| Station_E           | UK           | Closed           | 1946 | Europe        | Res_Prog |
| Station_G           | UK           | Closed           | 1947 | Europe        | Res_Prog |
| Station_J           | UK           | Closed           | 1957 | Europe        | Res_Prog |
| Station_N           | UK           | Closed           | 1955 | Europe        | Res_Prog |
| Station_O           | UK           | Closed           | 1956 | Europe        | Res_Prog |
| Station_P           | UK           | Closed           | 1957 | Europe        | Res_Prog |
| Station_T           | UK           | Closed           | 1961 | Europe        | Res_Prog |
| Station_V           | UK           | Closed           | 1953 | Europe        | Res_Prog |
| Station_W           | UK           | Closed           | 1956 | Europe        | Res_Prog |
| Station_Y           | UK           | Closed           | 1955 | Europe        | Res_Prog |
| Svea                | Sweden       | Seasonal_Active  | 1988 | Europe        | Res_Prog |
| Syowa               | Japan        | Permanent_Active | 1957 | Asia          | Res_Prog |
| Taishan             | China        | Seasonal_Active  | 2014 | Asia          | Res_Prog |
| Tor                 | Norway       | Seasonal_Active  | 1993 | Europe        | Res_Prog |

|               |                |                  |      |                |          |
|---------------|----------------|------------------|------|----------------|----------|
| Troll         | Norway         | Permanent_Active | 1990 | Europe         | Res_Prog |
| Union_Glacier | Chile          | Seasonal_Active  | 2014 | South_America  | Military |
| Vanda         | New_Zealand    | Seasonal_Active  | 1969 | Oceania        | Res_Prog |
| Vechernyaya   | Belarus        | Seasonal_Active  | 2007 | Europe         | Res_Prog |
| Vostok        | Russia         | Permanent_Active | 1957 | Asia           | Res_Prog |
| Vostok_I      | Russia         | Closed           | 1957 | Asia           | Res_Prog |
| Wasa          | Sweden         | Seasonal_Active  | 1989 | Europe         | Res_Prog |
| Weddell_I     | Russia_USA     | Closed           | 1992 | Various        | Res_Prog |
| World_Park    | Not_Applicable | Closed           | 1987 | Not_Applicable | NGO      |
| Yelcho        | Chile          | Seasonal_Active  | 1962 | South_America  | Res_Prog |
| Zhongshan     | China          | Permanent_Active | 1989 | Asia           | Res_Prog |

Annexe 3: Critical Political Content Analysis – Analysed Texts

| <u>Country</u>        | <u>Documents Analysed</u>   |
|-----------------------|---|
| <u>United Kingdom</u> | <ol style="list-style-type: none"> <li>1) <b>British Antarctic Survey (BAS) Website:</b><br/><a href="https://www.bas.ac.uk/">https://www.bas.ac.uk/</a></li> <li>2) <b>Antarctica: Global Britain Video:</b><br/><a href="https://www.youtube.com/watch?v=wwrvt1mzxyg">https://www.youtube.com/watch?v=wwrvt1mzxyg</a></li> <li>3) <b>British Antarctic Territory (BAT) Strategy</b> – downloaded from:<br/><a href="https://www.gov.uk/world/organisations/british-antarctic-territory">https://www.gov.uk/world/organisations/british-antarctic-territory</a></li> </ol> <p style="text-align: center;"><i>(All last accessed 19<sup>th</sup> April 2019)</i></p>  |
| <u>USA</u>            | <ol style="list-style-type: none"> <li>1) <b>United States Antarctic Programme (USAP) Website:</b><br/><a href="https://www.usap.gov/">https://www.usap.gov/</a></li> <li>2) <b>National Science Foundation Website – Antarctica Section:</b><br/><a href="https://www.nsf.gov/geo/opp/antarct/usap.jsp">https://www.nsf.gov/geo/opp/antarct/usap.jsp</a></li> <li>3) <b>USA Department of State Website:</b><br/><a href="https://www.state.gov/e/oes/ocns/opa/c6528.htm">https://www.state.gov/e/oes/ocns/opa/c6528.htm</a></li> <li>4) <b>Report on the US Antarctic Programme</b> – Downloaded from:<br/><a href="https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nstc96rp">https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nstc96rp</a></li> </ol> <p style="text-align: center;"><i>(All last accessed 19<sup>th</sup> April 2019)</i></p>  |
| <u>Netherlands</u>    | <ol style="list-style-type: none"> <li>1) <b>Netherlands Polar Programme (NPP) Website:</b><br/><a href="https://www.nwo.nl/en/research-and-results/programmes/Netherlands+Polar+Programme">https://www.nwo.nl/en/research-and-results/programmes/Netherlands+Polar+Programme</a></li> <li>2) <b>Pole Position 2.0 Strategy Document</b> – Downloaded from:<br/><a href="https://www.nwo.nl/en/research-and-results/programmes/Netherlands+Polar+Programme">https://www.nwo.nl/en/research-and-results/programmes/Netherlands+Polar+Programme</a></li> <li>3) <b>Netherlands Polar Programme Factsheet</b> – Downloaded from:<br/><a href="https://www.nwo.nl/en/research-and-results/programmes/Netherlands+Polar+Programme">https://www.nwo.nl/en/research-and-results/programmes/Netherlands+Polar+Programme</a></li> <li>4) <b>Netherlands Policy Framework Strategy 2011-2015</b> – Downloaded from:<br/><a href="https://www.nwo.nl/en/documents/alw/netherlands-polar-programme---summary-of-dutch-document-framework-the-netherlands-and-the-polar-regions-2011-2015">https://www.nwo.nl/en/documents/alw/netherlands-polar-programme---summary-of-dutch-document-framework-the-netherlands-and-the-polar-regions-2011-2015</a></li> </ol> <p style="text-align: center;"><i>(All last accessed 19<sup>th</sup> April 2019)</i></p> |



|                                  |  |
|----------------------------------|--|
| <p><b><u>Germany</u></b></p>     | <ol style="list-style-type: none"> <li>1) <b>Alfred Wegener Institute (AWI) Website:</b><br/> <a href="https://www.awi.de/en.html">https://www.awi.de/en.html</a></li> <li>2) <b>Federal Institute for Research and Natural Resources Website:</b><br/> <a href="https://www.bgr.bund.de/EN/Themen/Polarforschung/polarforschung_node_en.html">https://www.bgr.bund.de/EN/Themen/Polarforschung/polarforschung_node_en.html</a></li> <li>3) <b>German Federal Foreign Office Website:</b><br/> <a href="https://www.auswaertiges-amt.de/en/aussenpolitik/themen/internatrecht/einzelfragen/antarktis-node?openAccordionId=item-231650-0-panel">https://www.auswaertiges-amt.de/en/aussenpolitik/themen/internatrecht/einzelfragen/antarktis-node?openAccordionId=item-231650-0-panel</a></li> </ol> <p style="text-align: center;"><i>(All last accessed 19<sup>th</sup> April 2019)</i></p> |
| <p><b><u>South Korea</u></b></p> | <ol style="list-style-type: none"> <li>1) <b>Korean Polar Research Institute (KOPRI) Website:</b><br/> <a href="http://www.kopri.re.kr/eng">http://www.kopri.re.kr/eng</a></li> <li>2) <b>KOPRI Information Leaflet</b> – downloaded from:<br/> <a href="http://www.kopri.re.kr/eng/html/comm/050302.html">http://www.kopri.re.kr/eng/html/comm/050302.html</a></li> <li>3) <b>KOPRI Brochure</b> – downloaded from:<br/> <a href="http://www.kopri.re.kr/eng/html/comm/050301.html">http://www.kopri.re.kr/eng/html/comm/050301.html</a></li> <li>4) <b>KOPRI Annual Report</b> – downloaded from:<br/> <a href="http://www.kopri.re.kr/eng/html/comm/050303.html">http://www.kopri.re.kr/eng/html/comm/050303.html</a></li> </ol> <p style="text-align: center;"><i>(All last accessed 5<sup>th</sup> April 2019)</i></p>  |
| <p><b><u>Ukraine</u></b></p>     | <ol style="list-style-type: none"> <li>1) <b>National Antarctic Scientific Centre of Ukraine (NASC) Website:</b> <a href="http://uac.gov.ua/en/research-program-en/">http://uac.gov.ua/en/research-program-en/</a></li> </ol> <p style="text-align: center;"><i>(All last accessed 19<sup>th</sup> April 2019)</i></p>   |

[Annexe 4: Interview Consent Form](#)

**Ethics Statement and Consent Form**

Thank you for agreeing to be interviewed for this thesis project, a necessary requirement for the completion of an MSc Human Ecology at Lund University, Sweden.

This research positions itself in Critical Antarctic Studies, using a social sciences approach to understand the mechanisms of how science operates in Antarctica to serve a broader national purpose.

Therefore, I wish to interview you as a result of your involvement in Antarctic research and will ask questions about your experiences within this frame.

You may choose to remain anonymous, can abstain from answering any questions and have the right to withdraw from the interview at any time. All answers will be treated as strictly confidential should you choose to remain anonymous.

I would like to record the interview; however, I can refrain from doing so at your request.

If you wish, I am able to send you a transcription of the interview, the meaning I derived from it and the quotes I wish to use. This will offer you a chance to review what was said before its inclusion in my thesis.

Any raw data and subsequent transcriptions will only be seen by me, the researcher, retained on a secure file until the end of June 2019 and then destroyed, following the conclusion of the project.

Please sign below to confirm your understanding and consent of the above and return to me at [ma2062bu-s@student.lu.se](mailto:ma2062bu-s@student.lu.se).

If you have any comments or questions, prior to or following the interview, I am also contactable at this email address.

Signature: ..... Date: .....

## Annexe 5: Interview Guide

### **Interview Guide**

#### 1) Background Questions:

Tell me briefly about your research in Antarctica

- a. How many times have you been, if any?
- b. What drew you to Antarctica?
- c. Which country(ies)'s national programme do you or have you worked for?

What impact does the scientific research that you do have on society, the country, the planet?

How do the narratives that are frequently used to portray Antarctica fit in with reality; think 'enigmatic', 'wilderness', 'pristine', 'fragile'?

#### 2) Research and funding:

- How does the research area or topic that you do get decided, and by whom?
- Notion of a higher agenda (is there any research mandated by gov?) - to fit country's views? Are you aware of any other countries that (also) do this?
- Idea of competition between countries? Change over time – within own career and within Antarctic history?
- Number of mentions 'leading' and 'cutting edge'; Why do you think countries are so focussed on becoming or being the leader in Antarctic science?
- How are countries' positions in the ATS affected by their scientific research, if at all? Does that tie in to being a leader in science?
  - Why is it important to be a leader in polar affairs?
- Does the science that is conducted benefit the government, or private interests in any way?
- How far do you agree with the statement that the Antarctic Treaty is seen as protecting the Antarctic interests of richer countries?
  - How far do you agree with the statement that the Antarctic Treaty can be seen as a form of neocolonialism, or as a protection of (post)colonial interests?
- Collaborations with other countries – conducted with which country?
- Overcrowding on Antarctic Peninsula (if they aware of, if they have been...any conflict arising over space?)

3) Awareness of own country's (or other countries that they have worked with) policy regarding Antarctica:

- Are you aware of your country's policy towards Antarctica?
  - How does it differ from the policies of other countries that you have worked with? Has the policy evolved over time?
- Do these policies ever clash with research priorities?
- Do you agree with these policies? Why/why not?
- Do your country's policies clash with any other countries? How so?
- Have they changed or evolved over time?

4) Other Uses of Antarctica:

- Are you aware of any private, commercial or corporate interests in Antarctica?
  - resources?
- How has this changed over time?
- How do you think attitudes are changing with regards to Antarctica's living and non-living resources?
- Do you have any suggestions as to what might happen after the Madrid Protocol's period comes to an end in 2049 (resource and mining)
- Has global interest in Antarctica increased in the last few years? Why?
- How do you think an increase in consultative nations from the global south might affect the balance of the treaty system, if at all?

5) Country-Specific Questions

- Are territorial claims ever discussed – during research conduction etc...?
- Connection with space/space research – last frontiers?
- Do you think that science is used to build a particular narrative of the continent?
  - if no, do you think that science leads to a particular narrative, whether intentional or otherwise?
- Are you aware of your country's history in Antarctica?
  - What about the history of countries that you have worked with?

- Do you think historical legacy is ever used to justify countries' presence in Antarctica?

- Do you think that different countries' histories as claimant nations affects how science is conducted or operated? What about countries who have joined the Treaty later, do they conduct science differently?

- Mention colonialism?

- Is there ever any tension with countries as a result of territorial claim, or lack of territorial claims?

#### 6) Future:

- Do you have any ideas of what the future holds for Antarctica? With regards to climate change, politics or otherwise? Is it positive or negative?

#### 7) Concluding Remarks:

- Do you have anything else that you wish to add or comment on?