The Asian Forum for Polar Sciences: Fostering Asian co-operation in Antarctica

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Abstract

In the past years, Asian countries have been in the spotlight of academics and politics for various reason. Terms such as 'orientalism', 'the Asian century', and lately 'polar orientalism' have been used by many scholars to express the Asian participation in worldwide activities. 'Polar orientalism' expresses the fear that countries have towards the relation between East Asian countries and their interest on polar regions. Since the Heroic Age of Antarctic explorations, Asian countries have been involved in activities in the area below 60° S latitude. Japan was also one of the twelve original signatories of the Antarctic Treaty.

Since 2004, Asian countries operating in Antarctica have been organised in a regional group: the Asian Forum for Polar Sciences (AFoPS). AFoPS aims to foster co-operative scientific and logistic projects within Asian countries, to serve as a forum to encourage more Asian countries to be involved in polar activities and to communicate Asian achievements to the wider polar community.

This thesis discusses the achievements obtained by AFoPS in the Antarctic community and how AFoPS, as a regional group, is positioning itself from a policy making and knowledge outcomes point of view. Additionally, also the Asian presence in Antarctica has been assessed and the level of sharing of infrastructures has been evaluated. The research has been conducted using both qualitative and quantitative approaches through interviews, bibliometric analysis and sourcing relevant documents.

AFoPS, through the establishment of five action groups that were in operation for the first twelve years of life of this forum, fostered scientific co-operative activities in the Asian polar community. The outcomes of the research conducted under the AFoPS umbrella indicate an increase of co-authored peer-reviewed works. The results show that countries with a strong polar background are the one that are mainly publishing co-

authored papers, and here especially researchers affiliated with institutions in the Republic of Korea. Countries that more recently began to engage in Antarctic research are enhancing their expertise co-operating with more established players. Thailand, for example, is a country that is gaining awareness on Antarctic issues through co-operation within AFoPS. In fact, AFoPS Members that already have a polar program and infrastructures in Antarctica, are sharing their facilities with AFoPS Members and Observers that currently do not have the capability to establish their own Antarctic programmes. In doing that, AFoPS aims to encourage more Asian countries to be actively involved in Antarctic research to increase, through co-operative projects, our understanding about teleconnections, or how the Antarctic interacts with the rest of the globe.

Acronyms and abbreviations

AFoPS	Asian Forum for Polar Sciences
AGM	Annual General Meeting
ANARE	Australian National Antarctic Research Expeditions
ASOC	Antarctic and Southern Ocean Coalition
ASMA	Antarctic Specially Managed Area
ASPA	Antarctic Specially Protected Area
AT	Antarctic Treaty
ATCM	Antarctic Treaty Consultative Meeting
BP	Background Paper
CAA	Chinese Antarctic Administration
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CEE	Comprehensive Environmental Evaluation
CEP	Committee for Environmental Protection
CHINARE	Chinese Antarctic Expedition
COMNAP	Council of Managers of National Antarctic Programs
CSA	Canadian Space Agency
DNA	Dirección National del Antártico
DROMLAN	Dronning Maud Land Air Network
EPB	European Polar Board
EPICA	European Project for Ice Coring in Antarctica
ESA	European Space Agency

FARO	Forum of Arctic Research Operators
GARS	German Antarctic Receiving Station
GDP	Gross Domestic Product
GOJ	Government of Japan
GPZ	General Protection Zone
IAA	Instituto Antártico Argentino
IAATO	International Association of Antarctic Tour Operators
IASC	International Arctic Science Committee
ICAO	International Civil Aviation Organization
IGY	International Geophysical Year
IHO	International Hydrographic Organization
IMO	International Maritime Organization
IP	Information Paper
IPEV	Institut Polaire Français Paul Emile Victor
IPY	International Polar Year
ISS	International Space Station
IT-HRH	Information Technology under Initiative of Her Royal Highness Princess Maha Chakri Sirindhorn Foundation
JARE	Japanese Antarctic Research Expedition
KOPRI	Korea Polar Research Institute
KRZ	Krill Research Zone
MEJI	Mars Exploration Joint Initiative
MoU	Memorandum of Understanding
MPA	Marine Protected Area

MS	Motor Ship
MV	Motor Vessel
NASA	National Aeronautics and Space Administration of the United States of America
NCAOR	National Centre for Antarctic and Ocean Research
NCPOR	National Centre for Polar and Ocean Research
PNRA	Programma Nazionale di Ricerche in Antartide [Italian National Antarctic Program]
PRIC	Polar Research Institute of China
PSCT	Polar Science Consortium of Thailand
RAPAL	Reunión de Administradores de Programas Antárticos Latinoamericanos [Meeting of Managers of Latin American Antarctic Programs]
RCC	Rescue Coordination Centre
RSA	Russian Space Agency
RV	Research Vessel
SCAR	Scientific Committee on Antarctic Research
SP	Secretariat Paper
SRZ	Special Research Zone
WMO	World Meteorological Organization
WoS	Web of Science
WP	Working Paper

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Chapter I

The Asian Forum for Polar Sciences: an assessment of regional co-operation

Abstract

The work here presented is a review of the current situation on the relation of Asian countries with Antarctica and aims for a better understating towards the role of the Asian Forum for Polar Sciences (AFoPS) in the Antarctic Treaty Area.

This chapter presents a critical analysis of the current situation of the Asian presence in Antarctica providing also information on the history of AFoPS. A gap of knowledge in scholarly work with regard to AFoPS has been observed, while there is extensive analysis on Asian countries in Antarctica analysed as nuclear entities. It is important to assess AFoPS role in the wider Antarctic region, both for policy and scientific perspectives, to understand its relation with other international organisations active in the Antarctic Treaty Area.

AFoPS, in its relatively short history, has a number of achievements: a Memorandum of Understanding with the International Arctic Science Committee and the Scientific Committee on Antarctic Research. Additionally, thanks to co-operative activities within the group Members, such as exchange of personnel and co-operative science-support projects, AFoPS involved countries traditionally without a polar background, such as Thailand and Vietnam, to conduct scientific activities in Antarctica.

1.1 Introduction

The Asian Forum for Polar Sciences (AFoPS) was the first, and remains the only, Asian regional group aiming to facilitate scientific research and support in polar environments. AFoPS can be considered the cluster of the relation between Asia and the polar regions because it represents the willingness of conducting scientific research for those Asian countries that already have or are developing a polar program.

For the purpose of this theoretical study, Asia is inclusive of all the countries that are part of Central, East & Southeast, Middle East and South Asia as per the Central Intelligence Agency classification (2017). Specific consideration for inclusion in this research on AFoPS was given to two countries that geographically lay between Europe and Asia: the Russian Federation and Turkey. The Russian Federation was not included in this research, and considered as a European country, because of its attendance as Permanent Observer in the European Polar Board (EPB). On the other hand, Turkey showed interest in taking part in AFoPS, and for this reason, it will be considered. While acknowledging that only AFoPS Members and Observers will be the focus of this research, Table 1.1. gives an overview of all the Asian countries that are involved in various Antarctic fora and organisations.

Table 1. 1 Asian countries' participation in Antarctic organisations

	AFoPS		ATCM		CCMLAR		COMNAP		SCAR	
	Member	**Observer**	**Consultative**	**Non-consultative**	**Members**	**Acceding States**	**Members**	**Observers**	**Full Membership**	**Associate Membership**
Democratic People's Republic of Korea				+						
India	+		+		+		+		+	
Indonesia		+								
Islamic Republic of Iran										+
Japan	+		+		+		+		+	
Kazakhstan				+						
Malaysia	+			+				+	+	
Mongolia				+						
Pakistan				+		+				+
People's Republic of China	+		+		+		+		+	
Philippines		+								
Republic of Korea	+		+		+		+		+	
Sri Lanks		+								
Thailand	+									+
Turkey				+				+		+
Vietnam		+								

This chapter gives an overview of the pre-existing literature, underlining a gap of knowledge on scholarly works in regard to the AFoPS' role in the Antarctic Treaty Area. It also proposes a possible path of enquiry that can be used to achieve a more

comprehensive knowledge and enrich the understanding on AFoPS position and role with regards to research and co-operation in Antarctica within the Asian community.

Asia has been at the centre of scholarly literature and news in the past twenty to thirty years. Much attention in the scholarly literature has been devoted to the often-criticised definition of the Asian century (Gillen, 2014). The idea of the Asian century was used for the first time by Deng Xiaoping who, in 1988, while visiting India, said that "no genuine Asia-Pacific century or Asian century can come until China, India and other neighbouring countries are developed" (Chander, 2011, p. 726). In 2010 the Chinese Premier Wen Jiabao's asserted that the "Asian century has arrived" (Chander, 2011, p. 726). Mahbubani (2008) asserted that the Western dominion was ending and that there has been a revitalization of Asian societies. Chaturvedi (2012) added that "the Asian march to modernity represents diverse new opportunities for the West and the rest of world" (p. 228). Mainly, concerns about the Asian century definition evolved around the cultural, economic and geographic differences that are present in the Asian continent (Chander, 2011; Gillen, 2014).

Additionally, Dodds and Hemmings (2013) adopt the concept of 'orientalism', which was first coined by Edward Said (1978), with a polar interpretation naming this style of thoughts 'polar orientalism'. Subsequently, Dodds and Collis (2017) described 'polar orientalism' as a way "to draw attention to how a growing Asian interest and engagement in Antarctic once provoked (and still provokes) unease from the original signatories of the Antarctic Treaty" (Dodds & Collis, 2017, p. 59). According to Said (1978), 'orientalism' has many variations, and one of variations is based "upon an ontological and epistemological distinction made between "the Orient" and (most of

the time) “the Occident”” (p. 10). With regard to Antarctica, this distinction could be made between the Antarctic Treaty’s[1] twelve original signatories[2] and the acceding states. Although this differentiation is ephemeral because Japan is one of the twelve original signatories, it could still be applied to the other Asian countries that are part of the Antarctic Treaty System and to the countries that have only recently demonstrated their interest in conducting activities in Antarctica.

The relation between Asia and Antarctica is important for the international community because of the increasing presence and interest of Asian countries towards the Antarctic continent. The number of Asian countries involved in research in the Antarctic Treaty Area is rising, and with that also the number of peer-reviewed publications related to those projects are increasing. However, it is important to underline a lack of coverage especially on the role of AFoPS in regard to Antarctica. In fact, scholarly research to date has looked at the Antarctic engagement of Asian states in a singular fashion, focussing on individual states rather than studying the development of international relations and coalitions between these countries regarding polar matters. At present, only three academic publications, Zhao J et al. (2011), Kim and Jeong (2015) and Watanabe et al. (2015), analyse the role of AFoPS and its achievements in the first ten years of activity. The role of AFoPS within the wider Antarctic geopolitical framework has not been studied from a scholarly perspective. Academic consideration on this Asian regional group operating in the Antarctic Treaty Area is important to understand how AFoPS’ growing importance can impact Asian

[1] Antarctic Treaty, 1959, 12 U.S.T. 794, 402 U.N.T.S. 71, 19 I.L.M 860 (1980). [Hereinafter AT].
[2] The original signatories of the AT are: Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, Union of Soviet Socialist Republics, United Kingdom, and United States of America.

countries, and influence their scientific research and support programmes, not to mention how AFoPS can affect the balance of power within the Antarctic Treaty System.

1.2 Asia and the polar regions

Several Asian countries, China, India, Japan and the Republic of Korea, have been deeply involved in Antarctic research, some of them, India and Japan, since the International Geophysical Year (IGY) in 1957–1958[3]. It has to be noted that during the IGY 1957–1958, while Japan conducted research in Antarctica, Indian scientific activities were mainly conducted in the Northern hemisphere marking the first time that international science was conducted (Kochhar, 2008). Japan is an original signatory of the AT, which was negotiated between twelve countries in Washington, United States of America, on 1 December 1959 and entered into force on 23 June 1961. Others have become involved in Antarctic research in more recent years: the People's Republic of China (AT signatory in 1983 and Consultative Party in 1985), and the Republic of Korea (AT signatory in 1986 and Consultative Party in 1989) (Secretariat of the Antarctic Treaty, 2014). China, India, Japan and the Republic of Korea have also been signatories to the Protocol on Environmental Protection to the Antarctic Treaty[4] since it entered into force on 14 January 1998. Twenty-five years after the entry into force of the Protocol their commitment to maintain Antarctica a "natural reserve, devoted to peace and science", as per Article 2 of the Protocol continues. An additional example of their commitment is shown by Japan and Korea, in association with other nineteen co-

[3] The International Geophysical Year 1957–1958 is also known as the third International Polar Year.
[4] The Protocol on Environmental Protection to the Antarctic Treaty, 1991 (entered into force 1998), Senate Consideration of Treaty Document 102-22, reprinted in 30 I.L.M. 1461. [Hereinafter Protocol].

signers[5], submitting Working Paper 38 *Confirming Ongoing Commitment to the Prohibition of Mining Activity in Antarctica, other than Scientific Research - Antarctic Mining Ban* to the ATCM XXXIX – CEP XIX (Santiago, Chile) 2016. In this Working Paper, all the signatories reaffirm their commitment to Article 7 of the Protocol which prohibits any activities relating to mineral resources other than scientific research.

Malaysia has been a Non-Consultative Party to the AT since 2011 and the Protocol entered into force five years later, in 2016; Turkey, often considered in a bridge position between Europe and Asia, is a Non-Consultative Parties of the AT[6]. Thailand, Vietnam, and the Philippines have become involved in Antarctic-related matters in the past few years. Malaysia, the Philippines, Thailand, Turkey, and Vietnam have participated in the AFoPS AGM held in Incheon, Republic of Korea, in October 2016 as Observers. Nevertheless, also other Asian countries which are not represented during AFoPS meeting have demonstrated, for various reasons and with different levels of participation, interest towards Antarctica. Kazakhstan (2015), the Democratic People's Republic of Korea (1987), Mongolia (2015) and Pakistan (2012) have become Non-Consultative Parties to the AT. Pakistan has also ratified the Protocol on 31 March 2012 (Secretariat of the Antarctic Treaty, 2014).

China, India, Japan and Korea (Goodsite et al., 2016) have applied for, and been granted, Observer status in the Arctic Council[7] at the Kiruna Ministerial meeting held

[5] ATCM XXXIX - CEP XIX (Santiago, Chile) 2016 Working Paper 38 was submitted by the United States of America, Argentina, Australia, Belgium, Chile, Czech Republic, Finland, France, Germany, Italy, Japan, the Republic of Korea, Netherlands, New Zealand, Norway, Poland, South Africa, Spain, Sweden, United Kingdom and Uruguay.

[6] Turkey ratified the AT on 24 January 1996, and the Protocol on 27 October 2017.

[7] Since 1998, thirteen Non-Arctic states have been approved as Observers to the Arctic Council. These are: Germany (1998), Poland (1998), the Netherlands (1998), United Kingdom (1998), France (2000), Spain (2006), India (2013), Italy (2013), Japan (2013), People's Republic of China (2013), Republic of Korea (2013), Singapore (2013), and Switzerland (2017).

on 15 May 2013 in Stadshuset in Kiruna, Sweden (Kim, 2014). An additional example of the historical involvement in Arctic activities is A. Tanakadate's attendance, as president of the Japanese polar committee, at the first meeting of the International Commission for the Polar Year, held on 26–30 August 1930 in Leningrad, Union of Soviet Socialist Republics (Lüdecke & Lajus, 2010). This meeting was meant to provide a practical background for the second IPY (Laursen, 1949). Japan and India were also two of the original signatories of the Status of Spitsbergen[8] signed in Paris, France, on 9 February 1920, which entered into force on 14 August 1925 (Rajan & Krishnan, 2016; Status of Spitsbergen, 1920); China joined the Status of Spitsbergen in 1925 (State Council Information Office of the People's Republic of China, 2018). Presently, China, India, Japan and Korea have permanent Arctic research stations located in Ny-Ålesund; China established the Yellow River station in 2004, India erected Himadri station in 2008, Japan Rabben station in 1990, and Korea opened Dasan station in 2002 (Chaturvedi, 2013).

Tang (2018) notes that "for the first time since the end of the cold war, East Asia today is a region without a concrete regional project. To some extent, East Asia is now a region in danger if going adrift" (p. 39). This is true from an economic point of view, but it is not possible to affirm the same in relation to the polar regions. In fact, six Asian countries, namely India, Japan, Malaysia, the People's Republic of China, the Republic of Korea, and Thailand are Members of the Asian Forum for Polar Sciences (AFoPS). One of the principal motivations driving AFoPS is to facilitate the participation of new Asian countries in Antarctic activities. Considering the reach that AFoPS could have in

[8] Status of Spitsbergen 43 Stat. 1982, Treaty Series 686.

Asia, the number of AFoPS Members could dramatically increase, and AFoPS could become one of the most powerful coalitions in Antarctic politics and operations.

So far, scholarly research looked at the Antarctic engagement of Asian countries focussing on individual states rather than studying the development of international relations and coalitions between these countries regarding polar matters. Also, the role of AFoPS within the wider Antarctic geopolitical framework has not been studied from a scholarly perspective. The research presented here addresses this gap of knowledge and analyses how the growing importance and impact of Asian countries, through AFoPS co-operation, could modify the balance of power in, and with regard to, Antarctica.

1.3 Asian countries and AFoPS membership

Japan and the Republic of Korea had agreed to form an 'East Asian group' after a side meeting during the Council of Managers of National Antarctic Programs (COMNAP) AGM held in Brest, France, in 2003, and China joined this group subsequently through online communication (Zhao et al., 2011). Established in May 2004, AFoPS was formed by the Polar Research Institute of Japan, the People's Republic of China and the Republic of Korea. The group's first official meeting was held in Shanghai, China, on 25 May 2004 and was called to discuss the structure of AFoPS. Later, during the VI AFoPS Delegates Meeting in Tokyo, Japan, in February 2007, representatives of India and Malaysia joined AFoPS to become the fourth and fifth Members (Japan, 2009). One year later, in September 2008, at a meeting held at the Korea Polar Research Institute (KOPRI) in Incheon, Republic of Korea, researchers from Indonesia, the Philippines, Thailand and Vietnam were invited to join the forum as

Observers (Asian Forum for Polar Sciences [AFoPS], 2014). Sri Lanka was admitted as Observer in 2015. The AFoPS secretariat is hosted by the Members and changes its location, secretary, and chair every two years: since 2016, the Secretariat has been hosted by the Polar Research Institute of China (PRIC).

The year 2016 saw an important milestone for the group for two reasons: Thailand was accepted as AFoPS Member and AFoPS signed a Memorandum of Understanding (MoU) with the International Arctic Science Committee (IASC) and the SCAR.

Thailand represents the first country to be accepted as AFoPS Member without being a signatory of the AT. This means Thailand does not have to operate in the Antarctic Treaty Area within the parameters of the AT or the Protocol. Thus, requirements for peaceful only use and freely making available scientific results, do not strictly apply to Thailand. In addition, all the provisions in place to protect the Antarctic environment through the Protocol, including the ban on mineral resources activities (Article 7), are not applicable to Thailand's activities; however, as mentioned by McColloch (1992), customary international law now applies in Antarctica. Nonetheless the concepts of peaceful use, scientific collaboration and the ban on mining activities are recognized as general principles, these can become accepted as binding customary international law. Thailand presented an expression of interest in seeking membership in AFoPS with Working Paper 09 presented during AFoPS XIX AGM (AFoPS, 2016, pp. 31–32). After review and discussions on Working Paper 09, delegates of the five Members' countries decided to accept, in principle, Thailand as a full Member and required the Thai government to submit additional documentation in order to officially

announce the sixth Member of the group, which then happened during the 2017 AGM (AFoPS, 2017). The request for additional documentation was based on AFoPS XIX AGM Working Paper 08 *Draft Procedures of Membership and Observer Accreditation* which states

> 1.4. The application for membership will be submitted by the national member of SCAR, IASC, COMNAP, FARO or other relevant international polar organizations, or by some other means if a country has no national member of the above mentioned organizations, in which case advice should be sought from the Secretariat.[9]

In fact, Thailand is a SCAR Associate Member through the Polar Science Consortium of Thailand (PSCT) (Scientific Committee on Antarctic Research [SCAR], 2017) but AFoPS' membership application was submitted through the Information Technology under Initiative of Her Royal Highness Princess Maha Chakri Sirindhorn Foundation (IT-HRH Princess Foundation) which performs secretariat functions for the Thailand National Polar Research Program. The additional documents were requested to guarantee that both these two separate entities would provide support to the Thailand National Polar Research Program. Therefore, Thailand acceptance in becoming an AFoPS Member seems to widen the before mentioned *Procedures of Membership and Observer Accreditation*, especially paragraph 1.4., to allow for non-SCAR, IASC, COMNAP and the Forum of Arctic Research Operators (FARO) organisations to join AFoPS.

[9] The *Procedures of Membership and Observer Accreditation* here presented as AFoPS XIX AGM Working Paper 08 have been amended before being approved and accepted on 12 October 2016. The revised and accepted paragraph 1.4. now reads "The application for membership will be submitted by the recognized national Antarctic program of the applying country".

A MoU between AFoPS, IASC and SCAR was signed in Kuala Lumpur, Malaysia, on 26 August 2016, during the closing ceremony of the SCAR Open Science Conference 2016 and it represents the first MoU signed by AFoPS with other polar organisations. Signing on behalf of AFoPS was Yeadong Kim (AFoPS Chair and immediate past KOPRI President), on behalf of IASC Susan Barr (IASC President), and on behalf of SCAR Jerónimo López-Martinez (SCAR President). The MoU will remain in force for five years and in 2021 it will be reviewed for possible extension (AFoPS, 2016a). The MoU was premised on the idea that all the three organisations "share the common goal of working internationally on polar science and technology to increase our understanding of Earth's Polar Regions and their connections to the global system"[10] (AFoPS, 2016a).

This MoU is a milestone for the group because AFoPS is now recognised by SCAR and IASC and it represents a step towards the presentation of Asian achievements towards international polar communities. The presentation of Asian achievements towards international polar communities is one of the main goals that AFoPS has had since its constitution.

1.4 AFoPS Member countries

To better understand AFoPS' leading role in Asia (Kim et al., 2010), it is important to have a brief overview of the history of the six AFoPS Members' activities in Antarctica. Many of these countries have a well-established and long-term interest in Antarctic research and might play a leading role for countries that have only recently developed interest towards the Antarctic Treaty Area. Knowing the history, through a brief excursus, of these countries and some of the milestones that have been achieved, will

[10] The complete text of the MoU can be found on the websites of all three organisations.

help to understand the importance of co-operation and the role that those countries can have towards the new actors. The history of the countries' involvement in Antarctica will be presented in the same order as these have become AFoPS Members.

1.4.1 Japan (AFoPS Member since 2003)

Japan's first interaction with Antarctica was with the early Japanese explorer Nobu Shirase who entered a bay in the Ross Barrier front and started the exploration on the ice on 16 January 1912 (Barr, 2012). His expedition, however, was not supported by the Japanese government. In 1934, the Japanese whaling company Nihon Hogei purchased the Norwegian vessel Antarctic to undertake its first whaling campaign in 1934–1935 (Gill, 1994). In 1951, Japan signed the San Francisco Peace Treaty[11] renouncing, under the Article 2(e), to its territorial rights including any claims to Antarctica (Osada, 1994; Scott, 1999; Tonami, 2017).

On 29 January 1957, Syowa station was established on East Ongul Island, Lützow-Holm Bay, Dronning Maud Land, Antarctica (Council of Managers of National Antarctic Programs [COMNAP], 2017). The establishment of this station has been part of the project for the IGY started in 1956 with the first trip of the vessel Soya sailing to Antarctica with scientists' members of the first Japanese Antarctic Research Expedition (JARE) on board (National Institute of Polar Research, 2014a). Japan ratified the AT as one of the twelve original signatories in 1961 (Secretariat of the Antarctic Treaty, 2014). Subsequently, Mizuho station was established in 1970 and Asuka station in 1985 (Osada,

[11] Treaty of Peace with Japan, signed at San Francisco, on 8 September 1951, 3 U.S.T 3169, TIAS No. 2490 (1951).

1994); at present, both these stations are temporarily closed and ready to be re-opened in case of necessity (COMNAP, 2018a).

Japanese researchers have conducted scientific activities in Antarctica every year since JARE-1, reaching JARE-59 at the time of writing, establishing international scientific collaboration and supporting researchers from Asian countries with less Antarctic experience.

1.4.2 Republic of Korea (AFoPS Member since 2003)

The Republic of Korea's first interaction with Antarctica was in 1978, when Korean boats sailed to the Southern Ocean to fish for krill (Brady & Seungryeol, 2012). Korean attention towards Antarctica was officially manifested in November 1986 when the Republic of Korea became the 33rd state to accede to the AT.

In 1987, KOPRI was established to demonstrate national interest for polar topics. In the same year, the Korean government began the construction of their first Antarctic base, King Sejong station, which was officially opened on 17th February 1988 (Han'guk Haeyang Yon'guso, 1998). The station is located on the Barton Peninsula, King George Island, South Shetland Islands, Antarctica, where seven other countries (Argentina, Brazil, Chile, the People's Republic of China, Poland, Russian Federation and Uruguay) have their stations. The activities of numerous scientists on this small island allowed Korean researchers to co-operate with other institutions. In October 1989, the Republic of Korea was granted Consultative status within the Antarctic Treaty System. The rising power of the Republic of Korea in Antarctica is additionally evidenced by the capital that has been invested in research: the Korean polar budget has increased by 400% from 2004 to 2010 (Brady & Seungryeol, 2012). Part of this increased budget went through the

construction of the Korean Research Vessel (RV) *Araon*: a feasibility study was conducted in 2003, the construction started in 2006 and she was inaugurated in 2009. RV *Araon* plays a pivotal role in supporting science in both the Arctic and the Antarctic. In 2010, the Republic of Korea started the plans to build the second Korean base, Jang Bogo station, in Terra Nova Bay, Ross Sea Region, Antarctica. Jang Bogo station, opened in 2014, was the first Korean base to be built directly on the Antarctic continent (Meduna, 2014) and is one of the more eco-friendly and sustainable station in the continent as it employs renewable energy technologies (Korea Polar Research Institute and Korea Environment Institute, 2012).

KOPRI have also investigated the possibility to build a gravel runway in co-operation with the Italian Antarctic Programme (Programma Nazionale di Ricerche in Antartide (PNRA)), which runs the nearby Mario Zucchelli station (Pelosi, 2012). After the submission of Comprehensive Environmental Evaluations (CEEs) to the AT (ATCM XXXIX - CEP XIX (Santiago, Chile) 2016 Working Paper 43 and ATCM XL - CEP XX (Beijing, China) 2017 Information Paper 58), Italy in 2016 started the construction of the gravel runway located at Boulder Clay, Victoria Land, Antarctica.

1.4.3 The People's Republic of China (AFoPS Member since 2003)

The People's Republic of China's engagement with the Antarctic started nationally in 1964 with the establishment of the State Oceanic Administration aiming to "engage in polar expeditions in the future" (Brady, 2017b, p. 46). Subsequently, in May 1982 the Chinese National Committee on Antarctic Expeditions was established (Chen et al., 2017) and in 1996 the committee was renamed as Chinese Antarctic Administration (CAA) (Brady, 2017b). International politics began, on 8 July 1983

(National Committee for Antarctic Research, 1985) with China requesting to become a party of the Antarctic Treaty System. Consultative status was obtained on 7 October 1985 (Secretariat of the Antarctic Treaty, 2014).

From a scientific perspective, during the summer 1979–1980, two Chinese scientists accompanied the Australian National Antarctic Research Expeditions (ANARE) to Casey station to undertake geological research (Guo et al., 1990; Chen et al., 2017). In the same year, the People's Republic of China discussed with Chile the possibility to collaborate in research related to fisheries, oceanography and geological surveys. After joining the Antarctic Treaty System, the People's Republic of China launched a long-term research (i.e. strategic) plan in Antarctica starting on 20 November 1984 with the first independent Chinese Antarctic Expedition (CHINARE I) and continuing with the establishment of the People's Republic of China's first research station, Great Wall station, on King George Island, South Shetland Islands, Antarctica, inaugurated on 20 February 1985 (Guo et al., 1985).

The People's Republic of China greatly benefitted from co-operation with more experienced countries (e.g. Japan assisted the People's Republic of China in training the participants of its first expedition; the Soviet Union provided general assistance; Argentina and Chile helped to select the most suitable location for Great Wall station; and New Zealand and USA shared their operational expertise in Antarctica (Zou, 2014)). The assistance received from other national Antarctic programs could result in a pivotal role for the People's Republic of China within AFoPS to help and support other emerging Antarctic players. On 26 February 1989, the People's Republic of China inaugurated Zhongshan station, in East Antarctica (Guo et al., 1990), and then shifted

its priorities from station building to the development of a scientific research programme. As a result, in 1989, PRIC was officially established (Zhao & Allison, 2016). China built its third station, Kunlun, in 2009 at Dome Argus (Dome A), East Antarctic Plateau, Antarctica, at 4087 m above sea level (COMNAP, 2017), the highest and the least explored territory in Antarctica, which is accessible only for two weeks per year (Brady, 2012b). This station is important for its inland location as the first two People Republic of China's stations were built on coastal areas. The period from 2001 to 2016 saw an increase in the budget dedicated to China's polar activities. In that period, in particular, China has invested USD 47 million in Antarctic research, eighteen times more than what it was invested between 1985 and 2000 (Liu & Brooks, 2018).

In addition, during the ATCM XXXVI - CEP XVI (Brussels, Belgium) 2013, the People's Republic of China representatives submitted Working Paper 08 proposing Dome A Antarctic Specially Managed Area (ASMA) that "would encircle Kunlun Station at a radius of 120 kilometres (for the clean air sector), 10 kilometres (for the buffer zone), and 30 kilometres (for two scientific zone)" (Brady, 2017b, p. 211; Brady 2017c). In 2014, the People's Republic of China established, Taishan, a seasonal camp in Princess Elizabeth Land, East Antarctica (COMNAP, 2017).

According to an article published on Xinhua (2014), the CAA planned to start the building of the fourth Chinese station in Victoria Land in December 2015 using the same plans that the Republic of Korea used for Jang Bogo station as an example of good practice to minimize the environmental impacts from Antarctic research stations (Polar Research Institute of China, 2014). A draft CEE for this station was submitted to ATCM XXXVII - CEP XVII (Brasilia, Brazil) 2014 as IP037. At this ATCM, Parties expressed their

concerns regarding the construction of this year-round facility, and the People's Republic of China did not reply to the feedback received from the Parties (Brady, 2017a, 2017b). Nevertheless, in January 2015 Chinese personnel disembarked at the site of the proposed station with "ten tons of material, setting up prefabricated accommodation, and built a temporary wharf" (Brady, 2017a, p. 8) without commencing the works on the facility. In November 2017, the Chinese icebreaker RV *XueLong* sailed to Inexpressible Island, Victoria Land, Ross Sea Region, Antarctica, with workers and construction materials to build the fifth Chinese facility in Antarctica (Xinhua, 2017a; Xinhua, 2017b). CAA, PRIC and Tongji University prepared a new Draft CEE for the Victoria Land Research station in January 2018, addressing the concerns raised by the Parties after the first draft in 2014, and relative WP013 and IP023 rev.1 and IP025 were submitted to ATCM XLI - CEP XXI (Buenos Aires, Argentina) 2018 for discussion (Polar Research Institute of China, 2018).

1.4.4 India (AFoPS Member since 2007)

India was one of the first countries, aside from the twelve initial signatories of the AT, to emphasise the importance of respecting Antarctica's fragile ecosystem (Suter, 1991). India raised its concerns, in 1956, with the request to insert in the United Nations General Assembly's agenda the 'Question of Antarctica', but the matter was not evaluated (Chaturvedi, 2012b). India was excluded from the conference that created the AT, because it did not have a research team operating in Antarctica during the IGY (Suter, 1991). In July 1981, India launched the Operation Gangotri, which brought twenty-one Indian scientists to Antarctica in January 1982 to conduct climatic research

and to assess the relation of the Antarctic climate system with the Indian monsoons (Chaturvedi, 1986; Suter, 1991; Beck, 1994a).

After the first scientific research in Antarctica, India became a Consultative Party of the Antarctic Treaty System on 12 September 1983 and opened its first station, Dakshin Gangotri, on 26 January 1984. The facility was decommissioned on 25 February 1990. The Department of Ocean Development of the Indian government inaugurated, on 25 May 1998, the National Centre for Antarctic and Ocean Research (NCAOR) as the leading agency for the implementation of the Indian Antarctic program (National Centre for Antarctic and Ocean Research, 2014). At present, India is running two year-round stations: Maitri, established in 1989 in an ice-free area in the Schirmacher Oasis, East Antarctica, and Bharati, built in 2011 in the Larsemann Hills, East Antarctica (COMNAP, 2017).

On 5 July 2018, the Indian Ministry of Earth Sciences, with the notification No. MoES/41/10/2018-Estt., as presented in the Gazette of India, officially renamed the NCAOR as National Centre for Polar and Ocean Research (NCPOR) without changing its role and structure.

1.4.5 Malaysia (AFoPS Member since 2007)

In the 1980s, Malaysia was very critical towards the Antarctic Treaty System and suggested that the United Nations should assume a central role in governing Antarctica (Davis, 1994). During the United Nations General Assembly in New York in 1982, the Malaysian Prime Minister, Dr Mahathir Mohammed, affirmed that Antarctica was the privileged land of few countries and he requested the United Nations to protect what should be considered as the Common Heritage of Mankind (Hamzah, 2012). Malaysia

requested any future profits deriving from Antarctic exploitation to be divided for the advantage of all of mankind, with developing countries taking precedence (Joyner, 1994). From the 1980s to early 1990s, Malaysia was the leader of a number of countries opposing the Antarctic Treaty System and, in that effort, was supported by Indonesia (Joyner, 1994).

In the late 1990s, Malaysia's perspective on Antarctic governance changed after Malaysian scientists were invited to join New Zealand's researchers at Scott Base (Hamzah, 2010). From that point onwards, Malaysian scientists joined other countries, including other AFoPS Members, to conduct research in Antarctica. In 2008, Malaysia became a full Member of SCAR and on 31 October 2011 the country acceded to the AT (Secretariat of the Antarctic Treaty, 2014). It also important to mention that Malaysia was the first Asian country to host a SCAR Open Science Conference, a biannual event organised since 2004, in August 2016, while Japan hosted SCAR Delegates meetings in 1968 and 2000, and the People's Republic of China hosted a SCAR Delegates meeting in 2002.

1.4.6 Thailand (AFoPS Member since 2017)

Thailand's first engagement with Antarctica was in November 1993 when Her Royal Highness Princess Maha Chakri Sirindhorn visited New Zealand's Scott Base and the United States of America's McMurdo station (National Science and Technology Development Agency, 2016). Two researchers from Thailand were hosted by Japan at Syowa station to conduct scientific research in 2004 and 2009 (National Science and Technology Development Agency, 2016). Having understood the importance of continuous research in Antarctica and the need for international co-operation, Her

Royal Highness visited, in April 2013, the CAA, the PRIC and also the RV *XueLong*, calling in Shanghai after her voyage to Antarctica (National Science and Technology Development Agency, 2016; Soonthornthum, 2016). These visits marked a turning point for Thailand presence in Antarctica with the signing of two MoUs with the CAA on 30 July 2013, and, three years later, with the PRIC on 6 April 2016 (Soonthornthumm, 2016; Xinhua, 2016).

In 2014 and 2015, Thailand sent a total of three scientists to the People's Republic of China's Great Wall and Zhongshan stations to conduct marine biology and oceanography research (Thailand, 2016; Soonthornthum, 2016). There are plans to continue these projects, adding also astronomy and geological research, into the proposed collaboration with the People's Republic of China for the next eight years.

During the SCAR Delegates meeting held in Kuala Lumpur, Malaysia, on 29–30 August 2016, Working Paper 4c was presented, to support Thailand's application to become a SCAR Associate Member. The paper underlined all the scientific projects Thailand was involved in polar regions in the past four years (Thailand, 2016) and Thailand was accepted as SCAR Associate Member.

1.5 Aims and objectives

AFoPS operates on interregional and intraregional scales. These two different scales guide the two overarching questions behind this thesis:

- With regard to international relations, to what extent could AFoPS influence the balance of power in the Antarctic Treaty System?

- Within the Asian boundaries, how could AFoPS change the Asian regional organisation, co-operation and its interaction with Antarctica?

With these two overarching questions, the research aims to understand AFoPS position in governance and science within the Antarctic Treaty System. To gain a better understanding of AFoPS, the analysis presented here aims to achieve the following goals:

- Assess regional bloc participation in Antarctica
- Assess Asian scientific contribution towards a greater understanding of the Antarctic
- Assess Asian contribution and participation in decision making within the Antarctic Treaty Consultative Meetings (ATCMs)
- Explore the shared use of Antarctic infrastructures and the influence of co-operative projects

Additionally, this research critically analyses the present situation and the state of knowledge of Asian co-operation in Antarctica. To summarise, the thesis aims to evaluate the current situation of Asian countries' co-operation in Antarctica, through the regional group AFoPS, to understand the extension of Asian participation in Antarctic matters.

1.6 Discussion

The status quo of the Asian presence in Antarctica has been analysed by many scholars, focusing on single countries' activities, but there has not been much discussion on international co-operation within regional groups. However, international co-

operation, aiming to facilitate research in the Antarctic, plays a pivotal role for logistic support and for the deployment of scientific projects run by multiple countries. In times when countries add to their scientific agendas 'big science' projects that they might not be able to conduct on their own, it is important to address international co-operation activities and regional groups operating in Antarctica. AFoPS is not the only regional group operating in Antarctica. In fact, the European Polar Board (EPB) and the Reunión de Administradores de Programas Antárticos Latinoamericanos [Meeting of Administrators of Latin American Antarctic Programs] (RAPAL), which are operating in Antarctica through their member entities representing European and South American countries. The role played by regional groups and organisations, both intra and extra-Antarctic, will help to enhance the knowledge on international co-operation in Antarctica and how this can foster new partnership involving also player that are not yet seen as Antarctic actors.

1.6.1 Towards a better understanding of AFoPS

To better understand AFoPS role in the Antarctic Treaty Area and its relation to other organisation operating in the same area, it is possible to use both qualitative and quantitative analysis methods. Qualitative analysis, and in particular semi-structured interviews, starting with focused inquiries as presented by Lincoln and Guba (1985), can be used to address the gap of knowledge created by a modest literature (Driscoll, 2011) on AFoPS role in the Antarctic Treaty Area. Semi-structured interviews give the participants the possibility to better express their own ideas (Taylor & Bogdan, 1998).

The quantitative analysis could be conducted through a comprehensive literature search in the period 2004, year of AFoPS establishment, to present for all the

co-authored papers, published in the English language, by authors affiliated with institutional (e.g. universities and research centres) or governmental (e.g. national Antarctic programs) entities from AFoPS Members' countries. These data can be retrieved using Web of Science (WoS) and Scopus databases to collect all the scientific publications from Asian authors. The use of only one database might be limiting because some journals are not listed in these databases. As per Whitley (2002), relying only on one indexing software, can produce non-accurate results, hence, the use of the two above mentioned services. Having an overview on scientific co-authored publications is important to understand the results achieved, to date, through collaboration towards an international polar community. Similarly, it is also possible to analyse the involvement of Asian countries in the Antarctic Treaty System analysing the number of Background, Information and Working Papers submitted to ATCM. The quantitative analysis of these data should include both the papers submitted by a single country and co-authored ones to be able to understand the impact that AFoPS has within ATCM. The joint use of semi-structured interviews, with the qualitative analysis of scientific publications co-authored by Asian researchers, will improve our understanding of the role that AFoPS, through co-operative projects, can play in Antarctica and how this can affect the balance of power within the Antarctic Treaty System.

1.6.2 AFoPS role in Antarctic governance and science

Promoting the highest level of co-operation between Asian countries on polar issues, AFoPS can play a pivotal role for countries developing, relatively late, an Antarctic interest. The connection with other international actors operating in

Antarctica, and the analysis of the relations and co-operation within AFoPS Members and observers show a crucial and instrumental role for the future development of this Antarctic regional group. AFoPS has to be regarded as an important new actor on the Antarctic stage; in fact, in the last twelve years, Asian countries, considered as singular entities, have invested more than ever in Antarctic research and infrastructure (Brady, 2012b; Brady & Seungryeol, 2012).

Part of those investments have also led to a cooperative project started under the AFoPS umbrella: pre-seasonal training for Chinese, Republic of Korea and Malaysian expeditioners with the Japanese Antarctic program or the participation of two Thai researchers during the 51st Japanese Antarctic Research Expedition (JARE-51) are exemplificative of that (National Institute of Polar Research, 2014b). Considering the number of countries geographically located in Asia, the number of AFoPS Members could dramatically increase, and AFoPS could become one of the more powerful coalitions in Antarctic scientific research, science support and politics. Understanding Asian countries' current and planned Antarctic activities is fundamental to comprehend and analyse how their presence in Antarctica is evolving and how this might shape the future of human engagement with the continent. Special consideration has to be given to the priorities these countries are setting for their Antarctic activities as well as their level of international relations within and beyond the Antarctic Treaty System.

To date, 18.9% of the Antarctic Treaty System Members (Consultative and Non-Consultative Parties) are Asian countries[12]. The Philippines, Thailand and Vietnam,

[12] Consultative Parties: India (1983), Japan (1961), the People's Republic of China (1985), the Republic of Korea (1989). Non-Consultative Parties: Kazakhstan (2015), the Democratic People's Republic of Korea (1987), Malaysia (2011), Mongolia (2015), Pakistan (2012), Turkey (1996).

currently having Member and Observer status within AFoPS, are countries without a strong polar background and have not a formal participation in the Antarctic Treaty System. Other Asian countries that currently are not Antarctic players, or do not have a strong polar background, might have the potential to undertake Antarctic expeditions and commence Antarctic research programmes through AFoPS. Their presence could change the balance of power in 'Antarctic governance'.

1.6.3 Asian countries' governance and scientific presence in Antarctica

For any country wishing to be a significant Antarctic player, the establishment and continuous operation of an Antarctic research facility or the advancement of a scientific project are considered demonstrations of commitment. This is supported by the words of Article IX, paragraph 2 of the AT stating that "Contracting Party demonstrates its interest in Antarctica by conducting substantial scientific research activity there, such as the establishment of a scientific station or the despatch of a scientific expedition".

In fact, the number of facilities run by a country is often used as a unique method to evaluate its activities on the continent and the interest to become a Consultative Party of the Antarctic Treaty System (Australia Dept. of Foreign Affairs, 1983; Beeby, 1972). However, scientific research and publications can be also used as a scale to assess whose activities and projects in Antarctica and to discuss how AFoPS is influencing Asian countries' activities. To analyse the impact of AFoPS, as a group, within the Antarctic Treaty System is possible to compare the number of Working Papers, Information Papers, and Background Papers, submitted to the ATCM by a single Asian country, with the co-authored papers submitted jointly with other AFoPS Members.

Working Papers, Information Papers, and Background Papers that have to be considered to do this comparison are the ones submitted by the four Consultative parties (India, Japan, the People's Republic of China, and the Republic of Korea) and the Non-Consultative party (Malaysia) to the ATCM - CEP from ATCM XXVII - CEP VII (Cape Town, South Africa) 2004, year of AFoPS establishment, to present.

Similarly, it is possible to evaluate Asian participation and the regional co-operation in scientific research analysing the number of scientific peer-reviewed publications submitted in English language by researchers affiliated with organisations located in one the six AFoPS Members' countries. International co-authored publications could be used to assess AFoPS influence in fostering joint scientific projects.

1.6.4 Will a joint Asian station be possible in Antarctica?

Before the entry into force of the AT, the first example of a shared facility is dated back to 1949–1952 with the Norwegian-Swedish-British Antarctic expedition. During this expedition, mainly based on glaciological research, Maudheim station was erected in Queen Maud Land, Antarctica. During the IGY 1957–1958, even though many stations hosted foreign scientist and there have been many examples of international scientific projects, there was only one example of joint facility: Hallett Station in Victoria Land, Ross Sea Region, Antarctica. The station was built by the United States of America and used as a year-round, joint station with New Zealand from 1956 to 1964; from 1964, it was used as a summer only station before being abandoned in 1973. In addition, Wilkes station was established by the United States of America on 29 January 1957 for the IGY; in 1958 the United States of America and Australia agreed on a joint use of the station

from 7 February 1959. The joint use lasted for two years, when, in 1961, Australia became the sole operator of the station until 1969 when it was replaced by Australia's Casey station. In the thirty-year period between the entry into force of the AT in 1961 and the adoption of the Protocol in 1991, there were only five cases of facilities that have been transferred from one country to another.

At present, out of 100 open and occupied facilities in Antarctica, only three are shared or joint facilities, and another two share logistic and scientific infrastructures (Wratt, 2013; van der Kroef et al., 2015; COMNAP, 2017). Looking at the future and using lessons learnt from the past, as Asian countries could move some steps into this co-operation path; the MoU for polar collaboration signed in 2016 by China and Thailand could be the first step for joint operation of facility. In addition, the interest expressed in 2014 by Turkey and Iran, countries without a strong Antarctic and polar background, could lead to a co-operation with other Asian countries with a stronger background in the realisation of an Asian joint research facility in Antarctica, if these countries are able to focus only on scientific co-operation and not on "national autonomy in the selection of locations for other reasons" (Hemmings, 2011, p.5).

1.7 Outline and structure of the thesis

Chapter II introduces the methods used to conduct the analysis on the Asian participation in the Antarctic theatre, the possible limitations of this research and the code of ethics followed during interviews. With the expression 'Antarctic theatre' the author refers to the region geographically delimitated by Article VI of AT and administrated under the Antarctic Treaty System's regulations. Chapter I, III, IV and V have been written up for publication in peer-reviewed journal articles and are presented

here verbatim, including their abstracts and acknowledgments. These four chapters address the objectives highlighted in the previous paragraphs in understanding AFoPS scientific and policy-making contribution in the Antarctic Treaty Area, the regionalisation of Antarctica, and the sharing of infrastructures.

In the current chapter, chapter I, the author aims to achieve a deep and critical understanding of the current knowledge of Asian activities in Antarctica. Starting from an analysis of the historical participation of Asian countries in polar activities, this chapter draws on AFoPS activities conducted in the fourteen years of activity and proposes possible ways to improve the awareness on the impact that AFoPS has on the Antarctic theatre.

Chapter III analyses the geographical concepts of 'region' and 'regionalism' and how these apply to the Antarctic. The concepts draw on the ideas of 'intraregional' and 'interregional' co-operative activities. In fact, Antarctica offers clusters of co-operative projects that are conducted within a specific Antarctic region, 'intraregional', and others involving at least two regions, 'interregional'. This study, through the use of specific example of co-operation within specific Antarctic regions, addresses a gap in our understanding on how regional groups operate in Antarctica. So far, scholars have largely focussed on activities conducted by a single country rather than analysing co-operative projects made possible by regional alliances.

Chapter IV assesses the contribution of Asian countries to improve the knowledge we have of Antarctic scientific issues and their role in policy making. This chapter provides an up-to-date analysis of the inputs provided by Asian countries to the ATCMs, comparing these results with the ones from the twelve original signatories of

the AT. Additionally, drawing on the methods used by Dudeney and Walton (2012), this chapter shows how Asian countries' rank in communicating their science in scholarly journals, compared to the other parties conducting scientific projects in Antarctica.

Chapter V argues that co-operation through the use of shared infrastructures is playing a central role in Antarctica. This chapter analyses the etymology of the 'joint' and 'share' use of facilities, both in Antarctica and Outer Space, which are often seen as analogues, with an emphasis on examples of shared facilities. The focus is on the assets operated by Asian countries and the role of co-operation in extending individual countries' scientific reach.

The final Chapter VI draws this thesis together combining the results and discussions presented in the four previous chapters to conclude the assessment of the Asian presence in Antarctica and in the Antarctic Treaty System through AFoPS.

Paper citations and the status of publication of each chapter, as of November 2018 are outlined overleaf in Table 1.2. The reference styles of these chapters were amended to present here a unique and coherent piece of work. Additionally, the word 'paper' used in the publications was amended to 'chapter' to maintain consistency and increase the readability of this thesis.

Table 1. 2 Papers citations and publication status for each chapter

Chapter	**Title for publication**	**Author**	**Journal**	**Publication status**	**Addenda**
Chapter I	The Asian Forum for Polar Sciences: an assessment of regional co-operation	Colombo Andrea	Advances in Polar Sciences	Received 10/05/2018. Recommended publication with revision 12/07/2018. Revision submitted 22/08/2018.	As of 5 July 2018, Ministry of Earth Sciences of India, through notification No. MoES/41/10/2018-Estt. officially renamed the National Centre for Antarctic and Ocean Research (NCAOR) as National Centre for Polar and Ocean Research (NCPOR). Paragraphs 1.5 and 1.7 have been added for thesis purpose only.
Chapter III	International co-operation in Antarctica: the influence of regional groups	Colombo Andrea	The Polar Journal	Abstract accepted, full paper under preparation	
Chapter IV	Assessing Asian engagement in Antarctica through bibliometric analysis	Colombo Andrea	The Polar Journal	Submitted 09/05/2018. Under review 24/05/2018.	Tables here presented from Table 4.1 to Table 4.5, and figures from Figure 4.1 to Figure 4.9 were renamed for consistency. Paragraph on methods of participation during ATCM was added.
Chapter V	Shared or joint facilities: the dichotomy of human presence in Antarctica	Colombo Andrea	Polar Geography	Submitted 03/09/2018. Recommended publication with revision 08//11/2018.	Tables here presented as Table 5.1 and Table 5.2 were renamed for consistency. Content of paragraph 5.4 was divided in sub-paragraphs here.

Chapter II

Methods

As indicated in the previous chapter, this doctoral project analyses the influence of AFoPS within Asia and in the wider Antarctic Treaty System. While recognising that AFoPS is a bi-polar organisation and that four of its Members have a stable presence both in the Arctic and in Antarctica, this research will focus only on the Antarctic Treaty Area. The Antarctic Treaty Area applies to the area south of 60° S latitude as defined by Article VI of AT, which states:

> [t]he provisions of the present Treaty shall apply to the area south of 60° South Latitude, including all ice shelves, but nothing in the present Treaty shall prejudice or in any way affect the rights, or the exercise of the rights, of any State under international law with regard to the high seas within that area (Secretariat of the Antarctic Treaty, 2015).

Tashakkori and Creswell (2007a) say that "research questions are shaped by the purpose of a study and in turn form the methods and the design of the investigation' (p. 207). Given the nature of the main research questions, this research offers the possibility to employ both qualitative and quantitative methods. Such a mixed-method approach is defined by Tashakkori and Creswell (2007b) as "research in which the investigator collects and analyzes [sic] data, integrates the findings, and draws inferences using both qualitative and quantitative approaches or methods in a single study or program, of

inquiry" (p. 2). The qualitative research is the results of semi-structured interviews as presented by Jamshed (2014), and the quantitative analysis has been conducted through a bibliometric analysis (Belter, 2015) of scientific publications submitted to peer-reviewed journals and papers submitted to ATCMs by Asian researchers and Parties. The use of primary data, such as interviews, help address the gap in knowledge created by a modest literature (Driscoll, 2011) on AFoPS' role in the wider Antarctic scenario. Additionally, having an overview of scientific co-authored publications is important as it is one of the principles behind the AT, with Article II stating that "[f]reedom of scientific investigation in Antarctica and cooperation [sic] towards that end, as applied during the International Geophysical Year, shall continue, subject to the provisions of the present Treaty", and represents the interest of a country to pursue scientific research in order to demonstrate their interest towards the preservation of Antarctica.

Both qualitative methods, such as interviews and participant observation, and quantitative methods, such as bibliometric analysis, have been used to answer the two overarching research questions of this project:

- With regard to international relations, to what extent could AFoPS influence the balance of power in the Antarctic Treaty System?
- Within the Asian boundaries, how could AFoPS change the Asian regional organisation, co-operation and its interaction with Antarctica?

In order to answer these questions, it is important to obtain insight and understand the four following themes:

- Assess regional bloc participation in Antarctica

- Assess Asian scientific contribution towards a greater understanding of the Antarctic
- Assess Asian contribution and participation in decision making within the Antarctic Treaty Consultative Meetings (ATCMs)
- Explore the shared use of Antarctic infrastructures and the influence of co-operative projects

2.1 Qualitative analysis

The use of qualitative research is ideally suited to examine AFoPS from different points of view and valorise different perspectives, to minimize bias. Taylor and Bogdan (1998) state that "qualitative research methods are ideally suited to examining the world from different points of view. [...] All perspectives are valuable in the sense that there is something to be learned from them" (pp. 19–20). Minichiello and Kottler (2010) analyse the contribution that qualitative methods could bring to a research, affirming that "there is no fixed way of thinking about the world and that different people can experience the same events but think about them or interpret them very differently" (p.16). Additionally, "combing qualitative inquiry with quantitative studies [help] to deepen, broaden, or better focus and describe results obtained" (Minichiello & Kottler, 2010, p. 17).

In-depth semi-structured interviews, incorporating "both open-ended and more theoretically driven questions" (Galletta, 2013, p. 45), were chosen as a method of inquiry because these gave the participants the possibility to express their ideas better. In fact, "the questions are open-ended in order to create space for participants to narrate their experiences: however, the focus of the question is very deliberate and carefully tied to

[the] research topic" (Galletta, 2013, p. 47). Using this method, the author had the opportunity to use a set of questions to start interviews.

> Semi-structured interviews are based on [a] semi-structured interview guide, which is a schematic presentation of questions or topics and need to be explored by the interviewer. To achieve optimum use of interview time, interview guides serve the useful purpose of exploring many respondents more systematically and comprehensively as well as to keep the interview focused on the desired line of action (Jamshed, 2014, p. 87).

All research participants were asked that same initial set of questions to obtain a theoretical saturation of data and avoid the moving target concept introduced by Guest, Bunce and Johnson (2006). With the moving target concept, Guest, Bunce and Johnson (2006) argue that the introduction of new questions produce new answers and only asking the same set of questions to all the participants is possible to achieve the data saturation. The concept of saturation will be explored more in the following section.

The aforementioned initial set of questions covered the following categories:

- Ideas behind AFoPS
- AFoPS' achievements to date
- AFoPS' influence in Asia
- AFoPS' influence in the Antarctic governance community
- Co-operation within AFoPS and future development

2.1.1 Sample group

Following Merriam (1998), a set of criteria was established to arrive at a sample of candidates for the purpose of this research. All participants were senior employees of Asian national Antarctic programs, with a well-recognised career and knowledge in polar issues. Aiming to understand the role of AFoPS in Antarctica, the sample group included only AFoPS representatives in order to bridge the knowledge gap created by a modest literature on the co-operative activities conducted by Asian countries. Using Glaser and Strauss's (1967) grounded theory, the information retrieved from interviews achieved a theoretical saturation. They defined saturation as

> [t]he criterion for judging when to stop sampling the different groups pertinent to a category in the category's theoretical saturation. Saturation means that no additional data are being found whereby the sociologist can develop properties of the category. As he sees similar instances over and over again, the researcher becomes empirically confident that a category is saturated (Glaser & Strauss, 1697, pp. 61).

In addition to the theoretical saturation this research also achieved a data saturation. Initially introduced by Guest et al. (2006), Fusch and Ness (2015) affirm that data saturation has been reached when "the ability to obtain additional new information has been attained" (p. 1408). Using the four models of saturation introduced by Saunders et al. (2018), Table 2.1 summaries the two types of saturation that were reached during the qualitative research of this thesis.

Table 2. 1 Models of saturation reached during this research

Model	Description	Focus
Theoretical saturation	Relates to the development of theoretical categories; related to grounded theory methodology.	Sampling
Data saturation	Relates to the degree to which new data repeats what was expressed in previous data.	Data collection

Source: Saunders et al. 2018, p. 1897.

2.1.2 Data analysis

Interviews lasted for roughly 60 minutes and, with the permission of the participants, were recorded using a voice recorder. Interviews were transcribed verbatim and the raw audio data and the transcriptions were securely stored in password protected digital folders and a hard copy in a key locked drawer. Only the author had access to the data.

The analysis of the transcriptions was inductive and data driven. Zhang and Wildemuth (2005) highlight that with inductive analysis "themes and categories emerge from the data through the researcher's careful examination and constant comparison" (p. 2). While analysing the transcriptions of open-ended questions, the author avoided the use of biases categories but allowed the data to create the categories (Hsieh & Shannon, 2005). They emphasise that this type of analysis is suited for open-ended question and it is "usually appropriate when existing theory or research literature on a phenomenon is limited" (Hsieh & Shannon, 2005, p. 1279), as is the case of AFoPS. It has to be mentioned that this type of analysis brings limitations: bias, specificity of the outcomes and difficulty to generalise the data obtained (Hickman, 2015) as often happens in qualitative research.

2.1.3 Ethics

My research followed the guidelines set by the Human Ethics Committee of the University of Canterbury and this project was approved under the code HEC 2015/57 accepting the ethical principles of research involving human being have to be followed. In fact, Vanclay, Baines and Taylor (2013) state that "[t]he application of ethics in professional context often takes the form of a written code, document or agreement that stipulates morally acceptable behaviour by individuals within an organization or profession" (p. 244). All the interviews were conducted in person during the Scientific Committee on Antarctic Research (SCAR) Open Science Conference held in Kuala Lumpur, Malaysia, in August 2016. Research participants had the right to anonymity and privacy (DeWalt & DeWalt, 2011) and were given the choice to maintain anonymity and to disclose their affiliation. A consent form and an information sheet, here presented as Appendix 1 and Appendix 2, were presented to the participants to inform them of their rights and to request the disclosure of their personal details. In addition, the participants were allowed to withdraw from the interview at any time and to not answer questions that they did not feel comfortable answering.

2.2 Quantitative analysis

The quantitative analysis was conducted on documents over a period of fourteen years, from 2004, which was the year of the establishment of AFoPS, to January 2018. The analysis was restricted to this period to better analyse AFoPS influence within the Antarctic Treaty System and the scientific community and compare it with the productivity of Asian countries considered as nuclear entities.

2.2.1 Papers for policy making

Four of the six AFoPS Members have the possibility to submit Working Papers for consideration of the other Parties during ATCMs to influence the policy making process. In fact, Working Papers can only be submitted by Consultative Parties and Observers aiming for discussion and action on a specific topic. Information Papers can be submitted by all attending Parties to provide additional information.

Using the Secretariat of the Antarctic Treaty Database, all the papers – Background, Information, and Working – submitted by Asian countries were analysed in the period from ATCM XXVII - CEP VII (Cape Town, South Africa) 2004 to ATCM XL - CEP XX (Beijing, People's Republic of China) 2017 inclusive. In the same period, five AFoPS Members have also submitted Information Papers and two Members submitted Background Papers.

The analysis of all the papers submitted by a single country have been weighted against the number of papers submitted by the original signatories of the AT and against the number of co-authored papers. This comparison was conducted to assess the participation of Asian countries in the policy-making process. The original signatories of the AT have been chosen as the benchmark since those countries fostered the entry into force of the AT and have been involved for the longest time in the policy making process.

2.2.2 Bibliometric analysis

The scientific influence and the know-how produced by Asian countries researching in Antarctica can be assessed using bibliometric analysis. As per Belter (2015),

> bibliometrics is the quantitative analysis of publications. It essentially extracts data from publications and analyzes [sic] that data in various ways to answer questions about the research that those publications represent. It is a method of studying the producers, processes, and evolution of research using research publications as a proxy for research (p. 219).

To conduct the bibliometric analysis, I used two indexing systems: Scopus and Web of Science (WoS). I preferred to use Scopus and WoS over other indexing services, such as Google Scholar and SciFinder, because their databases go back to 1900 (WoS) and 1995 (Scopus) and include more academic fields compared to the other software offering the same service (Jacso 2005; Li et al. 2010). Google Scholar was created in 2004 but there is no evidence supporting the historical coverage period of the database, while SciFinder was created in 1997. Even though the research covered the 2004–2018 period, for the same reason mentioned above, the historical and wide breadth of the database could give a better snapshot of the tendency of Asian countries in publishing scientific outputs as single country author or co-authoring. In fact, data on publications before the establishment of AFoPS have been analysed to assess if AFoPS contributed to create a different trend for co-authored outcomes.

Relying only on one indexing software can produce non-accurate results. Hence following the work of Whitley (2002), the research has been conducted comparing the

Scopus and WoS services. Previous scholarly works (Dastidar, 2007; Dastidar & Persson, 2005; Dastidar & Ramachandran, 2008; Dudeney & Walton, 2012) conducted bibliometric analysis of Antarctic science using the keyword '*Antarct**'. I have decided to use the same keyword and conduct the research on all peer-reviewed journals. The titles of the articles published and recorded in the databases of these indexing services form the body of data available. This data has been downloaded from the websites of the indexing services and analysed using the features of Microsoft Excel.

2.3 Participant observation

I had the privilege to participate as Observer in the AFoPS Annual General Meetings (AGM) 2016, hosted by the Korea Polar Research Program, in Incheon, Republic of Korea. On this occasion, I had the chance to conduct first-hand observations on how AFoPS delegates foster co-operative projects. According to Marshall and Rossman (2016), observation is the description of actions and behaviours of the participant. Fetterman (1998) define participant observation as "participation in the lives of the people being studied with maintenance of a professional distance that allows adequate observation and recording of data" (pp. 34–35). Even though Fetterman's (1998) definition of participant observation is not *in toto* applicable to my research, some of the behaviours I have witnessed are complementary to the results obtained in the bibliographic analysis and through interviews.

2.4 Possible limitations

One of the main problems for qualitative research is the presence of bias. Bias is not only culturally related to the researcher's personal background but could also be related to the analysis conducted. I have a European western background (not of Anglo-

Saxon progeny), and I have an interest towards Asian matters. Before embarking on this research project, I lived nine months in the People's Republic of China, thanks to a governmental scholarship, where I had the opportunity to learn Mandarin. My knowledge of Mandarin gives me the possibility to understand basic conversations and read short papers but not to conduct academic research in that language. I have no discrimination or prejudice towards the Asian community and it helped me to remain open-minded during this research and to analyse inductively the data obtained through interviews.

Smith and Noble (2014) state that analysis bias can occur when, during the analysis of the information obtained with interviews, the researcher only looks for data that can confirm their ideas and personal belief. Fusch and Ness (2015) introduce the concept of "personal lens" (pp. 1410–1411) in which the researcher is the instrument collecting the data and can influence the analysis. Limiting this analytical bias is important so that the results are obtained directly from the participants without the influence of the researcher's prejudice. The use of inductive and data driven analysis, as previously mentioned, limited these biases.

Not only qualitative research can have limitations, but also quantitative one. The mitigation of non-accurate results in the quantitative research section was put in place using the databases of two indexing services and the results obtained have been compared. The analysis of only documents submitted in English could be considered a limitation; in addition, some of the journals where Asian researchers publish their works could be excluded by Scopus and WoS databases. To have more detailed results, future works could explore projects published in the native language of these Asian countries.

Chapter III

International co-operation in Antarctica: the influence of regional groups

Abstract

International co-operation, with the aim to facilitate research in the Antarctic, plays a pivotal role for logistic support and for the deployment of scientific projects run by multiple countries. Co-operative activities can either be intra-continental or external; meaning co-operation based in Antarctica or co-operation that builds on the geographical and political boundaries of every country and governmental policies, respectively.

The current situation sees three extra-Antarctic regional groups active in Antarctica, which find their geographical origin, in Asia, Europe and South America. Each group is represented by the Asian Forum for Polar Sciences, the European Polar Board and the Reunión de Administradores de Programas Antárticos Latinoamericanos, respectively, which are operating through their member entities. The Asian Forum for Polar Sciences and the European Polar Board Members have demonstrated interest in both the Arctic and Antarctic, and the Reunión de Administradores de Programas Antárticos Latinoamericanos's countries focus their scientific and science-support activities only in the Antarctic Treaty Area.

This study analyses the concepts of region and regionalism and how regional co-operations in Antarctica are driving "big" science projects, which a country might not have the capacity or capability to conduct on its own. It also discusses the breadth, both geographical and biogeographic, that scientific research can obtain through regional co-operation.

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3.1 Region and Regionalism

Scholars have considered Antarctica as the "Region of Ice" (Herr, 2011, p. 5) with the AT regulating all the activities in the area below 60° S latitude, as an instrument to create "a regional architecture where states and other parties co-ordinate and integrate their activities above, across and below air, ice, rock and water" (Dodds & Hemmings, 2017, p. 4). However, the two descriptions above have a broad meaning showing how the idea of 'region' and 'regionalism' are not clearly delineated and do not assist with any attempts to find a conclusive and comprehensive definition of the Antarctic region. Excluding Antarctica, and only looking to the general concepts of region and regionalism, these have been extensively discussed by many geography, international relations and political science scholars (Dodds, 1998; Farrell, 2005; Katzenstein, 2005; Mansfield & Solingen, 2010; Dent, 2016) mainly giving an economic and political connotation to the notion of region and regionalism. All the attempts to define region and regionalism produced a variety of definitions that are often controversial. Trying to apply some of these definitions to the Antarctic, produces even more questionable results showing that a unique definition could not always been used.

Mansfield and Solingen (2010) define a region as "groups of countries located in the same geographic space" (p. 146). The Antarctic is devoid of countries. Looking to apply Mansfield and Solingen's definition would require, for example, the facilities run by the national Antarctic programs to be compared to countries. In fact, the Antarctic is considered as *terra nullius* (Joyner, 1998a), no country has sovereignty over it, and as *global commons* (Buck, 1998). The definition proposed by Farrell (2005) of "regions as unit or 'zones' based on groups, states or territories, whose members share some

identifiable traits" (p. 24) would be better suited to the context of Antarctic, with scientific research as the common trait, even though there is no union of different zones. Looking from a geographical point of view to define Antarctica as a region, the theory of propinquity is used by some claimant countries, namely Argentina and Chile (Graber, 1950) to assert their sovereign authorities or territorial claim over parts of Antarctica. The proximity of the Antarctic Peninsula to South America makes it difficult to define Antarctica as a different region from the South American continent. Katzenstein (2005) states that "regions are politically made" (p. 9). This description applies to Antarctica when considering the area regulated by the Antarctic Treaty System regime. For this piece of work, Antarctica, as a region, will include all the area below 60° S latitude as per AT Article VI.

3.1.1 Regionalism vs Nationalism

Regionalism was defined "as a policy and project whereby states and non-state actors cooperate and coordinate strategy within a given region … [aiming to] … pursue and promote commons goals in one or more issue areas" (Farrell, 2005, p. 24). In addition, regionalism "'involves primarily the process of institution creation' and is the intentional product of interstate cooperation [sic]" (Mansfield & Solingen, 2010, p. 147). As a result of promoting common goals and creating new institutions, regionalism is "fostering closer co-operative relations" (Dent, 2016, p. 13). These ideas of regionalism identify some of the ideological aspects behind the creation of regional groups of cross-nation, or multi-nation, entities involved in Antarctic research and their support programs.

Even though many countries are supporting co-operative international projects, every party conducting research in Antarctica does so aiming to develop its national interests, especially with regards to scientific activities. In the past, nationalism has been one of the factors that drove Antarctic explorations since the Heroic Era (Hemmings, Chaturvedi, Leane, Liggett, & Salazar, 2014) and has been a pillar for the claimant countries, especially Argentina, Chile, and the United Kingdom, to assert their sovereignty over a portion of the Antarctic. The AT, which Argentina and Chile are Parties to, Article IV, paragraph 2 states that

> No acts or activities taking place while the present Treaty is in force shall constitute a basis for asserting, supporting or denying a claim to territorial sovereignty in Antarctica or create any rights of sovereignty in Antarctica. No new claim, or enlargement of an existing claim, to territorial sovereignty in Antarctica shall be asserted while the present Treaty is in force.

However, Roldan (2015) and Benwell (2017) show how, through the use of cartography for example, Argentina and Chile continue to assert that sectors of Antarctica are part of their national territory.

To have nationalism, there must be something that people recognise as part of them or of their heritage. Nationalism, as defined by Breuilly (1993), builds on three assertions:

(a) There exists a nation with an explicit and peculiar character.

(b) The interests and values of this nation take priority over all other interests and values.

(c) The nation must be as independent as possible (p. 2).

Martin (2017), analysing Breuilly's concept of nationalism, describe nationalism as "political movements seeking or exercising state power" (p. 32). How do state power and nationalistic values apply to Antarctica? Hemmings et al. (2014) define national identity and how nationalism might arise in Antarctica underlining how the claimant countries' policies "puts preserving their territorial position at the top" (p. 5). They also underlined how nationalistic values in Antarctica are different compared to the rest of the world and nationalism "occurs in a "virtual" or mediated form, remote from the territory of the peoples concerned and the states mobilized" (Hemmings et al., 2014, p. 12). For example, Haward (2010) suggest that Australia is committed to the values of the AT, trying to "avoid disputes and reduce discord" (Haward & Bergin, 2010, p. 615), while balancing its own national interests as a claimant state. Bergin (2016) argues that Australia should "be investing strategically in Antarctic science, logistic and diplomacy". Additionally, Brady (2017c) and Press and Bergin (2017) discuss on the Australia's position towards other countries, and especially the People's Republic of China, operating in the Australian Antarctic Territory, East Antarctica, where many countries have built their own facilities and the nationalistic implications. In fact, according to Brady (2017c), the People's Republic of China, through the three facilities established in the region, is expanding its presence in a triangular sector, which resembles the shape of the territorial claims previously asserted by the seven claimant countries, within the Australian claimed territory.

Martin (2017) defines patriotism, a different form of nationalism, as "harnessed to the goals of the state or government" (Martin, 2017, p.25). This applies to the New

Zealand Government (2018) that, through the Strategic Defence Policy Statement, points out the fear of not being able to "distinguish between allowed and prohibited activities under the Antarctic treaty system [sic]" (p. 22) and the role that New Zealand has to assume "to ensure peace and stability on its southern flank and in the Ross Dependency, as well as the integrity of the treaty system" (p. 26). However, it has to be noted that New Zealand, and the other claimant Parties – Argentina, Australia, Chile, France, Norway, and the United Kingdom –, under AT Article IV, paragraph 1. (b) are entitled to preserve their status. The same applies also the Russian Federation and the United States of America maintaining their basis of claim. Brady (2017b) affirms that also the People's Republic of China, even though it is not publicly stated, has "potential sovereign rights in Antarctica … based on Chinese exploration and occupation of sites in Antarctica since the 1980s" (p. 191). In addition, Brady (2017b) argues that the People's Republic of China could use the establishment of Antarctic Specially Managed Area (ASMA) and Antarctic Specially Protected Area (ASPA), which will give them the sole responsibility to manage these areas (Pertierra & Hughes, 2013), to assert their claim Brady (2017b). To have the sole responsibility on the area, the People's Republic of China firstly mapped the area around Dome A in 2009 (Brady, 2017c). During ATCM XXXVI - CEP XVI (Brussels, Belgium) 2013 the People's Republic of China submitted Working Paper 38 proposing a new ASMA at Dome A. The proposal was unsuccessful because the People's Republic of China is the only operator in the area. ASMAs are intended to facilitate co-operation between countries and Kunlun station is the only infrastructure in the area[13]. "To many observes, China appears to be trying to use an ASMA to gain

[13] It has to be noted that a remote-controlled telescope, the High Elevation Antarctic Terahertz Telescope (HEAT) (Walker & Kulesa, 2009) jointly supported by the University of Arizona and the New South Wales University, is operated at Ridge A.

effective control of Dome A" (Brady, 2017b, p. 212). However, it has to be noted that in accordance with AT Article IV, paragraph 2, "no new claim, or enlargement of an existing claim, to territorial sovereignty in Antarctica shall be asserted while the present Treaty is in force" limiting the possibility of the People's Republic of China, and any other claimant or semi-claimant countries, to advance a new claim.

Nationalistic influences, intended as preservation of territorial and strategical positions in Antarctica, are still present in regional groups that, though co-operation, aim to reach results that they might not be able to achieve on their own, while conducting research in the Antarctic Treaty Area. In fact, the basis for regionalism lies on co-operation and cooperative projects to be conducted in a specific region but at the same time every country maintain its own national goals and aims that have to be achieved. A senior employee of an Asian national polar program while discussing on co-operation between players in Antarctica states that "it is much easier to make co-operation with neighbouring countries"[14]. However, co-operative projects can arise from need of countries that are not global neighbours but share similar interests in a particular Antarctic region.

Having addressed the issues of defining the words 'region' and 'regionalism', this chapter proceeds to analyse Antarctic region and regionalism. The first step will be the analysis of regional co-operative projects within Antarctica; subsequently, this contribution will explore regional groups co-operating in multiple Antarctic sub-regions. The majority of the countries involved in Antarctic research are part of both

[14] Personal interview conducted in August 2016 with a senior employee of KOPRI.

Intra and Extra-Antarctic regional groups; Extra-Antarctic groups often operate in more than one Intra-Antarctic region.

3.2 Intra-Antarctic Regionalism

There is no universally agreed definition of the Antarctic region – the wider biogeographic unit containing Antarctica and its surrounding seas – and the term 'Antarctica' – the continental landmass – is often misused. One scholar defines Antarctica as

> the continent that lies over the geographical South Pole, the southern end of the Earth's axis of rotation. The floating ice shelves that are seaward extensions of the continental ice sheet form an integral part of the "land" surface of the continent. [...] Greater Antarctica is the larger part that lies between the Transantarctic Mountains and the coast bordering the Southern Ocean south of the southern Indian Ocean and the southwestern Pacific Ocean. Lesser Antarctica is the smaller part that lies between the Transantarctic Mountains and the coast bordering the southern Pacific Ocean and the southern Atlantic Ocean. The Transantarctic Mountains themselves form part of the Greater Antarctica (Clarkson, 2007 pp. 47–48).

From a geographical perspective, the Transantarctic Mountains run from the Antarctic Peninsula into the Antarctic Continent dividing it into two distinct regions: East and

West Antarctica[15]. East and West Antarctica comprise other sub-regions as per Table 4.1. Many of these regions have a history of human presence and, at present, many of these regions host one or more research facilities. In this piece of work, I will analyse co-operation activities in three of the above regions, two in East Antarctica: Dronning Maud Land, Victoria Land; and one in West Antarctica: the Antarctic Peninsula. The essence of regionalism, meant as countries and actors co-operating within the borders of a specific region, is present in the projects conducted in these regions.

Table 3. 1 Antarctic geographic regions

Greater Antarctica - East Antarctica	**Lesser Antarctica - West Antarctica**
Transantarctic Mountains	Antarctic Peninsula (55° W–80° W)
Coats Land (37° W–20° W)	Ellsworth Land (80° W–103° W)
Dronning Maud Land (20° W–45° E)	Marie Byrd Land (103° W-152° W)
Enderby Land (45° E–55° E)	Edward VII Land (152° W–158° W)
Kemp Land (55° E–60° E)	Filchner-Ronne Ice Shelf (35° W–75° W)
Mac Robertson Land (60° E–70° E)	Ross Ice Shelf (160° E–160° W)
Princess Elizabeth Land (73° E–86° E)	
Wilhelm II Land (86° E–91° E)	
Queen Mary Land (91° E–102° E)	
Wilkes Land (102° E–136° E)	
Terre Adélie (136° E–142° E)	
George V Land (142° E–155° E)	
Oates Land (155° E–163° E)	
Victoria Land (163° E–171° E)	

Source: Clarkson, 2007.

3.2.1 East Antarctica

In East Antarctica, Dronning Maud Land is one of the regions showcasing examples of science-support and international co-operation; all eleven national Antarctic programs[16] operating in this area, shared the logistics to reach Antarctica through the Dronning Maud Land Air Network (DROMLAN) and managed a total of

[15] Greater Antarctica or East Antarctica and Lesser Antarctica or West Antarctica are both names accepted to describe the same region as per *Composite Gazetteer of Antarctica* (Scientific Committee on Antarctic Research [SCAR] Gazetteer, 2017).

[16] Belgium, Finland, Germany, India, Japan, the Netherlands, Norway, the Russian Federation, South Africa, Sweden, and the United Kingdom.

nine open and personned facilities during the Antarctic season 2017–2018[17]. The idea behind the formation of DROMLAN, which was formerly established as an international project during the XIV COMNAP AGM held in Shanghai, People's Republic of China, in 2002 (Idiens, 2012), formally originated from Recommendation VII-8 *Co-operation in Transport*, concluded at the ATCM VII (Wellington, New Zealand) in 1972 and stating

> *Acknowledging* the benefit to be derived from international co-operation in scientific investigation [...] accept the principle of using, where appropriate, common transport facilities by sea and by air for scientific and other personnel proceeding with their equipment to and from Antarctic stations.

DROMLAN also has a practical origin recognised by national Antarctic programs. International flights are operated from Cape Town, South Africa, to Novolazarevskaya (Russian Federation) station runway and to Troll (Norway) airfield. A total of nineteen international flights, carrying scientists and personnel working at facilities run by national Antarctic programs, took place during the season 2015–2016 (Germany, 2017). From these two blue-ice airstrips, intra-Antarctic flights depart to serve the greater Dronning Maud Land region and other areas in East Antarctica for scientific purposes. Since 2008, DROMLAN transportation facilities have been also used to facilitate inspections[18] with, most recently, an inspection led by Norway of the runway at Novolazarevskaya station (Russian Federation). During the last Antarctic season,

[17] During the Antarctic season 2017–2018, the main open and personned hubs served by the DROMLAN network were Aboa, Halley VI, Maitri, Neumayer Station II, Novolazarevskaya, Princess Elisabeth, SANAE IV, Syowa, and Troll. Dome Fuji, Kohnen, and Wasa were temporary closed during 2017–2018 season (COMNAP, 2018).

[18] The right to conduct inspection of Antarctic infrastructure is provided by AT Article VII and by the Protocol Article 14.

Norway conducted inspections to seven facilities during the period 9–17 February 2018, as presented in WP026 during the ATCM XLI (Buenos Aires, Argentina) 2018. The inspection team used the DROMLAN network, landing at Troll airfield, to reach Antarctica, and for intra-regional flights to inspect stations and to conduct the aerial inspection of Perseus runway. In fact, in addition to in-person visits to infrastructures, Parties could also inspect facilities through flyover[19]. Since the first inspection conducted during the Antarctic season 1962–1963, 23 Antarctic Treaty Parties undertook inspections to facilities, protected areas and vessels (Secretariat of the Antarctic Treaty, 2018a). At present, a total of fifty-seven inspections have been conducted, thirteen of which were conducted in the Dronning Maud Land region. Inspections to other facilities represent a burden to many Parties operating in Antarctica. Auburn recognised this as early as 1982,

> each trip requires transport, and logistic and material support; "one can't just hop a cab or fly from one base to another". [...] One means of dealing with this limitation is for inspected State to provide transport, as the United States did when New Zealand, Australia and the United Kingdom exanimated South Pole and Byrd in 1963 (Auburn, 1982, p. 111).

DROMLAN, as an international co-operative project, in addition to science and science-support capabilities, represents also an opportunity to facilitate the entry into the continent to the inspection teams interested in conducting inspection activities in East Antarctica and, in particular, in Dronning Maud Land. Therefore, international co-

[19] "Observers designated by Consultative Parties have complete freedom of access at all times to all areas of Antarctica including stations, installations and equipment. Consultative Parties have an unlimited right of aerial inspection" (Auburn, 1982, p.110).

operation plays a key role in supporting the rights of Parties to ensure the observance of the AT and the Protocol.

Victoria Land, in the Ross Dependency[20], is an example of scientific and science-support co-operation. At present, in this region there are five facilities run by five countries, Gondwana (Germany), Mario Zucchelli (Italy), Scott Base (New Zealand), Jang Bogo (Republic of Korea), and McMurdo (United States of America). The construction of a sixth facility is underway, Victoria Land Station (People's Republic of China). New Zealand and the United States of America share the McMurdo runways for international and intra-continental flights to reach a vast network of summer field camps. Similarly, Germany, Italy and the Republic of Korea share Mario Zucchelli runways for all fixed-wing flights operated in the region. Italy, New Zealand and the United States of America have also signed the Joint Logistics Pool arrangement which details the sharing of capacity and capability for operations in the McMurdo Sound area. Since the Italian station Mario Zucchelli is not located in the McMurdo Sound area, the agreement regards only the air-lifting and transport capabilities from Christchurch, New Zealand, to McMurdo runways.

The Cape Roberts Project, that involved scientists from Australia, Germany, Italy, New Zealand, United Kingdom, and United States of America, undertaking drilling measurements, for three consecutive seasons (1997–1999), to investigate the climatic history of the region (Cape Roberts Science Team, 1999 & 2000; Majewski, 2000; Victoria

[20] The Ross Dependency "is bounded by, and includes, the Siple, Shirase and Saunders coasts in Marie Byrd, the Ross Ice Shelf, and the Transantarctic Mountains from around the Amundsen Coast to the Pennel Coast in Oates Land. The Northern boundary of the region is at 60°S" (New Zealand Antarctic Institute, 2001, p.1.3).

University, 2016), is an example of international co-operative scientific projects conducted in this region.

Another big achievement reached through international co-operative effort is the establishment of the Ross Sea Marine Protected Area (MPA), the world largest MPA (Brooks et al., 2016), in October 2016, during the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) XXXV meeting held in Hobart, Australia, through Conservation Measure 91-05 (2016). The Ross Sea MPA, commenced on 1st December 2017, covering an area of 1,550,000 km², consists of three zones: the General Protection Zone (GPZ), the Special Research Zone (SRZ), and the Krill Research Zone (KRZ) as per areas boundaries described in CCAMLR Annex 91-05A. The duration of the MPA for the GPZ has been agreed to 35 years – consensus is required to continue the MPA over this period – and restriction on fishing in the SRZ has been agreed to last for 30 years as per CCAMLR Conservation Measure 91-05 paragraphs 20 & 21 (CCAMLR, 2016). The MPA is the result of co-operative efforts and consensus of the twenty-five Members of the CCAMLR[21]. The discussions were led by delegates of New Zealand and the United States of America over five years (2012 to 2016). Delegates of these two countries informed the CCAMLR Members about the intention to establish the Ross Sea MPA with CCAMLR-XXXI-16 Rev.1 (2012) *A proposal for the establishment of a Ross Sea region Marine Protected Area*, CCAMLR-SM-II-04 (2012) *A proposal for the establishment of a Ross Sea region Marine Protected Area* (during this special meeting a

[21] The Commission for the Conservation of Antarctic Marine Living Resources is composed of 24 countries Members, namely Argentina, Australia, Belgium, Brazil, Chile, France, Germany, India, Italy, Japan, Namibia, New Zealand, Norway, People's Republic of China, Poland, Republic of Korea, Russian Federation, South Africa, Spain, Sweden, Ukraine, United Kingdom, Unites States of America, and Uruguay. The 25th Member is the European Union.

reviewed version of CCAMLR-XXXI-16 Rev.1 (2012) was submitted), CCAMLR-XXXII-27 (2013) *A proposal for the establishment of a Ross Sea region Marine Protected Area*, CCAMLR-XXXIII-21 (2014) *A proposal for the establishment of a Ross Sea region Marine Protected Area*, CCAMLR-XXXIV-29 Rev.1 (2015) *A proposal for the establishment of a Ross Sea region Marine Protected Area*, and finally CCAMLR-XXXV-25 Rev.1 (2016) *A proposal for the establishment of a Ross Sea region Marine Protected Area*. During the last meeting, held in Hobart, Australia, 16–27 October 2017, following the entry into force of the MPA, New Zealand and United States of America jointly submitted CCAMLR-XXXVI-16 (2017) *Ross Sea region marine protected area: consequential changes to other conservation measures*.

3.2.2 West Antarctica

Activities in the Antarctic Peninsula provide an example of scientific and science-support international co-operation. In the region, King George Island, South Shetland Islands, is home to fourteen, active, research facilities run by ten countries[22], including eleven stations, one laboratory, one refuge, and one airfield camp (COMNAP, 2018b). The island can be reached by sea and by air, with the Chilean Lieutenant Rodolfo Marsh Airfield as main point of access and hub for logistic activities.

The first example of co-operation on the island can be seen from the arrangements at the Dallmann laboratory, which is run by German researchers but is hosted within the Argentine station Carlini. This laboratory also hosts European

[22] Arctowski (Poland), Artigas (Uruguay), Bellingshausen (Russian Federation), Carlini (Argentina), Dallmann (Germany), Eduardo Frei Montalva (Chile), Ferraz (Brazil), Great Wall (People's Republic of China), Julio Escudero (Chile), King Sejong (Republic of Korea), Lieutenant Rodolfo Marsh Airfield (Chile), Machu Picchu (Peru), Republica del Ecuador (Ecuador), and Ripamonti (Chile).

research projects and, during the winter when it is not personned with German scientists, personnel of Carlini station maintain the instruments in order to be able to conduct year-round research.

In addition, it is worth mentioning the Argentine-Chilean joint Rescue Coordination Centre (RCC) in place for the Antarctic Peninsula. As presented during ATCM XXXII (Baltimore, United States of America) 2009, as Annex B to WP047, Argentina and Chile have jointly operated, since 1998, the Patrulla Antártica Naval Combinada (Joint Antarctic Naval Patrol) to patrol waters around the Antarctic Peninsula with search and rescue purposes.

From a scientific point of view, a lot of research has been conducted over the years on the island. In fact, using Scopus, a database for peer-reviewed literature, King George Island is specifically mentioned in 1,138 abstracts, with the first publication dated 1975[23]. The five most prolific countries in publishing outcomes related to this region, are the ones with at least one facility in the area: Poland (193), Germany (179), Brazil (173), Argentina (134), and the Republic of Korea (121). Kennicutt (2009) gives an overview of some activities jointly conducted by researchers in King George Island, affirming that

> there are many excellent examples of scientific and logistic cooperation [sic] amongst National Programs in KGI [King George Island], for example: in creating an archive of meteorological and upper air data; in analysing climate parameters; in coordinating glaciological research on

[23] The search for King George Island in Scopus, was conducted on 1st May 2018, using the query string *ABS("King George Island")* including all document types and without year limitation.

the age of the KGI ice cover; in conservation and environmental monitoring in Admiralty Bay; in permafrost dynamics; and in analysing sea surface temperatures (pp.1–2).

3.2.3 Regionalism and co-operation

The examples presented above give a snapshot of co-operative activities that have been made possible thanks to bi- and multi-lateral agreements between countries that share a common interest in fostering the idea that co-operation is pivotal in their specific Antarctic region. The idea of a network of research stations and exchange of personnel recalls AT Article II "freedom of scientific investigation in Antarctica and co-operation toward that end, as applied during the International Geophysical Year, shall continue" and AT Article III, paragraph 1 stating that "(a) information regarding plans for scientific programs in Antarctica shall be exchanged to permit maximum economy and efficiency of operations; (b) scientific personnel shall be exchanged in Antarctica between expeditions and stations". The importance for international co-operation has been also underlined by Kennicutt during the US Antarctic Program's Blue Ribbon Panel, on 3 November 2011, in which he listed the facilitation of international co-operation as one of priorities for conducting science in the next 20 years. Kennicutt (2011) affirms that it will be important to have a "[d]istributed network of land-based stations [,] International network of scientific stations … Network of coastal observing sites with ocean access … Minimize barriers to international cooperation [sic] and partnerships [and] create incentives for international participation" (p. 29).

The exchange of knowledge and personnel is one of the pillars for many countries conducting research in Antarctica. Co-operation could go beyond a specific Antarctic

region creating regional groups, based on their members' geographical location in the world, that share similar scientific interest towards Antarctica.

3.3 Extra-Antarctic Regionalism

At present, as already mentioned on the first page of this chapter, there are three extra-Antarctic regional groups whose members are operating in the Antarctic Treaty Area: the AFoPS, the EPB, and the RAPAL. Science and science-support are the main aims of Extra-Antarctic regional groups that foster common interest between countries to avoid overlaps in scientific research while bringing together countries that have cultural, linguistic, or political similarities.

The opportunity to expand co-operation beyond a regional border opens up new possibilities that otherwise would not have been possible. In fact, the establishment of a facility in a specific Antarctic location could limit researchers' ability to conduct a project in a different area because they will not have the support required from their national Antarctic program. A senior employee of the Korea Polar Research Institute, whose country is part of AFoPS, suggests that

> When we started this project, we had a very strategic approach on how to use AFoPS countries' existing stations, as these are located in ideal places. Some stations are located in East Antarctica and we have stations in the Antarctic Peninsula, it is a proper match. Many biologists, due to climatic conditions, can conduct limited research in East Antarctica; vice versa, King George Island is the perfect place biology projects. We hosted in our bases many Japanese scientists. East Antarctica, however, is a very pristine region and is the perfect location for sea ice studies and for science

technologies too. For example, China is trying to set up deep ice drilling, that require lot of skills, so they sent people to Japanese stations in East Antarctica to learn drilling technologies[24].

This statement shows what can be achieved, in terms of personnel exchange, from an extra-Antarctic regional group and how international knowledge exchange is beneficial to develop skills that are not available within the home country. It is true not only for countries that already have an established national Antarctic program but also for the ones that are in the initial stages of developing their research and science-support programs.

We try to encourage more contact between scientists through AFoPS symposiums and workshops, so that we can provide support to them to exchange knowledge; we also have working groups to new co-operative projects. We also try to invite many Asian countries to attend our annual meeting[25].

This is true not only for the Asian regional group but also for the other two. In fact, AFoPS, EPB and RAPAL share the common idea of facilitating co-operative science and science-support projects, within their respective Members. For AFoPS and EPB, that co-operation extends to both Poles, with co-operative activities in both the Arctic and Antarctica.

[24] Personal interview conducted in August 2016 with a senior employee of an AFoPS Member country.
[25] Personal interview conducted in August 2016 with a senior employee of the Korea Polar Research Institute.

3.3.1 The Asian Forum for Polar Sciences (AFoPS)

AFoPS was established in May 2004 by the national Antarctic programs of Japan, the People's Republic of China, and the Republic of Korea. The initial idea of an Asian regional group was explored by representatives of Japan and the Republic of Korea who decided, during the COMNAP AGM held in Brest, France, in 2003, to form the East Asian Group (Zhao et al., 2011). In subsequent years, the national polar programs of India, Malaysia and Thailand joined the group as Members. Representatives from Indonesian, Philippine, Sri Lankan, and Vietnamese research centres joined AFoPS AGMs as Observers[26]. Non-Asian countries can also access the meeting as Observers, as can international organisations; in fact, representative from the national Antarctic programs of Australia and Turkey attended the AFoPS AGM 2016 as the Executive Secretary of the EPB did (Interview with a senior employee of the Korea Polar Research Institute, 2016). However, to be accepted as an Observer, a country must have a polar research program, meaning a stable scientific intent (Interview with a senior employee of an AFoPS Member country, 2016). In fact, the sole participation of scientists in joint Antarctic research projects, hosted within the infrastructures of countries with an established program, is not sufficient (Interview with a senior employee of the Korea Polar Research Institute, 2016). Researchers from Singapore, for example, have been conducting Antarctic projects with Republic of Korea' peers but, without a clear and stable intent to pursue Antarctic research, an organisation from Singapore could not

[26] "Observer is a temporary attendance to the meeting, becoming an AFoPS Member is different. [There are] not specific rules in place, all Observers can become Members. AFoPS [is a] very flexible organisation, however all the Members have to agree". Personal interview conducted in August 2016 with a senior representative of an AFoPS Member country.

been accepted as Observer (Interview with a senior employee of the Korea Polar Research Institute, 2016).

Even without a strong background in polar research, all AFoPS Observers have institutions that are developing research projects with an Antarctic focus, but they still do not have enough means and knowledge to operate their own national Antarctic program. Asian countries who have a strong background in polar research are helping new countries to start co-operative projects that can support the development of their national Antarctic programs. To foster these co-operative projects, AFoPS relies on five action-working groups supporting scientific and logistic issues: Earth sciences, Life sciences, Planetary sciences, Engineering and logistics, and Public relations and data management. At present, these action-working groups are under review, but there are several examples of achievements from these fora. Japan, for example, during the Antarctic season 2009–2010 (Japanese Antarctic Research Expedition (JARE) 51), hosted two researchers from Thailand at Syowa station supporting scientists from a country traditionally without a polar background and experience (National Institute of Polar Research, 2017). Similarly, in March 2013, Japan hosted five representatives from three AFoPS countries (Malaysia, the People's Republic of China, and the Republic of Korea) during a winter training course, in order to exchange personnel and best practices (National Institute of Polar Research, 2017). The willingness to involve more emerging countries in polar research is also visible, with reference to the Korea Polar Research Institute and the Japan National Institute of Polar Research' activities, as evidenced by a fellowship for early career researchers and sharing of capabilities. These two countries in 2014 started fellowships for people from other Asian countries, hosting five or six and two or three scientists, respectively, to work with their institutes; additionally, they also

offer the possibility to researchers to participate in Antarctic cruises in order to foster exchange of personnel and knowledge (Interviews with senior employees of Asian national Antarctic programs, 2016).

Looking at the location of infrastructures run by countries that are AFoPS Members, it is possible to see the wider distribution of infrastructure across the Antarctic continent. As per Antarctic scientific research season 2017–2018, Asian countries are active in the Antarctic Peninsula, Dronning Maud Land, Princess Elizabeth Land, and Victoria Land. The Asian presence in Victoria Land will likely increase over the next few years with the new People's Republic of China research station in that area currently under construction.

On 13 June 2008, ATCM XXXI adopted Resolution 3 (2008) *Environmental Domains Analysis on the Antarctic continent as a dynamic model for a systematic environmental geographic framework*. The annex to this resolution, following the work of Morgan et al. (2007), identified 21 different environmental-geographic regions. Facilities run by AFoPS Members are located in: A. Antarctic Peninsula northern geologic; B. Antarctic Peninsula mid-northern latitude geologic; D. East Antarctic coastal geologic; N. East Antarctica inland ice sheet; and U. North Victoria Land geologic[27]. Additionally, on 1 June 2017, the ATCM XL adopted Resolution 3 (2017) *Revised Antarctic Conservation Biogeographic Regions* (making Resolution 6 (2012) *Antarctic Conservation Biogeographic Regions* no longer current). Referring to the Annex to Resolution 3 (2017) which lists those regions, Asian countries' facilities are

[27] The environmental-geographic regions follow the same nomenclature as presented in Morgan et al. (2007).

situated in four different biogeographic regions, out of the sixteen in total, those being: 3. North-west Antarctic Peninsula; 6. Dronning Maud Land; 7. East Antarctica; and 8. North Victoria Land[28]. The presence of facilities run by Asian countries in these heterogenic regions, in terms of biodiversity and environments, opens the possibility for researchers to plan projects in many different scientific disciplines that might not been conducted only in one region. Under the AFoPS umbrella, and thanks to several bi-lateral agreements between Asian countries and institutions, researchers can conduct scientific projects, virtually, in any Antarctic region (Interview with a senior employee of the Korean Polar Research Institute, 2016).

Some of the results of the collaborative projects that have been fostered by the sharing of infrastructures, can be found also in the in-house, peer-reviewed, journal that is published by Asian countries under AFoPS agreements. Such a communal publication demonstrates how co-operation makes a scientific contribution to the community.

> In the Antarctic Treaty and in the Scientific Committee on Antarctic Research we are active countries, and we also are representing many populations in the world; however, for some reasons, we are not really recognised in the world and so we are trying to make us more visible. … Rather than a single country, if we are going to be recognised as an Asian group, we will be more visible, and it will be more productive for us. … It looks that we are less active in science, but it is not actually true, there is only a language barrier. So rather than just a single country, AFoPS makes

[28] The Antarctic conservation biogeographic regions follow the same nomenclature as presented in Terauds et al. (2012) and Terauds & Lee (2016).

> a big voice and it is better for us to be recognised. We make two journals with contributes from Asian countries, we like to make our own products. We are a science community, and we prefer to make our products rather than meetings; special volume is our contribution to the community[29].

This shows the importance that this regional group have for Asian countries to help them in showing to the wider polar community, the results achieved by them and how their research will aid in understanding the polar regions.

3.3.2 The European Polar Board (EPB)

The European Polar Board (EPB) is a "collective of European national polar research institutes" (Vanstappen & Wouters, 2017, p. 277), from nineteen European countries[30], composed of twenty-seven Members[31]. Those Members are funding agencies, polar operators and research institutes (European Polar Board, 2018); the membership structure of EPB differ from AFoPS one as, in AFoPS, only national polar programs are Members and a single institute cannot achieve the Member status. EPB was established in 1995 by the European Science Foundation as part of the European

[29] Personal interview conducted in August 2016.
[30] Austria, Belgium, Bulgaria, Denmark, Estonia, Finland, France, Germany, Iceland, Italy, Luxemburg, the Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.
[31] The twenty-seven EPB Members, listed by countries alphabetical order, are namely: Fonds zur Förderung der wissenschaftlichen Forschung in Österreich (FWF), Fonds National de la Recherche Scientifique (FNRS), Fonds voor Wetenschappelijk Onderzoek – Vlaanderen (FWO), Belgian Science Policy Office (BELSPO), Българският Антарктически Институт (Bulgarian Antarctic Institute), Styrelsen for Institutioner og Uddannelsesstøtte, Eesti Teaduste Akadeemia, Thule Institute, Arctic Centre, Centre National de la Recherche Scientifique (CNRS), Institute Polaire Français Paul Emile Victor (IPEV), Hermann von Helmholtz-Gemeinschaft Deutscher Forschungszentren (HGF), Icelandic Centre for Research (RANNIS), Consiglio Nazionale delle Ricerche (CNR), Programma Nazionale di Ricerche in Antartide (PNRA), polar.lu, Nederlandse Organisatie voor Wetenschappelijk Onderzoek (NWO), Norges forskninhsråd, Havforskningsinstituttet, Polska Akademia Nauk (PAN), Fundação para a Ciência e a Tecnologia (FCT), Consejo Superior de Investigationes Cientificas (CSIC), Ministerio de Economía y Competitividad (MINECO), Polarforskningssekretariatet, Vetenskapsrådet (VR), Schweizericher Nationalfonds (SNF), and the Natural Environment Research Council (NERC) British Antarctic Survey.

Marine and Polar Science Board, and it became independent of the Foundation in January 2015. Accordingly, with Article 5.1 of EPB's Articles of Association[32], every country can be represented by a maximum of three organisations becoming Members, "unless the Plenary Meeting decides that there are particular reasons to admit more organisations of a particular country" and the Plenary Meeting decides also on the acceptance of new Members. At present, there are no Observer countries or organisations that are part of EPB, although, in the past, the Russian Federation had a role as Permanent Observer. In accordance with EPB's Articles of Association, there is the possibility to join with Observer status[33].

Similarly to AFoPS, the EPB wants to foster scientific co-operation and create a network of polar facilities and field operations between its Members (European Polar Board, 2017), aiming at

> facilitating cooperation [sic] and coordination between Directors and managers of national funded Polar Programmes with the aim of identifying and prioritising issues of Polar Science Strategy common European interest and which add clear strategic value to the effort of national programmes (Idiens, 2012, p.103).

Eighteen of the nineteen Member countries, with the exception of Luxemburg, are signatories of the AT, with either Consultative or Non-Consultative status. Fourteen[34] have also ratified the Protocol. The promotion of collaboration within European countries, and the sharing of logistics and science-support infrastructure,

[32] Articles of Association, 7 December 2015, F179-F555-31004012.
[33] Personal communication with Joseph E. Nolan, EPB Policy Officer.
[34] At present, Austria, Denmark, Estonia, and Iceland's governments have not yet signed the Protocol.

gives EPB Members the opportunity to collaborate in permanent infrastructures located in five Antarctic regions. In Wilkes Land, East Antarctica, Concordia station, open year-round, is also a unique example of European co-operation as the station is the only jointly operated "European permanent research station" (COMNAP, 2017, p. 72) in the Antarctic Treaty Area jointly run by the French Institut Polaire Français Paul Emile Victor (IPEV) and the Italian Programma Nazionale di Ricerche in Antartide (PNRA) since 2005. In Dronning Maud Land, as of Antarctic season 2017–2018, five open and personned facilities run by European countries were affiliated with EPB: Aboa (Finland, seasonal), Halley VI (United Kingdom, year-round)[35], Princess Elisabeth (Belgium, seasonal), Neumayer III (Germany, year-round), and Troll (Norway, seasonal). Additionally, the seasonal Dumont d'Urville (France) station is in Terre Adelié, and in Victoria Land there is a European presence with the seasonal Italian station Mario Zucchelli. In the Antarctic Peninsula, other EPB Members facilities can be found; these are: Arctowski (Poland, year-round), Dallmann Laboratory (Germany, seasonal), Dirck Gerritsz Laboratory (Netherlands, seasonal), Gabriel de Castilla (Spain, seasonal), International Field Camp Peninsula Byers (Spain, seasonal), Juan Carlos I (Spain, seasonal), Rothera (United Kingdom, year-round), and Signy (United Kingdom, seasonal).

The aforementioned facilities are located in the following Environmental Domains of Antarctica: A. Antarctic Peninsula northern geologic; G. Antarctic Peninsula offshore islands; I. East Antarctic ice shelves; K. Northern latitude ice shelves; L. Continental coastal-zone ice sheet; N. East Antarctica inland ice sheet; Q. East Antarctic

[35] Halley VI station has been operated as a year-round station since 2012. Currently the station is only occupied during the Antarctic summer season.

high interior ice sheet; and U. North Victoria Land geologic. Looking at the biogeographic distribution of the infrastructures run by European countries whose institutes are EPB Members, these are located in the following regions: 1. North-east Antarctic Peninsula; 2. South Orkney Island; 3. North-west Antarctic Peninsula; 4. Central south Antarctic Peninsula; 6. Dronning Maud Land; 8. North Victoria Land; and 13. Adélie Land[36]. The distribution of EPB Members' facilities in seven different biogeographic regions opens possibilities for co-operative activities between researchers with interests to explore new ecosystems.

In 1989 the Commission for the Conservation of Antarctic Marine Living Resources established the Marine Debris program in order to monitor the pollution of the waters covered by the convention. Various scholars (Ivar do Sul et al., 2011; Isobe et al., 2016; Waller et al., 2017), media (Doyle, 2018; Taylor, 2018) and the non-governmental organisation Greenpeace (2018) report on the problem of plastic contaminating Antarctic waters. In order to have a better understanding of this environmental issue, EPB organised on 16 June 2018 a workshop, *Minimising plastic use and waste in polar research and logistics*, to seek possibilities to reduce the use of plastics, if and when possible, creating awareness and promoting better policies on the use of plastics.

[36] Terauds et al. (2012) and Terauds & Lee (2016) report in their work on the Antarctic Conservation biogeographic Regions, region 13 Adelie Land, however, accordingly with the *SCAR Composite Gazetteer of Antarctica* place ID 77 and place ID 18306, this region should be referred as Terre Adélie (French for Adélie Land), hence the choice of the author to use Adélie and not Adelie Land.

3.3.3 The Reunión de Administradores de Programas Antárticos Latinoamericanos (RAPAL)

The Reunión de Administradores de Programas Antárticos Latinoamericanos (RAPAL) [Meeting of Administrators of Latin American Antarctic Programs] is a forum for South American countries to co-ordinate scientific and science-support activities in the Antarctic Treaty Area, and to discuss environmental issues and policies. The origin of the group can be found in the late 1980s, 1987–1989, with the directors of the national Antarctic programs of Argentina, Chile and Uruguay, who met in Buenos Aires, Argentina (1987), Santiago, Chile (1988), and Montevideo, Uruguay (1989) to foster co-operative activities. In 1990, delegates from Brazil, Ecuador and Peru joined for the first meeting of this forum in Buenos Aires, Argentina.

According to RAPAL's Terms of Reference (2018)[37], paragraph 4a, only countries that have achieved Antarctic Treaty Consultative State status can have their national Antarctic operator taking part in the forum as Members with voting rights. In fact, as in AFoPS, only national Antarctic operators can be RAPAL Members. At present, in the Antarctic Treaty there are no South American country, in addition to the ones whose programs are already RAPAL Members, with a Consultative State status. However, Venezuela has indicated its wish for Consultative State status, but, has to date, been turned down by the Antarctic Treaty Consultative Meetings. A South American country, which is not a Consultative State party, might express its interest in taking part in the meeting and, if consensus has been reached within the Members, could become a Permanent Observer of the forum, as per terms of reference paragraph 4c. The

[37] RAPAL *Términos de Referencia* (Terms of Reference) were translated by the author.

Permanent Observer status gives to the country the possibility to submit papers informing the other Members of its scientific achievements, but without the ability to vote and to take part in any decision-making.

South American countries' infrastructures in Antarctica are located in the Western Antarctic region, mainly the Antarctic Peninsula, due to the proximity of this region to the South American continent and due to the historical expeditions. The Estación Polar Cientifica Conjunta Glaciar Unión (Union Glacier station), is a summer camp located in the Ellsworth mountain range, Ellsworth Land, which was inaugurated on 4 January 2014 by the President of the Republic of Chile, Sebastián Piñera (PrensaAntárctica, 2014; Fuerza Aérea de Chile, 2018). However, Chile reported its interest in occupying this camp only in the 2016–2017 Preseason Information, and there is no mention of it in the Permanent Information and Annual Report on the Secretariat of the Antarctic Treaty website.

For the Antarctic season 2017–2018, the following twenty-seven South American stations were occupied: Artigas (Uruguay, year-round), Belgrano II (Argentina, year-round), Brown (Argentina, seasonal), Camara (Argentina, seasonal), Carlini (Argentina, year-round), Carvajal (Chile, seasonal), Decepcion (Argentina, seasonal), Dr. Guillermo Mann (Chile, seasonal), Esperanza (Argentina, seasonal), Ferraz (Brazil, year-round), Frei (Chile, year-round), Gabriel González Videla (Chile, seasonal), Machu Picchu (Peru, seasonal), Marambio (Argentina, year-round), Matienzo (Argentina, seasonal), Melchior (Argentina, seasonal), O'Higgins (Chile, year-round), Orcadas (Argentina, seasonal), Pedro Vicente Maldonado (Ecuador, seasonal), Petrel (Argentina, seasonal), Prat (Chile, year-round), Primavera (Argentina, seasonal), Professor Julio Escudero

(Chile, year-round), Risopatrón (Chile, seasonal), Ruperto Elichiribehety (Uruguay, seasonal), San Martin (Argentina, seasonal), and Yelcho (Chile, seasonal). Seven of the above-mentioned stations share the same runway at the Lieutenant Rodolfo Marsh Airfield, run by the Chilean Air Force. With regard to the Antarctic Conservation Biogeographic Regions, these stations are located in regions: 1. North-east Antarctic Peninsula; 2. South Orkney Islands; 3. North-west Antarctic Peninsula; 4. Central south Antarctic Peninsula; and 10. Transantarctic Mountains. Looking at the Environmental Domains of Antarctica, these facilities are located in: B. Antarctic Peninsula mid-northern latitudes geologic; E. Antarctic Peninsula; G. Antarctic Peninsula offshore islands; and M. Continental mid-latitude sloping ice.

An additional example of co-operation offered by this regional group, is the 'Joint Antarctic Naval Patrol' system jointly operated by Argentina and Chile. In case of an emergency, search and rescue calls, and pollution fighting operations, the 'Joint Antarctic Naval Patrol' intervenes in the area of the Antarctic Peninsula region. For example, Sanchez (2017) presents the clean-up operation conducted in 2007 by the joint patrol, "via the Argentine *Suboficial Castillo* and the Chilean *Lautaro*, to prevent pollution of local waters" (p. 184) after the sinking of the Motor Ship (MS) *Explorer* on 23 November 2007.

However, co-operation is not limited to science-support, but as previously mentioned, the scientific co-operation has been fostered over the year by researchers of many countries operating in this area. Kennicutt (2009) underlines how, especially in King George Island, Argentina, Chile and Uruguay, jointly with Poland and the Republic of Korea, were conducting research on life sciences. The results of these projects were

relevant not only for these countries but contributed also to increase the understanding of this region.

3.3.4 Co-operation beyond regional groups

Eighty-three percent of the countries that are currently conducting scientific research in Antarctica, through their own facilities, are part of an extra-Antarctic regional group. Only five countries, namely Australia, New Zealand, the Russian Federation, South Africa, and the United States of America, through their governments and organisations, currently are not formally members of any extra-Antarctic regional group. Nevertheless, some of these countries are deeply involved in Antarctic matters and have a sizable Antarctic budget. As Brady notes (2017a), the People's Republic of China, the United States of America, and the Russian Federation are the three countries with the largest "Antarctic Science Budget (Operation Costs-Research Funds-Capital Investment)" (p. 19), and the United States of America, the Russian Federation, and the People's Republic of China are top three for the "Level and Spread for Engagement in Antarctic Affairs" (p.19). Additionally, the Russian Federation for example, is deeply involved in the logistical support of activities in the Dronning Maud Land area with the Dronning Maud Land Network using Novolazarevskaya station runway for intercontinental flights.

Australia, New Zealand, the Russian Federation, South Africa, and the United States of America have a long history of interaction with Antarctica as demonstrated by being part of the twelve original signatories of the AT, having ratified the Protocol in 1998 and having been Members of the SCAR 1958, being Members of the COMNAP and Members of the CCAMLR. Additionally, Cape Town, Christchurch, and Hobart are

considered three of the five gateway cities, and their connections to Antarctica have many historic linkages, both for commercial and scientific purposes. At present these three cities host various national Antarctic programs personnel in their travel to and from Antarctica.

Looking at the geographical distribution of stations run by these countries, it can be noted that their facilities reach across a significant portion of the continent. In fact, these countries have facilities located in East Antarctica in Dronning Maud Land, Mac Robertson Land, Princess Elizabeth Land, the Trans-Antarctic Mountains, Victoria Land, and Wilkes Land; and in West Antarctica in the Antarctic Peninsula. As of the 2017–2018 Antarctic scientific season, Amundsen-Scott South Pole (United States of America, year-round), Casey (Australia, year-round), Davis (Australia, year-round), Mawson (Australia, year-round), McMurdo (United States of America, year-round), SANAE IV (South Africa, year-round), and Scott Base (New Zealand, year-round) were utilised in East Antarctica. The only presence in Lesser Antarctica is the seasonal Palmer station run by the United States of America. The above countries have ships capable of reaching the Antarctic region. Analysing the biodiversity of the areas where the countries' facilities were built it is possible to note these are located in biogeographic region: 3. North-west Antarctic Peninsula; 6. Dronning Maud Land; 7. East Antarctica; and 9. South Victoria Land. Considering the Environmental Domains of Antarctica, these facilities are located in the following regions: D. East Antarctic coastal geologic; E. Antarctic Peninsula; Q. East Antarctic high interior ice sheet; S. McMurdo – South Victoria Land geologic; and T. Inland continental geologic.

Even though these countries are not part of a regional group, it does not mean that there are no examples of co-operation between them. The previously mentioned Joint Logistics Pool between New Zealand and the United States of America is not the only example of co-operation already in place between these countries. During the IGY 1957–1958, New Zealand and the United States of America jointly built Cape Hallett station which was occupied until 1962, when on 25 December a fire partially destroyed it. A second fire destroyed another part of the building in 1964, and the station was abandoned in 1973; in 1984–1986 the remaining parts of the station were removed. Also, during the IGY, the United States of America inaugurated, on 29 January 1957, Wilkes station, in Wilkes Land, which was handed over to Australia on 7 February 1959. Australian personnel personned this facility until 1969 when Casey station was built. Australia and the United States of America also collaborated in the joint construction and deployment of "an automated astronomical observatory in Ridge A, the highest elevation on the Antarctic Plateau" (Stephens, 2016, p. 3) that has been in operation since 2012.

Additionally, while New Zealand and the United States of America have promoted the establishment of the Ross Sea Marine Protected Area, Australia has also played an important role as demonstrated by the statement requesting the creation of this Marine Protected Area jointly signed by the Foreign Ministers of Australia, France New Zealand, the United States of America, and the Commissioner for Maritime Affairs and Fisheries of the European Union (Australian Antarctic Division, 2013).

3.4 Conclusion

The concept of region and, its derivative regionalism, are, from a theoretical perspective, not easy to define in a unique way so that they can be used and adopted in all situations. Definitions of the word 'region' can be different if considered from a physical or politico-geographical perspective and often draw on the relationships that the region has with other elements. Antarctica as a region, or as a sub-set of different regions, is not excluded from this theoretical issue. In fact, we cannot produce a unique definition of Antarctica but various concepts that underline the difference between the various regions, and sub-regions, forming the continental landmass. However, the multitude of definitions that could describe the Antarctic region acquire significance only in set contexts and only if these definitions are accepted by the relevant actors. The acceptance by the relevant actors to define a region as such, is emblematic in the case of the area below 60° S latitude that, as per AT Article VI, defines the rights and responsibilities of the currently fifty-three countries that are signatories to the AT and have interest in conducting scientific research in Antarctica.

Intra-Antarctic regional groups foster big science projects that one country might not be able to achieve on its own. While these groups are built on a particular Antarctic region where the projects are undertaken, the researchers, coming from different worldwide backgrounds and world regions, share a similar intent to understand a specific issue of that region. There have been many examples in the past of successful multi-national co-operative projects undertaken in specific regions. The Cape Roberts Project, conservation and environmental monitoring in Admiralty Bay,

and the European Project for Ice Coring in Antarctica (EPICA) just to name a few, could not have achieved the same results if conducted only by one country.

Extra-Antarctic regional groups are built on similarities identifying its members and, often, on the ideas of regions and borders that differentiate countries and continents in our society. The extra-Antarctic groups that have been analysed in this chapter, and in particular the ones that are already well-established in the polar theatre, have an important role in fostering co-operative projects between their own members. However, these groups could have a higher impact on countries that are new-comers in Antarctica in helping them to create, through scientific co-operations, their own research programs. In the context of AFoPS, the two examples presented were that of Thailand, co-operating with Japan and the People's Republic of China, and Turkey that showed interested in participating during AFoPS meetings. In the context of the EPB, Switzerland could be a country that can benefit from joining EPB; similarly, Venezuela as RAPAL Member.

In the near future, the number of international co-operative projects is likely to increase. One such project is the Thwaites Glacier project in Marie Byrd Land, to be undertaken by researchers from the United Kingdom and the United States of America for the next five years (International Thwaites Glacier Collaboration, 2018). Regional groups and projects run jointly on regional scale will influence the future of Antarctic research.

Chapter IV

Assessing Asian engagement in Antarctica through bibliometric analysis

Abstract

Asian countries have been operating in Antarctica since the International Geophysical Year 1957–1958 and currently, four Asian countries have a stable presence in Antarctica operating nine facilities. Those four countries India, Japan, the People's Republic of China and the Republic of Korea, are also, with Malaysia and Thailand, Members of the Asian Forum for Polar Sciences, which intends to promote the highest level of co-operation between Asian countries in polar issues.

The participation of Asian countries in Antarctic Treaty Consultative Meetings has been analysed through a comprehensive review of the Working Papers, Information Papers and Background Papers submitted by the Asian Forum for Polar Sciences Members, both single-authored and co-authored papers. A bibliometric analysis of peer-review papers submitted in English by author(s) affiliated with research facilities or governmental entities from a country that is an Asian Forum for Polar Sciences Member was conducted to evaluate the level of co-operation, through co-authored works, in scientific publications. Since 2004, year of the Asian Forum for Polar Sciences establishment, more than 16,500 peer-reviewed publications have been authored by authors affiliated with Asian organisation. While there is a strong Asian presence in scientific papers, is not possible to say the same for the Antarctic governance.

This chapter aims at understanding how the Asian Forum for Polar Sciences is facilitating scientific cooperative projects and research collaborations within its members analysing the outcome and outreach of these, both within the Antarctic Treaty System and to the wider, meaning not Asia alone, Antarctic community.

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4.1 Introduction

Scientific activities have primacy in Antarctica under the AT. The AT, signed in Washington in 1959 by the 12 original signatories, and entered into force in 1961, is a regime, with restriction clauses[38] (Hoffmeister, 2018), regulating human activities in the southernmost continent and in the Southern Ocean (Haward, 2017). Article I "Antarctica shall be used for peaceful purpose only …" and Article II "Freedom of scientific investigation in Antarctica and cooperation [sic] toward that end, as applied during the International Geophysical Year, shall continue, subject to the provisions of the present Treaty" clearly state the primary purpose of human presence in Antarctica. Scientific activities and co-operations have played a pivotal role during the development of the AT (Scully, 2011); in fact, the international scientific co-operation developed during the IGY 1957–1958 was the motivation for the establishment of the AT (Berkman, 2002).

4.1.1 Is scientific research concealing geopolitical interests?

During the IGY 1957–1958 the original signatories of the AT were amongst the countries that, before the AT entrance into force in 1961, agreed to offer a state the possibility to build stations anywhere in Antarctica, without regard to prior claims, in order to support scientific research (Dodds, 1997). Part of the group of the original signatories were the seven countries who asserted territorial claims in Antarctica – Argentina, Australia, Chile, France, New Zealand, Norway, and United Kingdom – plus two countries – the Union of Soviet Socialist Republics and the United States of America

[38] Only countries that demonstrate interest in Antarctica carrying out substantial research, on the basis of Article XIII, paragraph 1, and Article IX, paragraph 2, can access to the Antarctic Treaty System.

– who held a non-recognition legal position of the claims while reserving their rights to make a claim in the future (Joyner, 2011). Claimant countries used four different legal principles to support their territorial claims: the sector principle, the theory of propinquity, the *uti possidetis* principle, and the principle of effective occupation[39] (Conforti, 1986).

Looking at the broader concept of territorial acquisition in international law, as mentioned by Joyner (1992), there are only six recognized methods to acquire title to territory

> 1. Through the physical occupation of heretofore unoccupied lands;
> 2. through voluntary cession, a process involving the formal transfer of title from one state to another;
> 3. through accretion, where forces of nature change and affect the geography of the region;
> 4. through prescription, where one state continues to occupy some portion of another state's territory for a prolonged time without challenge from the latter;
> 5. through treaties of peace, following a war; and
> 6. by conquest, or forced cession, where all or part of a subjugated country's territory is annexed by the victor state (Joyner, 1992, p. 50).

Only one of these methods apply to Antarctica and its governance: occupation. The legal concept of 'effective occupation' – defined as "occupation thus effected is real

[39] I will not discuss these four principles in this chapter; however, it is important to mention them to understand that, the principle of effective occupation is the only one that relates the construction of infrastructures in Antarctica to the claimants' idea of territorial occupation.

occupation, and, in contradistinction to fictitious occupation, is named effective occupation" (Triggs, 1986, p. 4) – with reference to Antarctica[40], has been explored by many scholars over the years (Conforti, 1986; Beck, 1994b; Dodds & Hemmings, 2009; Jia, 2015). In 1949, the then Australian Antarctic Division Director Philip Law stated that "no nation can hope to rope off a section of the earth as its property unless it sustains its claim by actively occupying a portion of that area and carrying out useful work there" (Dodds & Hemmings, 2009, pp. 517–518).

This statement, declared by a representative of a claimant country, reinforces the idea of 'effective occupation' as demonstration of interest towards Antarctica before the entry into force of the AT. Brady (2017a, 2017b), citing the work of Wu Yilin, introduces also the concept of "soft presence" (Brady, 2017b, p. 209) as an example of control over a territory. In fact, Chinese sources declared that claimant countries put in place environmental measures, defined 'soft presence', to protect their assets and use ASMAs and ASPAs to "seize control over territory in Antarctica and the Southern Ocean" (Brady, 2017b, p. 209).

Taking into account that the entry into force of the AT does not remove the disagreements on territorial claims but only suspends these (Orheim, 2013; Gautier, 2015), that sovereignty cannot be acquired without territory (Rogan-Finnemore, 2005), and that Antarctica is considered as *terra nullius* (Joyner, 1998a), infrastructures are

[40] The idea of occupation of a territory with the same characteristics of Antarctica opened various issues. The Legal Status of Eastern Greenland (Norway v. Denmark), 1933 Permanent Court of International Justice, series A.-B., No. 53, has been used as precedent for the *terra nullius*' occupation and it is also ascribable to Antarctica.

used as indicators of the influence through presence and 'effective occupation' of a government in Antarctica (Brady, 2014; Brady, 2017b).

The construction of infrastructure is also used to evaluate the interest of a country in becoming a Consultative Party of the Antarctic Treaty System (Beeby, 1972; Australian Dept. of Foreign Affairs, 1983). As Brady notes, "… most states ignore the legal requirements to make fully public all their Antarctic activities and capabilities, while some ATCPs are engaging in very low-level Antarctic research." (Brady, 2012b, p. 46). The low level of Antarctic research is also related to the often-discussed problem of the extensive construction of stations in Antarctica, with consequent diminution of wilderness area, without science-related purposes, but with the only intention to acquire Consultative status within the Antarctic Treaty System (Keys, 1999; Antarctic and Southern Ocean Coalition [ASOC], 2004). However, some Members of the Antarctic Treaty System have a different stance on the new countries seeking to become Consultative Parties. In fact, Japan's position in regard to the acquisition of Consultative status is quite different; as stated in the ATCM XXXIX (Santiago, Chile) 2016 Final Report, paragraph 93 "Japan insisted that an increase in Consultative Parties directly contributes to dissemination of the principles of the Antarctic Treaty and the Protocol on Environmental Protection to the Antarctic Treaty" (Secretariat of the Antarctic Treaty, 2016a).

Research infrastructures represent the hubs from were scientific projects are deployed, long-term observations and monitoring are conducted, and are the only opportunities to carry out in situ winter science and observations. Looking at the history of Antarctic research facilities that are still in operation, twenty-five facilities, run by

nine countries, which are also part of the AT initial signatories, were built before the entry into force of the AT. An additional twelve were built in the period from 1962 to 1976[41], twenty-five from 1977 to 1989, eleven in the 1990s – in the same period when the negotiation for the Protocol took place – and twelve facilities were built in the past 18 years. Headland (2009) analyses the number of winter stations opened during the IGY 1957–1958, including also facilities that, at present, are no longer operated, observing a decreasing trend in the number of operative stations.

> For 1957, the first winter of the eighteen month long International Geophysical year, 54 stations were open …For the 1958 winter 53 stations were opened as four were reopened or established …During the two winters of the 2007 to 2009 International Polar Year 44 stations were open … (17 on the peri-Antarctic islands and 27 on Antarctica) (Headland, 2009, p. 23).

Figure 4.1 shows that the number of newly built stations, that are still open and occupied at present, related to the number of new parties acquiring Consultative status, in a certain period of time, undergo a cyclical trend. The period from the building of the first facility, Argentina's Orcadas research station in 1904, to the entry into force of the AT, and the period from 1977 to 1989 shows the same relation between new stations and new Consultative Parties. However, over the past twenty-eight years, the trend is decreasing: twenty-two new facilities were built, and five countries obtained consultative status. This shows that the countries that have been involved in the

[41] The period 1962–1976 has been chosen because represents the window after the AT entry into force and Poland acquiring Consultative status; Poland was the first country to seek and become Consultative Party after AT entered into force in 1961.

Antarctic Treaty System since 1959 are the ones with the greatest number of operational research stations and that the new countries are not building new facilities as an automatic action to become Consultative Parties to the AT. One of the reasons behind the decreasing trend in facilities' construction is related to the high installation and maintenance costs for an Antarctic infrastructure. Some of the new countries in the Antarctic Treaty System have a lower Gross Domestic Product (GDP) compared to the ones involved since 1959, consequently a lower budget for polar activities, and, having the opportunity to invest only in scientific and science supporting activities co-operating with other countries who already have research infrastructure, could help them develop their polar background.

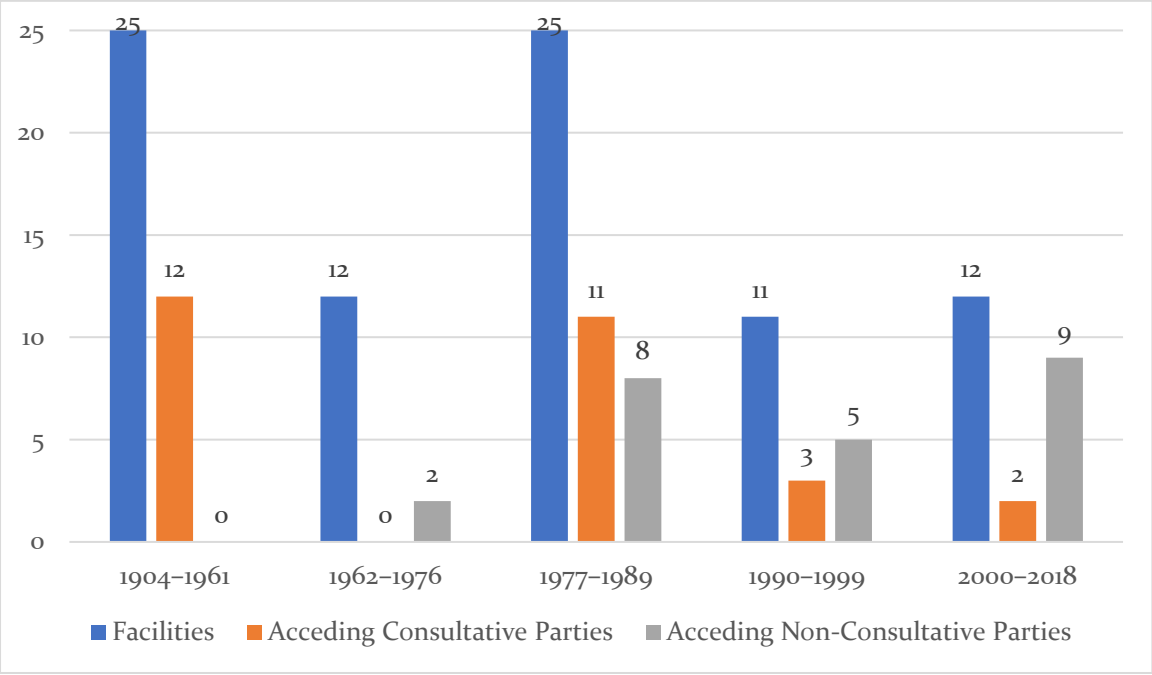

Figure 4. 1 Comparison of number of new stations with parties in the Antarctic Treaty System

Source: Data retrieved from Secretariat of the Antarctic Treaty, 2014; COMNAP, 2017.

Dodds & Hemmings (2013) describe the unease of western countries towards new actors in Antarctica using the term 'Polar Orientalism' (Dodds & Hemmings, 2013, p. 1430). This unease feeling reflects also on the number of facilities run by Asian countries,

especially China (Perlez, 2015; Liu, 2016; Slevison, 2016), and on how the Asian presence, through "ways to confront and challenge hierarchic structures and exclusionary procedures with the ATS" (Verbitsky, 2014, p.329), can influence the future of the Antarctic Treaty System. It is important to remember that the Antarctic Treaty System works on a consensus basis and the Protocol is of indefinite duration, and, until 2048, can only be modified by unanimous agreement of all the Parties. Looking at the numbers of open and occupied infrastructures – stations, camps, laboratories and refuges – in Antarctica (Figure 4.2), the average number of facilities per Asian countries (2.25) is very similar to the European one (2.53)[42], while the one for Oceania's countries (3) and South America (4.83) are higher[43].

[42] The following signatories countries have been considered, per geographical reasons, part of Europe: Belarus, Belgium, Bulgaria, Czech Republic, Finland, France, Germany, Italy, the Netherlands, Norway, Poland, Russia, Spain, Sweden, United Kingdom and Ukraine.

[43] I will not conduct in this paper an in-depth analysis of Asian countries' assets. However, here is important to underline that, while the Asian influence and presence in Antarctica is rising and should be considered, other geographical regions have a wider impact on Antarctica.

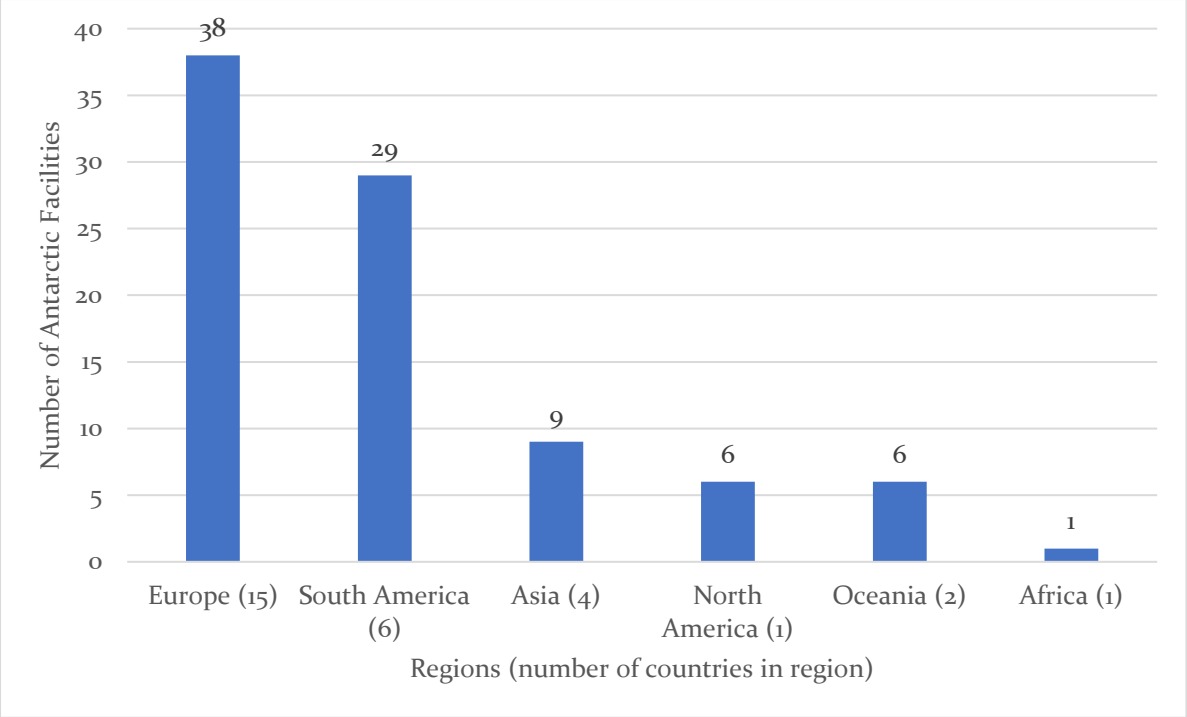

Figure 4. 2 Number of Antarctic facilities by region

Source: Data retrieved from COMNAP, 2018a.

The data presented on Figure 4.2 shows that the construction of facilities flying the flag of an Asian country should not been seen as a threat and with unease, as it was the case of the "yellow peril" (Chander, 2011, p. 717), because these are in line with the activities of all other regional groups.

The decreasing number of new stations, in addition to fewer countries becoming Consultative Parties, and all the Non-Consultative Parties who have not built a facility in the continent, should be regarded as evidence that the interest of countries towards Antarctica is no longer the same as it was before the entry into force of the AT. Josh Frydenberg, former Australian Federal Environment Minister, affirmed that "science is the currency of Antarctic influence" (Norman, 2016). Recalling the peaceful use of Antarctica, the freedom of scientific investigation there and affirming that "[T]he Antarctic Treaty grants privileges to the states that "demonstrate their interest in

Antarctica by conducting substantial scientific research activity here"" (Conforti, 1986, p. 258) the focus of this chapter will be only on the scientific research.

4.1.2 Scientific research serving Antarctic Treaty policies

Jacobsson (2009) underlines the pivotal role the IGY played in the creation of the AT "transferring the discussion from the diplomacy table to the science one" (p. 7). The significance of science survives to the present day in AT Article II, which preserves science as the currency in Antarctica. In addition, AT Article IX, paragraph 2, refers to scientific research in Antarctica, stating a "Contracting Party demonstrates its interest in Antarctica by conducting substantial scientific research activity there, such as the establishment of a scientific station or the despatch of a scientific expedition" thus, demonstrating ways that an AT Party may become a Consultative Party. The Protocol also refers to the acquisition of Consultative status, through its Article 22, paragraph 4, recalling that a Party must ratify the Protocol before obtaining Consultative status

> the Antarctic Treaty Consultative Parties shall not act upon a notification regarding the entitlement of a Contracting Party to the Antarctic Treaty to appoint representatives to participate in Antarctic Treaty Consultative Meetings in accordance with Article IX (2) of the Antarctic Treaty unless the Contracting Party has first ratified, accepted, approved or acceded to this Protocol.

During ATCM XL held in Beijing, People's Republic of China, in 2017, Decision 2 was adopted (making Decision 4 (2005) as no longer current). Decision 2 (2017) updates the guidelines for Consultative status specifying a time limit – 210 days – for the submission of the supporting documentation, related to a Party's activities in Antarctica

and objectives of its scientific programs, to the depository Government for the AT in order to discuss and evaluate during the next ATCM the status of the Contracting Party. Acquiring Consultative status is very important from a political perspective, as it gives a Party the possibility to participate in consensus-based decision making with regard to any Antarctic matters, i.e. be able to vote.

Poland, after the establishment on 26 February 1977 of Henryk Arctowski station on King George Island, Antarctic Peninsula, Antarctica, is the first country to obtain Consultative status, after the original signatories in 1959 (Sollie, 1983). Gray and Hughes (2016) argue that Poland "set a precedent for almost all subsequent "would be" Consultative Parties" (p. 2). In the twenty-three-years period after Poland Consultative status there was only one case in which "there was no consensus among the Consultative Parties 'that the scientific activities have fully met the requirements of Article IX, paragraph 2 of the Antarctic Treaty'" (Pannatier, 1994, p. 126) with the Parties refusing Ecuador's application to become Consultative Party during ATCM XV (Paris, France) in 1989. Six months after ATCM XV (Paris, France) 1989 the Ecuadorian government built Pedro Maldonado station, which was opened on 2 March 1990. In November 1990, Ecuador's application was accepted, and the country became Consultative Party. In fact, the second and third countries to be accepted as Consultative Parties after 1977 were Brazil and India in 1983, and neither of these countries had a research station at the time their applications for Consultative status were discussed (Panattier, 1994). To date, the Netherlands are the only country that became Consultative Party without their own facilities in Antarctica and with no declared intention to do so at that time[44] (Bastmeijer,

[44] The Netherlands are currently operating Dirck Gerritsz Laboratory which was established on 27 January 2013 at the United Kingdom's Rothera station, Adelaide Island, Antarctic Peninsula.

2003; Abbink, 2009). The Netherlands based its application on co-operative scientific projects that were conducted in the years prior to its request for Consultative status sharing existing facilities of other Parties.

Being a Consultative Party, in addition to participating in consensus-based decision-making, gives a country the opportunity to present Working Papers during the annual ATCMs. It is important to note that as per *Rules of Procedure of the Antarctic Treaty Consultative Meeting and the Committee for Environmental Protection* (2016), only Consultative Parties and Observers are entitled to submit Working Papers (Secretariat of the Antarctic Treaty, 2016b). The number of Working Papers, with the proposed governance initiatives, are indicators of the status of a country in the Antarctic community (Brady, 2014). In fact, only Consultative Parties and Observes can submit Working Papers aiming to stimulate discussion on a specific topic during the ATCMs.

Previous studies assessed how the submission of papers to the ACTM is directly linked to the willingness of a country to strengthen their Antarctic politics and to demonstrate their scientific work to maintain the Consultative status within the Antarctic Treaty System (Dudeney & Walton, 2012; Gray & Hughes, 2016). Results showed that the signatories' countries are the ones that are having a bigger impact with the submissions of papers comparing to the other countries.

4.1.3 Scientific research outputs and outreach

Since Antarctica is considered a continent devoted to peace and science, research is at the core of any governmental activities there and "science legitimized international control over Antarctica by creating a mechanism for its management and a goal for its continued rational use" (Berkman, 2002, p. 75). Brady (2014) states that a country can

acquire status and influence in Antarctic governance through the quality of the science it conducts. Asian countries seem to have recognised this. In fact, the Asian countries that are part of the Antarctic Treaty System have demonstrated their willingness to comply with AT regulations and to devote their activities to scientific research. They are heavily investing in Antarctic research and research-related activities. For example, the People's Republic of China, in 2003, invested for its quinquennial plan US$ 20 million, and then in 2010 increased its budget for Antarctic research to US$ 44 million (Brady, 2012c). Similarly, the Korean polar budget was increased by 400% from US$ 9 million in 2004 to US$ 40 million in 2010 (Brady & Seungryeol, 2012). However, Asian countries are not the only ones increasing their budget for polar activities. For example, the New Zealand Ministry of Business, Innovation & Employment's Strategic Science Investment Fund will support a new fund called the Antarctic Research Platform which aims at maximising scientific benefit for the country (New Zealand Ministry of Business, Innovation & Employment, 2017). This new investment by New Zealand government will be NZ$ 21 million, US$ 15 million, over a period of three years and a seven-year funding plan is anticipated.

Works by other authors (Dastidar, 2007; Dastidar & Persson, 2005; Dastidar & Ramachandran, 2008; Aksnes & Hessen, 2009; Erb, 2009) include previous bibliometric analyses of science publications in order to evaluate the scientific influence of the countries conducting research in the Antarctic Treaty Area by measuring the quantity of the outputs produced by the scientific community from 1981 to 2007 limiting their research to journal articles. Fu & Ho (2016) considere also the citation index for every paper submitted and the country of the author's residence in accordance with their institutional affiliations expressed, when collating a list of the most active and

influential countries and institutions. The results of these studies present a snapshot of the national productivity in Antarctic science for the countries involved in research in the Antarctic Treaty Area. However, since new actors have become interested in Antarctica and new national budgets have been dedicated to science after the publications of the above-mentioned works, there is need for a re-evaluation of scientific outputs. I have undertaken such bibliometric analysis of scientific publications with a focus on AFoPS contributions.

4.1.4 Asian presence in Antarctica

Asian countries present different levels of involvement in Antarctica. India, Japan, the People's Republic of China and the Republic of Korea, are Consultative Parties to the AT. Malaysia is a Non-Consultative Party. The other Asian countries have not yet formalised their governmental position toward the Antarctic Treaty System. Governmental bodies of India, Japan, the People's Republic of China and the Republic of Korea are Members of the CCAMLR. Similarly, governmental body of India, Japan, the People's Republic of China and the Republic of Korea are also Members of the COMNAP and Malaysia is a COMNAP Observer. Looking at the scientific involvement and their membership within the SCAR, India, Japan, the People's Republic of China and the Republic of Korea are "well-developed programmes" (SCAR, 2017), Malaysia is an "initial-stage programme" (SCAR, 2017) and Thailand is an "associate member" (SCAR, 2017). It is important to note that the national organisation which applies for SCAR membership may not be endorsed by its own government and may not reflect actual government commitment to AT and the Protocol. The organisational process model introduced by Allison (1971) in his critique to the traditional rational actor model

in international relations and government decision-making, explains this fracture of power and how governments are made of collection and coalition of different organisations. Every organisation has responsibility for one area of expertise and it focuses only on that area; the results is that multiple organisations' outputs form the government decisions. As the final government commitment to AT and the Protocol is a formed by multiple outputs, the scientific engagement of a particular organisation per se, it is not a guarantee of the governmental view. However, if a scientific organisation is from a country who has not acceded to the Protocol, SCAR requires a statement agreeing to comply, to the best of its ability, to the Protocol and ATCM Resolutions and Measures and Decisions.

4.2 Methods

In order to conduct a bibliometric analysis of the scientific publications and a review of the papers submitted to the ATCM, I used two different methods and three databases. The three databases were those of the Antarctic Treaty Secretariat, Scopus and Web of Science (WoS).

I performed a comprehensive literature search of the Antarctic Treaty Secretariat's database from ATCM XXVII - CEP VII (Cape Town, South Africa) 2004 and up to ATCM XL - CEP XX (Beijing, People's Republic of China) 2017 inclusive to assess the number and type of Working and Information Papers submitted to the ATCM. The Asian Parties, Consultative and Non-Consultative, which had submitted at least one paper in this period of time were included into the search. Searches were made filtering the papers submitted by a single country weighting them against the number of papers that were submitted as co-authored with at least another Asian country or another AT

signatory. The search provided a combined total of 247 papers submitted by Asian countries to ATCMs during that period. Thirty-six of these were co-authored papers.

In addition, I conducted during the third trimester of 2017, and the final data were consolidated in January 2018, a quantitative analysis of the number of scientific publications submitted by Asian authors, and by authors affiliated with Asian research centres, using two scientific citation indexing services: Scopus and WoS. Scopus and WoS have been preferred to other similar indexing services, such as SciFinder® and Google Scholar, because their databases are more comprehensive in terms of academic fields covered in their datasets and year coverage (Jacso, 2005; Li, Burnham, Lemley, & Britton, 2010; Ellegaard & Wallin, 2015). WoS, by Clarivate Analytics, is a scientific citation indexing service formed by six databases which includes over 33,000 journals. Similarly, Scopus, by Elsevier, has strong coverage on journals, books and conference proceedings. Scopus also includes social sciences, humanities and arts records (Li, Burnham, Lemley, & Britton, 2010). Even though neither of the two chosen indexing services do humanities and social science publications' justice, it is important to note that the majority of Asian authors' publications can be categorised as hard science outputs. I decided to use and compare two databases in order to obtain a more accurate picture on Antarctic publications. This, according to Whitley (2002) is the preferred method, as the "comparison of citation searching in SciFinder Scholar and Web of Science [...] shows that relying on either index alone leads to faulty results when trying to obtain citation totals for individual authors" (p. 1214).

In the search, the search parameter '*Antarct**' was used following the methods applied in previous scholarly works (Dastidar, 2007; Dastidar & Persson, 2005; Dastidar & Ramachandran, 2008; Dudeney & Walton, 2012). '*Antarct**' was searched in the title

of peer-reviewed publications included in all the databases available and it gave a result of approximately 35,000 records in the period 1961–2018[45]. Different filters have been used to include only information relevant and related to organisations affiliated or belonging to countries that are AFoPS Members in the period from 2004 to 2018 period (Table 4.1).

Table 4. 1 Filters used in the citation indexing services' search

Type of Filter	**Web of Science**	**Scopus**
Keyword	Antarct*	Antarct*
Search Field	Title (TI)	TITLE
Year Range	Timespan from 2004 to 2018	PUBYEAR>2003 AND PUBYEAR<2019
Country-Territory	Address (AD)	AFFILCOUNTRY
Document analysed	All document types	ALL
String example for co-authored publications' search	TI=Antarct* AND AD=*Country* AND AD=*Country*; Timespan=2004-2018	(TITLE (Antarct*) AND AFFILCOUNTRY (*Country*) AND AFFILCOUNTRY (*Country*)) and PUBYEAR > 2003 AND PUBYEAR < 2019)

During the search process, some results were obtained that warrant explanation: the search of the keyword '*Antarct**' was conducted only on the titles because the use of the keyword in the abstract reported inaccurate results. This is caused by the use of '*Antarct**' in many papers' abstract that were not exclusively related to scientific projects conducted in the Antarctic Treaty Area. For example, results returned a paper using the word '*Antarctic*' in the abstract but focussing on the effect of climate change in French Polynesia.

I recognize the limitation of using the title as unique search field but approximately 18,000 records which form the basis of this analysis are valuable data, to

[45] Full results of each of the two indexing services will be provided later in the article.

represent a trend in publications, and, that the use of two indexing services could mitigate the number of incorrect records, giving robust results for research purposes.

4.3 Antarctic Treaty Consultative Meeting (ATCM)

The ATCM is an annual forum, in which all the Parties who have signed the AT and have a demonstrated interest towards Antarctica, meet, pursuant with Article IX paragraph 1, to exchange information, discuss communal interest matters and to recommend to their governments measures promoting the objectives of the AT (Secretariat of the Antarctic Treaty, 2015). The countries attending these meetings are divided in two groups: Consultative Parties, currently twenty-nine countries, are the ones who have demonstrated they are carrying out substantial scientific activity in Antarctica and obtained Consultative status, and the Non-Consultative Parties are twenty-four, at present. The meetings are attended also by three Observers organisations, CCAMLR, COMNAP and SCAR, by invited Experts, the Antarctic and Southern Ocean Coalition (ASOC), the International Association of Antarctic Tour Operators (IAATO), and others upon invitation, such as, at present, the International Civil Aviation Organization (ICAO), the International Hydrographic Organization (IHO), the International Maritime Organization (IMO), the World Meteorological Organization (WMO). Only Consultative Parties can actively participate in decision-making discussions. All the attending Parties are invited to submit relevant documents to the Antarctic Treaty Secretariat prior the beginning of the meetings; these documents are classified as Working Papers (WPs), Information Papers (IPs) or Background Papers (BPs) in accordance with the action required or expected at the meeting. In addition to these papers that can be submitted by the Parties, the Secretariat can produce

Secretariat Papers (SPs) which inform on the Secretariat activities. Working Papers can only be submitted by Consultative Parties and Observers, aiming for discussion and action on a specific topic. Information Papers can be submitted by all the attending Parties, in order to provide information. Background Papers are a recent category of paper, introduced with Decision 2 (2011) simply to provide background to any issue. The latter are not discussed during the meeting but are only submitted to formally inform the participants on some matters of general interest.

The level of involvement of a country in the ATCMs can be assessed by analysing the number of papers that they submitted (Dudeney & Walton, 2012; Gray & Hughes, 2016). As mentioned before, AFoPS aims at encouraging more Asian countries to become involved in polar sciences and to present Asian achievements towards the international polar community. Analysing the Antarctic Treaty Secretariat's database to quantify the number of Working Papers, Information Papers and Background Papers is therefore one way to evaluate the progress made since AFoPS establishment towards this aim.

4.3.1 Papers submitted to Antarctic Treaty Consultative Meetings (ATCMs) and Committee for Environmental Protection (CEP)

Searching the Antarctic Treaty Secretariat's database for papers from ATCM XXVII - CEP VII (Cape Town, South Africa) 2004 and up to ATCM XL - CEP XX (Beijing, People's Republic of China) 2017, the five Asian countries that are Parties to the AT submitted a total of 247 papers during the meetings[46]. The total of 247 papers is

[46] Of the five countries, only four countries, India, Japan, the People's Republic of China, and the Republic of Korea, can submit Working Papers to ATCMs.

comprised of fifty-six Working Papers, 178 Information Papers and thirteen Background Papers. With regard to Background Papers, only India and the Republic of Korea submitted this type of papers; in addition, these have been submitted only in the last five years, since ATCM XXXV - CEP XV (Hobart, Australia), in 2012. For both ATCM XXXII - CEP XII (Baltimore, United States of America) 2009 and ATCM XXXV - CEP XV (Hobart, Australia) 2012 there were no Working Papers submitted by Asian countries.

Analysing the papers by country author, the People's Republic of China is the most active country, within the AFoPS group, per number of Working Papers submitted to ATCM with a total of twenty-two. In the same period, India, Japan and Republic of Korea submitted fourteen, ten, and ten papers respectively (Figure 4.3).

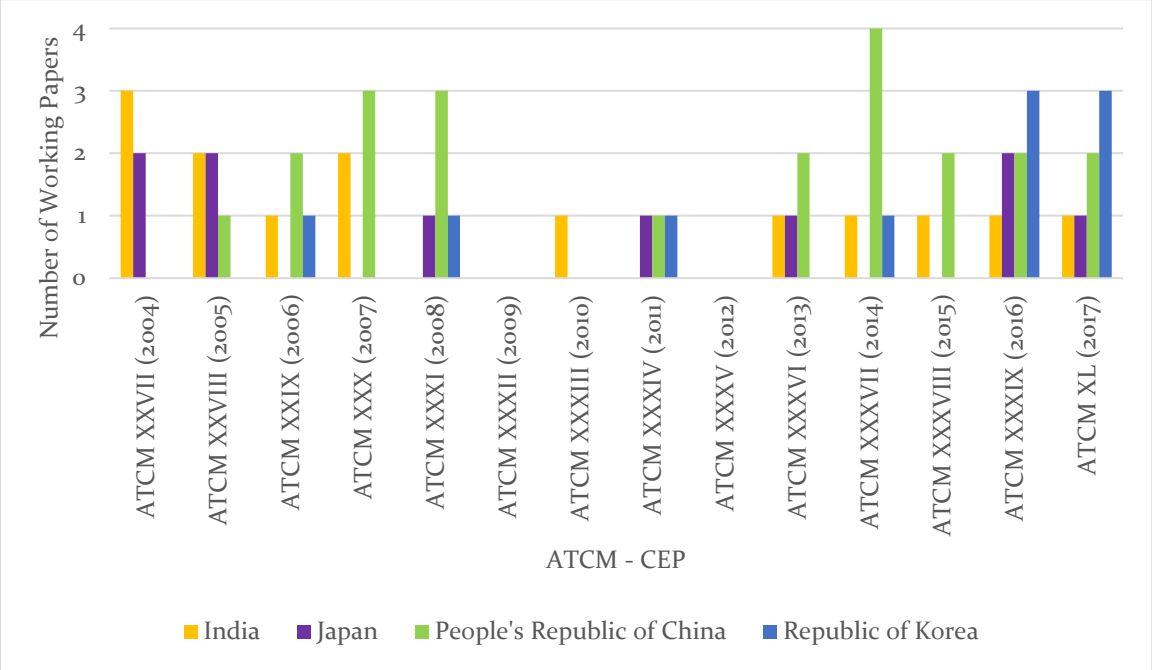

Figure 4. 3 Number of Working Papers submitted to ATCMs - CEPs by AFoPS Members from 2004 to 2017

Source: Data retrieved from the Antarctic Treaty Secretariat's database in June 2017.

Comparing these data with the number of Working Papers submitted, in the same period, to ATCMs by non-Asian original signatories of the AT, the Asian countries

are all in the bottom third in terms of paper submission. South Africa is also in the bottom third sharing the less prolific position with Japan and the Republic of Korea at ten Working Papers for the period (Figure 4.4). The four more prolific countries are United Kingdom, Australia, United States of America and New Zealand. They all operate with English as their first language, perhaps providing an unseen advantage. The middle group of countries is led by Chile, Norway, Argentina and France, countries which may also beneficiate from French and Spanish, with the exception of Norway, as two of the four official AT languages. Language can be seen as one of the reasons for this low number of Working Papers – nevertheless the same pattern is also evident in the number of Information Papers submitted to ATCMs. Another reason can be that few countries – Argentina, Australia, Chile, France, New Zealand, Norway, United Kingdom and Unites States of America – participate more than others during discussion at ATCMs, also on topics presented by other countries, and Asian countries are not in this group.

Figure 4. 4 Comparison of total number of Working Papers submitted to ATCMs - CEPs by the AT original signatories and AFoPS Members from 2004 to 2017

Source: Data retrieved from the AT Secretariat's database in June 2017. (Note: Japan is original AT signatory and AFoPS Member).

On 31 October 2011, Malaysia acceded to the AT. Malaysia remains, to date, a Non-Consultative Party so does not have the ability to submit Working Papers. The sixth AFoPS Member, Thailand, and all the Observers, Indonesia, the Philippines, Sri Lanka, and Vietnam, have not yet signed the AT. Since ATCM XXXVI (Brussels, Belgium) 2013, Malaysia submitted one Information Paper every year, reporting on its national activities in Antarctica[47]. The number of Information Papers submitted by Asian countries, is three times the number of Working Papers submitted by the same group. This difference could be related to the different purposes of these papers, the first informs and the latter gives recommendations and requires action of the Parties; in addition, from a cultural perspective, Asian countries are not always willing to directly make proposals to urge an action. India is the most active Asian country in submitting

[47] Malaysia submitted IP110 to ATCM XXXVI (2013), IP076 to ATCM XXXVII (2014), IP130 to ATCM XXXVIII (2015), IP063 to ATCM XXXIX (2016), and IP065 to ATCM XL (2017).

Information Papers, with a total of forty-eight, followed by Japan at forty-four, the Republic of Korea with forty-one and the People's Republic of China with forty (Figure 4.5).

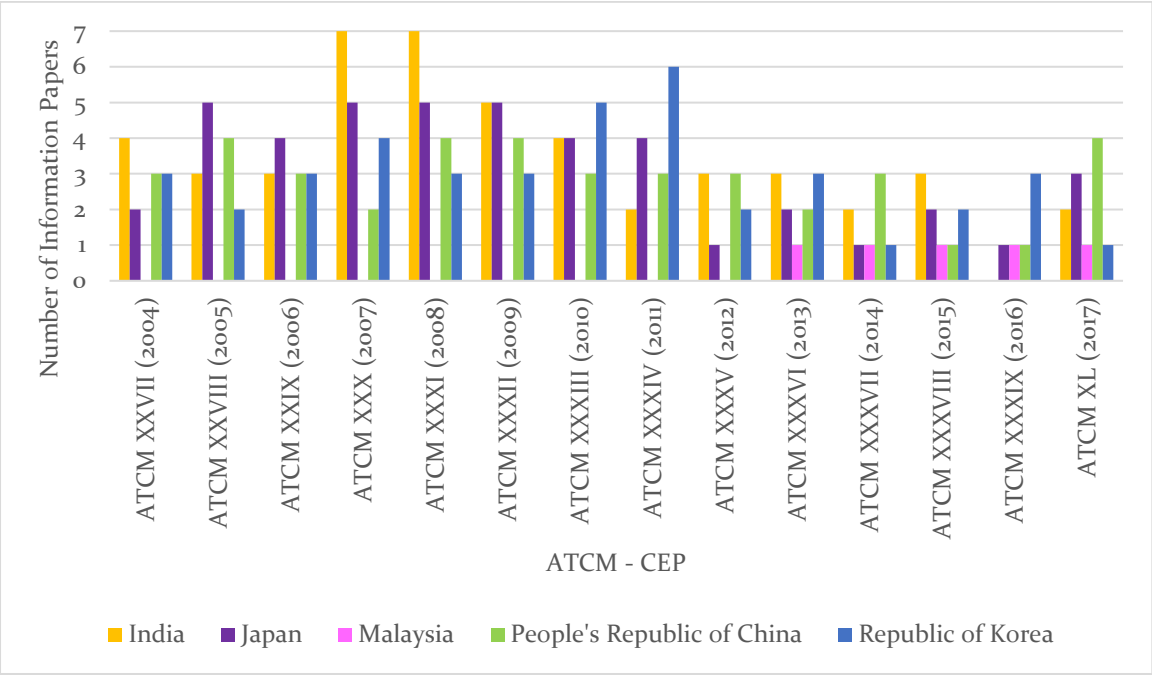

Figure 4. 5 Number of Information Papers submitted to ATCMs - CEPs by AFoPS Members from 2004 to 2017

Source: Data retrieved from the AT Secretariat's database in June 2017.

Similarly to the results obtained in the comparison of Working Papers submitted to ATCMs between the original signatories of the AT and AFoPS Members, also for the Information Papers, Asian countries do not appear at the top of the most active countries. In addition, the countries that are the most active in the submission of Working Papers are following the same trend and are the countries with the highest number of submitted Information Papers (Figure 4.6). At the lower end of Information Papers submissions, the Asian countries are not the least productive countries, with the exception of Malaysia, with France, Belgium and South Africa being the least active. Belgium and South Africa, excluding Asian countries, are not only the less active in the

submission of Information Papers but also for Working Papers; France is the fourth less active country in producing Information Papers, but it is more active for the submission of Working Papers.

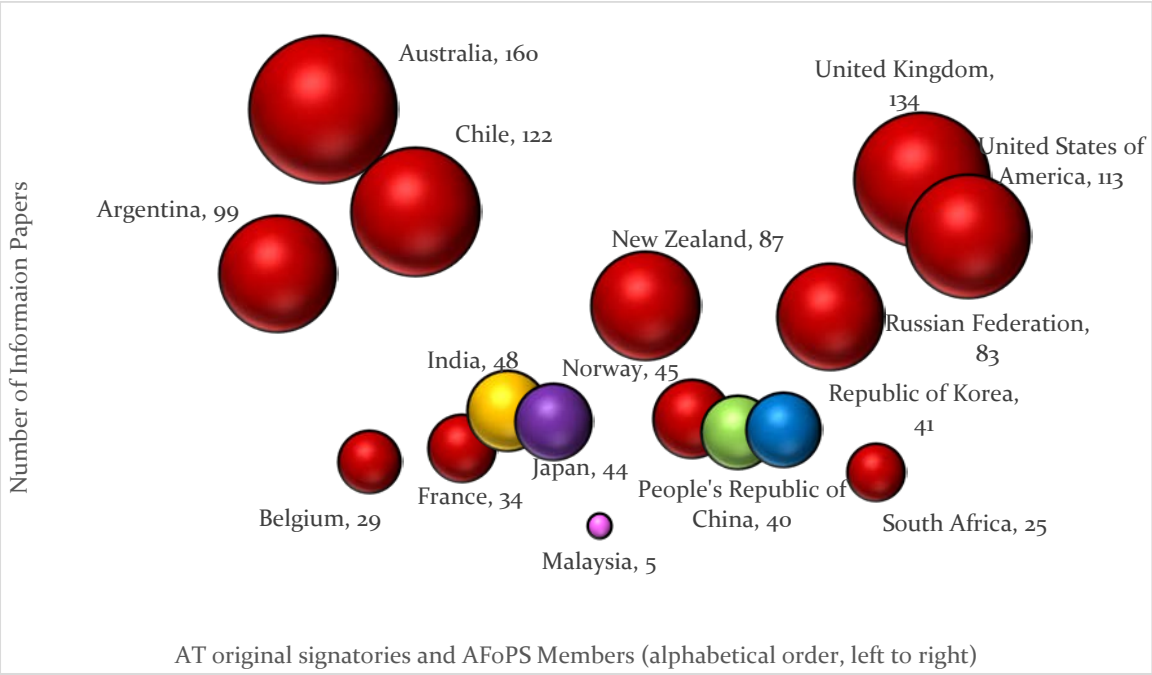

Figure 4. 6 Comparison of total number of Information Papers submitted to ATCMs - CEPs by the AT original signatories and AFoPS Members from 2004 to 2017

Source: Data retrieved from the AT Secretariat's database in June 2017. (Note: Japan is original AT signatory and AFoPS Member).

AFoPS as a group is not part of the ATCM, however it is possible to assess its representation in the ATCM through the number of papers submitted by individual Member Asian countries mentioning this regional group. The achievements obtained by this forum have been presented to the other AT Members only seven times over the last fourteen years. Japan presented IP107 to ATCM XXX (2007), IP076 to ATCM XXXI (2008), and IP089 to ATCM XXXII (2009); the People's Republic of China presented IP038 to ATCM XXXIII (2010), and IP174 to ATCM XL (2017); and the Republic of Korea presented IP070 to ATCM XXXVII (2015), and IP021 at ATCM XXXIX (2016). All these Information Papers were presented by the country hosting the AFoPS Secretariat in that

particular year. In addition to these, Malaysia submitted IP063 to ATCM XXXIX (2016), and IP065 to ATCM XL (2017) in which Malaysian participation within the organisation was presented.

Comparing these results with the other regional groups operating in Antarctica, the EPB and the RAPAL, two differences are immediately visible. All the papers submitted by AFoPS countries, with a mention to the group, are authored by the single country hosting the Secretariat; Peru, on behalf of RAPAL, submitted IP155 to ATCM XL (2017) that was co-authored by all the six Members of the group – Argentina, Brazil, Chile, Ecuador, Peru and Uruguay. Even though AFoPS Members have not co-authored any submission of Information Papers to ATCMs, the group is the most active in sharing its activities because IP155 ATCM XL (2017) is the only papers that was submitted with a mention to RAPAL and there are no papers on EPB activities.

Despite the absence of co-authored papers regarding AFoPS matters, Asian countries have been active in co-authoring papers submitted to the ATCMs, but they do not lead in that activity.

4.3.2 Co-authored papers submitted to Antarctic Treaty Consultative Meetings

As previously mentioned, Asian countries have submitted to ATCMs - CEP a combined total of 247 papers, thirty-six of which were co-authored with other parties of the Antarctic Treaty System and none were co-authored only by Asian countries. The Asian countries with the highest number of co-authored papers, sixteen and nineteen respectively, are India and the People's Republic of China. These two countries have co-authored, together with Australia, Romania and Russian Federation, two Working

Papers and seven Information Papers reporting on the Larsemann Hills ASMA[48]. The Republic of Korea has nine co-authored papers and Japan seven; Malaysia has no record of co-authored papers.

The WP038 to ATCM XXXIX - CEP XIX (Santiago, Chile) 2016 '*Confirming Ongoing Commitment to the Prohibition of Mining Activity in Antarctica, other than for Scientific Research: Antarctic Mining Ban*' is the paper with the highest number of co-authors, demonstrating the priority and commitment of many Consultative Parties in respecting the Protocol and its ban on mining-related activities[49]. Australia is the most active country in co-authoring Papers with Asian countries, with a total of twenty-five papers, followed by the Russian Federation with fifteen (Tables 4.2 & 4.3). Australia is a co-author of 70% of the joint papers submitted by Asian countries. The trend of the Australian submission shows that it is the second most prolific for the submission of Working Papers and the most prolific Party in submitting Information Papers to ATCMs – CEPs in the period 2004–2017. It also has to be noted that almost half of Australia's co-authored papers included in this analysis all have the same focus: the Larsemann Hills ASMA. All the papers on the Larsemann Hills ASMA, twenty Working Papers and sixteen Information Papers, with the exception of two – IP026 to ATCM XXXVI - CEP XVI (Brussels, Belgium) 2013 and WP040 to ATCM XL - CEP XX (Beijing, People's Republic of China) 2017 – were also co-authored with at least one country of the original signatories of the AT. India and the People's Republic of China are the two Asian

[48] Romania co-authored only five Information Papers.

[49] Similarly, during the ATCM XXXIX 2016 the *Santiago Declaration on the Twenty Fifth Anniversary of the signing of the Protocol on Environmental Protection to the Antarctic Treaty* reaffirmed the commitment of the Parties to the protection of the Antarctic environment. While acknowledging the Parties' commitment, the *Santiago Declaration* is not considered in this research because it was not presented as Working or Information Paper.

countries with the highest number of co-authored papers on this topic; the presence of the Indian facility Bharati and the People's Republic of China Zhongshan in the ASMA No. 6 represent the interest of these two countries in the area.

Table 4. 1 Information Papers (IPs) jointly submitted to ATCMs - CEPs from 2004 to 2017

Meeting	Paper	Title	Submitted by
ATCM XXXI - CEP XI (2008)	IP017	Measures to protect the Larsemann Hills, East Antarctica, from the introduction of non-native species	Australia; India; People's Republic of China; Romania; Russian Federation
ATCM XXXII - CEP XII (2009)	IP054	Report of the Larsemann Hills Antarctic Specially Managed Area (ASMA) Management group	Australia; India; People's Republic of China; Romania; Russian Federation
ATCM XXXII - CEP XII (2009)	IP017	1st India-Brazil-South Africa (IBSA) Dialogue Forum Seminar on Antarctica: exchange amongst Antarctic programs	Brazil; India; South Africa
ATCM XXXIII - CEP XIII (2010)	IP040	Report of the Larsemann Hills Antarctic Specially Managed Area (ASMA) Management group	Australia; India; People's Republic of China; Romania; Russian Federation
ATCM XXXIV - CEP XIV (2011)	IP079	Report of the Larsemann Hills Antarctic Specially Managed Area (ASMA) Management group	Australia; India; People's Republic of China; Romania; Russian Federation
ATCM XXXIV - CEP XIV (2011)	IP109	Cooperation Management Activities at ASPAs in 25 de Mayo (King George) Island, South Shetland Islands	Republic of Korea; Argentina
ATCM XXXV - CEP XV (2012)	IP061	Report of the Larsemann Hills Antarctic Specially Managed Area (ASMA) Management group	Australia; India; People's Republic of China; Romania; Russian Federation
ATCM XXXVI - CEP XVI (2013)	IP027	Korean-German Workshop about Environmental Monitoring on King George Island	Republic of Korea; Germany
ATCM XXXVI - CEP XVI (2013)	IP044	Joint Investigation Report of Breaking ice barrier at Leningradsky Bay in April 2012 (Russian & Indian Antarctic Programmes)	Russian Federation; India
ATCM XXXVI - CEP XVI (2013)	IP046	Report of the Antarctic Specially Managed Area No. 6 Larsemann Hills Management group	Australia; India; People's Republic of China; Russian Federation
ATCM XXXVII - CEP XVII (2014)	IP067	Report of the Antarctic Specially Managed Area No. 6 Larsemann Hills Management group	Australia; India; People's Republic of China; Russian Federation
ATCM XXXVIII - CEP XVIII (2015)	IP116	East Antarctic - Ross Sea Workshop on Collaborative Science	Australia; People's Republic of China
ATCM XL - CEP XX (2017)	IP014	Antarctic Environments Portal: Content Management Plan	Australia; Japan; New Zealand; Norway; SCAR; Spain; United States of America
ATCM XL - CEP XX (2017)	IP025	Report of the Antarctic Specially Managed Area No. 6 Larsemann Hills Management group	Australia; People's Republic of China; India; Russian Federation
ATCM XL - CEP XX (2017)	IP095	Opening of Chile-Korea Antarctic Cooperation Center	Chile; Republic of Korea
ATCM XL - CEP XX (2017)	IP154	MADICE-Joint Initiative of Scientific Programme at CDML by India and Norway	India; Norway

Source: Data retrieved from the AT Secretariat's database in June 2017.

Table 4. 2 Working Papers (WPs) jointly submitted to ATCMs - CEPs from 2004 to 2017

Meeting	Paper	Title	Submitted by
ATCM XXVII - CEP VII (2004)	WP048 rev.1	Revisions to the rules of procedure of the Antarctic Treaty	Australia; Japan
ATCM XXVIII - CEP VIII (2005)	WP027 rev.1	Draft Antarctic Specially Managed Area (ASMA) Management Plan for the Larsemann Hills, East Antarctica	Australia; People's Republic of China; Russian Federation
ATCM XXVIII - CEP VIII (2005)	WP046	Intersessional Consultation Process	Australia; Japan
ATCM XXVIII - CEP VIII (2005)	WP056	Proposed amendments to the Rules of Procedure (2004)	Australia; Germany; Japan; Peru; Sweden; United Kingdom; United States of America
ATCM XXIX - CEP IX (2006)	WP008	Management Plan for the Larsemann Hills Antarctic Specially Managed Area	Australia; People's Republic of China; Romania; Russian Federation
ATCM XXIX - CEP IX (2006)	WP022	"Possibilities for environmental management of Fildes Peninsula and Ardley Island". Proposal to establish an intersessional contact group	Brazil; Germany; People's Republic of China; Republic of Korea; Russian Federation
ATCM XXX - CEP X (2007)	WP008	Larsemann Hills, East Antarctica. Antarctic Specially Managed Area Management Plan	Australia; India; People's Republic of China; Romania; Russian Federation
ATCM XXX - CEP X (2007)	WP009	Draft Antarctic Specially Protected Area (ASPA) Management Plan for the Amanda Bay, Ingrid Christensen Coast, Princess Elizabeth Land, East Antarctica	Australia; People's Republic of China
ATCM XXXI - CEP XI (2008)	WP019	Revised Draft Antarctic Specially Protected Area (ASPA) Management Plan for the Amanda Bay, Ingrid Christensen Coast, Princess Elizabeth Land, East Antarctica	Australia; People's Republic of China
ATCM XXXVI - CEP XVI (2013)	WP063	Draft Antarctic Specially Protected Area (ASPA) Management Plan for Stornes, Larsemann Hills, Princess Elizabeth Land	Australia; India; People's Republic of China; Romania; Russian Federation
ATCM XXXVII - CEP XVII (2014)	WP018	Revision of the Management Plan for Antarctic Specially Protected Area (ASPA) No. 169 Amanda Bay, Ingrid Christensen Coast, Princess Elizabeth Land, East Antarctica	Australia; People's Republic of China
ATCM XXXVII - CEP XVII (2014)	WP021	Revision of the Management Plan for Antarctic Specially Managed Area (ASMA) No. 6 Larsemann Hills, East Antarctica	Australia; India; People's Republic of China; Russian Federation
ATCM XXXIX - CEP XIX (2016)	WP010	Antarctic Environments Portal	Australia; Japan; New Zealand; Norway; SCAR; Spain; United States of America of America
ATCM XXXIX - CEP XIX (2016)	WP028	Report of the Intersessional Contact Group 'Developing a Strategic Approach to Environmentally Managed Tourism and Non-Governmental Activities'	New Zealand; India
ATCM XXXIX - CEP XIX (2016)	WP038	Confirming Ongoing Commitment to the Prohibition of Mining Activity in Antarctica, other than for Scientific Research. Antarctic Mining Ban	United States of America; Argentina; Australia; Belgium; Chile; Czech Republic; Finland; France; Germany; Italy; Japan; Netherlands; New Zealand; Poland; Republic of Korea; South Africa; Spain; Sweden; United Kingdom; Uruguay
ATCM XXXIX - CEP XIX (2016)	WP052	Non-native flies in sewage treatment plants on King George Island, South Shetland Islands	Republic of Korea; United Kingdom; Chile; Uruguay
ATCM XL - CEP XX (2017)	WP025	Antarctic Environments Portal	Australia; Japan; New Zealand; Norway; SCAR; Spain; United States of America
ATCM XL - CEP XX (2017)	WP026	Inter-Parties' Action Plan to Manage the Non-Native Flies in King George Island, South Shetland Islands	Republic of Korea; Chile; United Kingdom; Uruguay
ATCM XL - CEP XX (2017)	WP036	Green Expedition in the Antarctic	Australia; Chile; France; Germany; India; New Zealand; Norway; People's Republic of China; Republic of Korea; United Kingdom; United States
ATCM XL - CEP XX (2017)	WP040	Report of the Intersessional Contact Group on Inspection in Antarctica under Article VII of the Antarctic Treaty and Article 14 of the Environmental Protocol	Netherlands; Republic of Korea; United States of America

Source: Data retrieved from the AT Secretariat's database in June 2017.

The number of co-authored papers decreases if we consider only the ones including at least two Asian parties. India and the People's Republic of China submitted, as co-authors, 12 papers, mostly Information Papers, the Republic of Korea three papers and Japan one (Table 4.4). It is clear that Japan, even though one of the original signatories, is the least active country in producing co-authored papers to ATCM. On the other hand, Japan is active in the submission of Information Papers as a single-author country but not in the submission of Working Papers.

Table 4. 3 Number of AFoPS Members' co-authored papers submitted to ATCM - CEP from 2004 to 2017

Country	India	Japan	People's Republic of China	Republic of Korea
India	-	0	12	1
Japan	0	-	0	1
People's Republic of China	12	0	-	2
Republic of Korea	1	1	2	-

Data retrieved from the AT Secretariat's database in June 2017.

One of AFoPS main goal is to improve Asian countries' presence and participation in ATCMs. However, to be able to achieve improvement in this respect, its Members have to demonstrate a higher level of participation in these meetings, by submitting a higher number of papers. At present, this higher level of participation has not yet been manifested.

4.4 Scientific publications

Antarctica is a continent for science, and scientific activities represent the interest of countries that are actively involved in conducting research in the Antarctic Treaty Area. The outcomes and findings of scientific projects are presented as peer-reviewed works and the number of these publications can be used to determine the effectiveness of their activities. The analysis of research outcomes in peer-reviewed

journals shows the extent of the scientific involvement in this area is rising. The data retrieved from Scopus returned 17,134 publications in the period 1961–2003 and 17,196 publications from January 2004 to January 2018. Similarly, the data retrieved from WoS shows that in the period 1961–2003, 16,526 publications were produced, and in the period from January 2004 to January 2018 there were 16,766 publications. Considering the 17,916 publications, 3361 have been authored by at least one author affiliated with an organisation based in one of the six AFoPS Members countries. Examining the output of Asian countries, through the number of peer-reviewed publications submitted without co-authoring with other Asian countries, we see an increasing trend in number of publications (Figures 4.7 & 4.8).

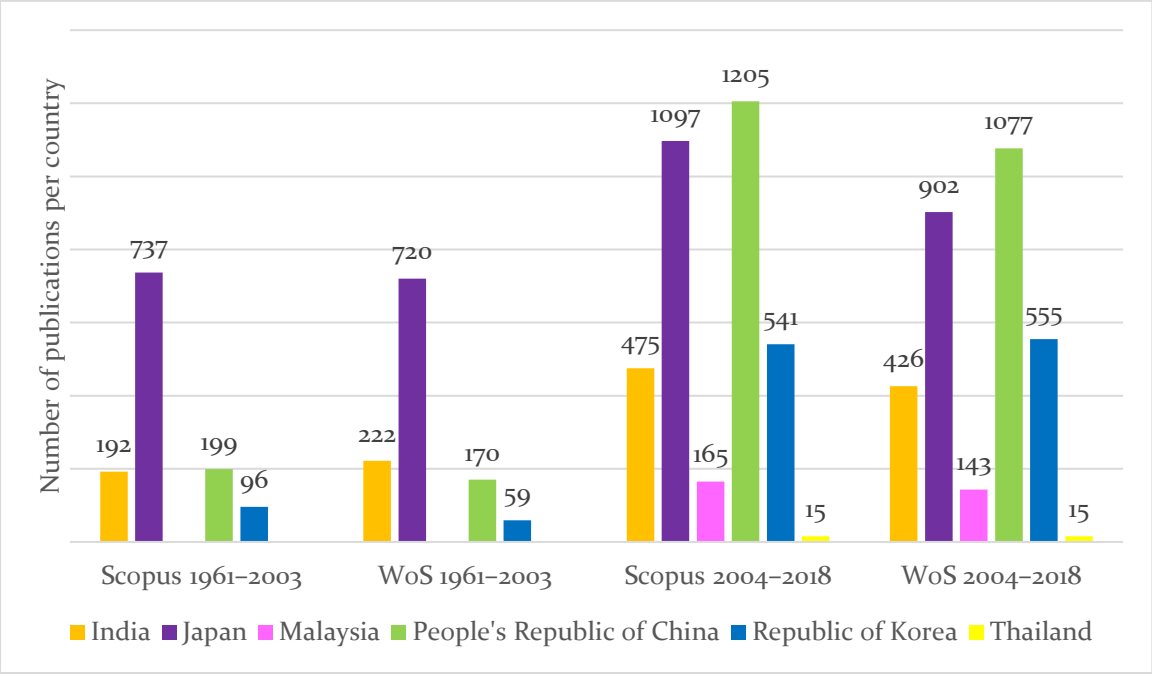

Figure 4. 7 Comparison of AFoPS Members' peer-reviewed publications before and after AFoPS establishment

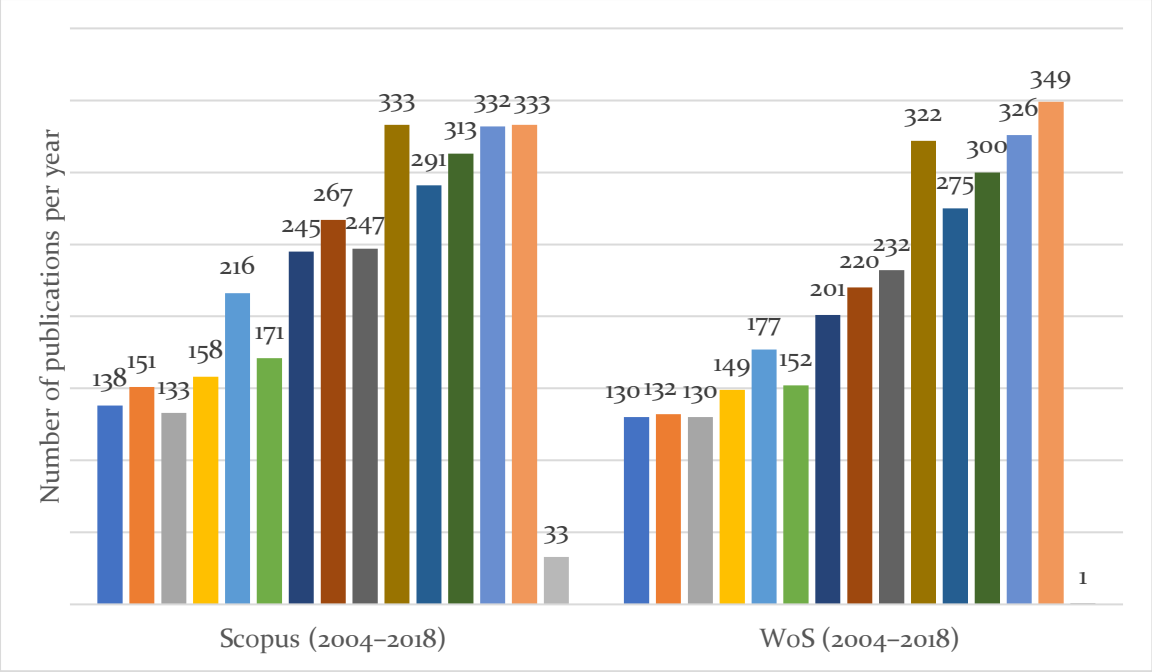

Figure 4. 8 Yearly comparison (2004–2018) of AFoPS Members' peer-reviewed publications after AFoPS establishment

4.4.1 Scopus

The search on Scopus databases retrieved 3361 peer-reviewed publications, authored by at least one author affiliated with an organisation based in an AFoPS Members country. Broadening the search outside AFoPS boundaries and looking at the non-Asian countries' organisation who have co-authored publications with researchers located in one of the AFoPS Members country, United States of America (444), Australia (240) and United Kingdom's (190) research centres are the ones producing the highest results worldwide.

On the other hand, within AFoPS boundaries, the People's Republic of China's authors were co-authoring works mostly with researchers from Republic of Korea's institutions – thirty-three publications in total, seventeen of which were on earth and planetary sciences with the year 2014 being the most productive with six publications. Researchers from Japan and the Republic of Korea have published a total of twenty-

seven pieces of work, and authors from the Republic of Korea and India fourteen. The Republic of Korea, compared to the other AFoPS countries is the one with the highest percentage of co-authored papers per total number of published peer-reviewed works; however, none of these have been authored with researchers from the two newest Members in AFoPS, Malaysia and Thailand. Thailand's researchers have co-authored five papers with Japan's scientists and three with the People's Republic of China's researchers; none of the other five AFoPS Members have co-authored papers with Malaysia.

When considering more than two AFoPS countries co-authoring works together, there are only six results: one has been published in 2005 by authors affiliated with Japan, People's Republic of China, and Republic of Korea's institutions covering the earth and planetary sciences' subject are. Another five have been produced in 2010, 2012, 2013, and 2014 by authors from India, Japan, People's Republic of China, and Republic of Korea; four of these articles are in the earth and planetary sciences field, one of the fields in which the respective national Antarctic science programs made investments, published and the fifth paper has been categorized as multidisciplinary.

While the subject field of peer-reviewed publications does not influence the total number of papers, it acknowledges the breadth of research conducted in Antarctica. Analysing the subject areas of the co-authored papers, the greatest number of articles (1702) was categorized under earth and planetary sciences, followed by agricultural and biological sciences (1021), and environmental science (610); Table 4.5 shows all the research fields, using the subject areas proposed by Scopus, of co-authored papers submitted by AFoPS Members researchers.

Table 4. 4 Co-authored papers divided per subject areas

Subject Area	**Number of papers**	**Subject Area**	**Number of papers**	**Subject Area**	**Number of papers**
Earth and Planetary Sciences	1702	Agricultural and Biological Sciences	1021	Environmental Science	610
Biochemistry, Genetics and Molecular Biology	480	Engineering	342	Physics and Astronomy	320
Immunology and Microbiology	319	Chemistry	265	Computer Science	207
Chemical Engineering	175	Materials Science	169	Multidisciplinary	128
Medicine	109	Social Sciences	85	Mathematics	79
Pharmacology, Toxicology and Pharmaceutics	65	Energy	41	Arts and Humanities	20
Neuroscience	9	Business, Management and Accounting; Health Professions; Nursing	5	Decision Sciences	4
Economics, Econometrics and Finance; Veterinary	3	Psychology	2		

Source: Data retrieved from Scopus in January 2018.

Comparing these results with the co-authored research published before AFoPS establishment, there is a sharp increasing in co-operative activities. In fact, before 2004 only twelve papers were co-authored by Asian countries: nine between Japan and Republic of Korea's researchers and three between the People's Republic of China and the Republic of Korea's scientists. The Republic of Korea maintains its position as the most active country in co-authoring peer-reviewed papers.

4.4.2 Web of Science (WoS)

Using the indexing services of WoS, scholars affiliated with the Republic of Korea result the most active in producing co-authored peer-reviewed scientific publications.

In fact, in the period 2004–2018, researchers from the Republic of Korea have published thirty-six papers with the People's Republic of China's scientists, thirty with authors affiliated with Japan and six with researchers from India; these papers have manly been published between 2004–2008 and 2012–2017. Scientists from Japan have co-authored publications with authors based in India, fourteen papers, and have also co-operated with the newest AFoPS Member, Thailand. Researchers from Japan and Thailand have co-authored five papers, two before Thailand joined AFoPS and three after its admission as Observer. The participation of researchers from Thailand in various Japanese Antarctic Research Expeditions have fostered these publications and the co-operation between organisations of these two countries. However, researchers from Japan are not the only one who co-authored publications with Thailand. Researchers from the People's Republic of China have co-authored three papers in 2012, 2017 and 2018 with scientists from Thailand: the two Memoranda of Understanding signed between the polar entities of these two countries are advancing, not only the logistical support but also scientific outreach and outcomes.

As has already been outlined by the analysis conducted on Scopus, also analysing WoS databases, there are no results for co-authored papers submitted by scientists affiliated with organisations from Malaysia. Similarly, there are eight results for papers submitted by more than two organisations affiliated with AFoPS countries; all these papers have been co-authored by Japan, the People's Republic of China and the Republic of Korea's institutions and all have a science and technology focus.

In the analysis of the research fields of these publications, WoS provides three subject areas: science and technology, social sciences, and arts and humanities. Out of

the 3096 analysed papers, 99% of the publications (3063) have been coded as belonging to the science and technology subject fields, twenty-seven have been categorized as social sciences and six as arts and humanities.

4.4.3 AFoPS influence in publications

Before the establishment of AFoPS, there were only few examples of co-authored papers between Asian countries; the first co-authored paper was published in 1983 by scientists affiliated with organisations from Japan and the Republic of Korea. Institutions from these two countries published co-authored works again in 1997, one year earlier than the first co-authored paper submitted by India and Japan's researchers. In the last eighteen years there has been an increase in publications with researchers from the Republic of Korea publishing with Japan and the People's Republic of China's ones; scientists from Japan co-authored works also with scientists from India.

Even though there are evidences of co-operation between AFoPS Members in a great array of research projects, there are no publications involving all the AFoPS Members at the same time. In addition, there are only three papers in the scholarly literature mentioning AFoPS. These have been published in 2011 and 2015; the two 2015 publications are part of a special issue of the *Polar Sciences* discussing AFoPS achievements to date. One of these two papers, '*Recent advance in Asian polar science – Commemorating ten-year activities of the Asian Forum for Polar Sciences (AFoPS)*', is the only example of paper to be co-authored by researchers affiliated with all the Members' countries. The second paper, '*The development of the Asian Forum for Polar Sciences (AFoPS)*', was published by the then Director of Korea Polar Research Institute and the AFoPS Secretariat that, in 2015, was hosted in Incheon, Republic of Korea. The 2011

publication, '*Engaging Asian Nations in IPY: Asian Forum for Polar Sciences (AFoPS)*', is part of the final summary publication at the end of the International Polar Year 2007–2008.

Considering the results obtained both from Scopus and WoS is clear that the establishment of AFoPS has created a more co-operative environment for Asian researchers. However, these co-operative projects are mainly involving organisations from three Asian countries at the same time. In the first ten years after its establishment, AFoPS introduced five action groups in order to improve co-operation between its Members; three of these are science-related and focus on earth sciences, life sciences, and planetary sciences[50]. Analysing the subject fields of the co-authored papers, especially the one retrieved from Scopus as its databases have more specific subject areas, the co-operation under AFoPS' action groups is evident; in fact, planetary and biological sciences are the fields in which the greatest number of publications are logged in. In addition, biological and planetary science are two of the fields in which all Asian national Antarctic programs invest in scientific projects every Antarctic research season.

Studying the number of publications of Asian countries as single entities and not only the co-authored papers, the organisations affiliated with AFoPS Members countries have, as a whole, contributed to more than one fifth of the total number of publications related to Antarctic science in the period 2004–2018. Figure 4.9 shows the most productive authors are affiliated with institutions located in the United States of America, followed by the ones in the United Kingdom, Australia, Germany and Italy; at the sixth place there is the first Asian country, the People's Republic of China.

[50] The other two action groups are engineering and logistic, and public relations and data management.

Researchers from Japan are at the eighth place, the Republic of Korea's scientists are at fourteenth place and India's ones are eighteenth. In a list of the twenty most productive countries, nineteen are Consultative Parties to ATCM and Canada, which is the twelfth most productive country, is the only Non-Consultative Party.

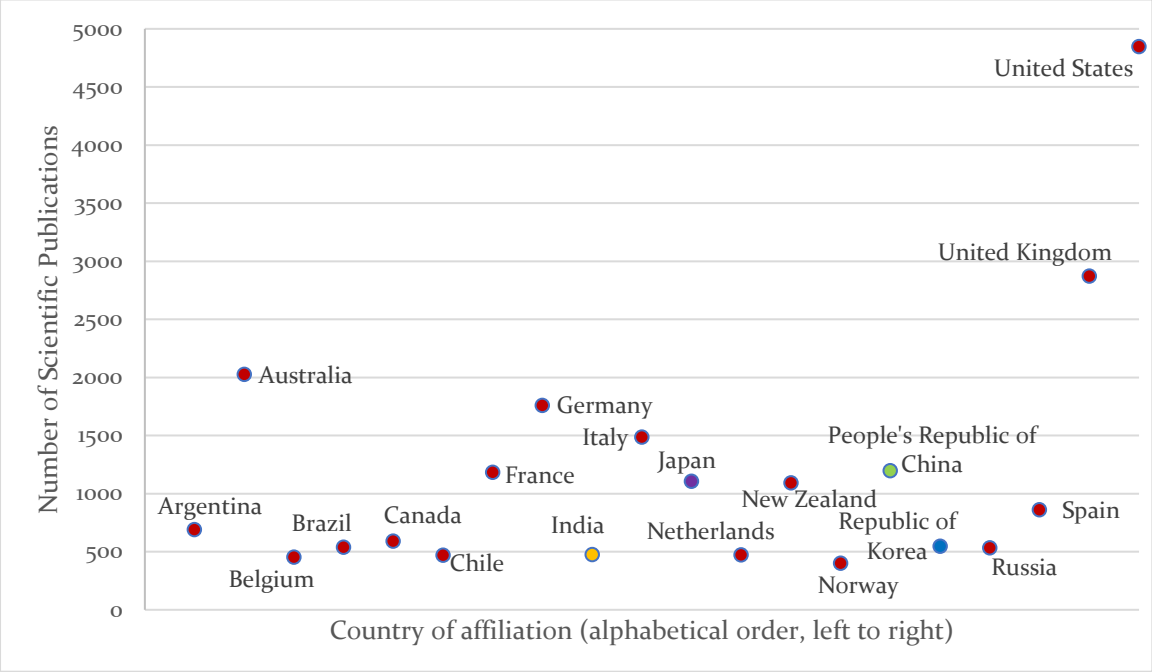

Figure 4. 9 Twenty most prolific countries affiliated with authors producing Antarctic-related scientific peer-reviewed publications from January 2004 to January 2018

Source: Data retrieved from Scopus in January 2018.

4.5 Conclusion

There is no doubt that Asian countries should be regarded as important players in Antarctic Treaty Area. Many of these countries, involved in Antarctic scientific activities, are not only the ones with a strong economy worldwide, but are also investing in scientific research.

Nevertheless, Asian countries are demonstrating their commitment towards the wider Antarctic community in an ambiguous manner. While these countries are investing in scientific projects, and the outcomes of those are well visible through the

high number of publications authored by Asian institutions, the governments are less active in their participation during ATCMs. It seems that Asian countries are not playing an important role in the AT governance system, especially in relation to the submission of Working Papers, given the possibility to propose and request actions to be undertaken by all the Parties. The submission of Working Papers is not the only way to demonstrate participation in governance issues, as

> [d]ecision making in ATCMs in not done by formal votes. Decisions during the proceedings are taken "on the basis of consensus informally arrived at". This is important because the ATCP representatives can discuss, negotiate, and compromise political and national interest concerns about various measures to create an agreement, thus ensuring that the measures will be adopted, and precluding diplomatic strains and political friction that might arise from voting (Joyner, 1998b, p. 406).

Additionally, the AT requires consensus for decision making "rather than the two-thirds or three-quarters majority voting rule found in many other international, especially environmental, agreements" (National Research Council, 1993, p. 34). It means that a single country that is not approving a Decision, Measure or a Resolution is enough to prevent the entry into force of it. However, it is in the spirit of the AT, based on consensus informally arrived at, that all the Parties work together to reach as much agreement as possible. Since the establishment of AFoPS in 2004, three Measures that have been adopted by the Parties during ATCMs are not yet effective: Measure 4 (2004) *Tourism and Non-Governmental activities*, Measure 1 (2005) *Annex VI (Liability)*, and Measure 15 (2009) *Landing of Persons from Passenger vessels*. However, India,

Japan, the People's Republic of China, and Korea are not the only countries to have not yet implemented these Measures into their domestic legislation and so these have not yet entered into force.

Analysing Information Papers, Asian countries are more active, but their participation is below that other countries, which produce a greater number of Information Papers and Working Papers. In doing that, these countries could have more control on ATCMs proposing actions and recommendations. As a regional group, AFoPS might, through the representative of their countries, produce joint Information Papers to be submitted yearly and constantly to ATCM. The submission of Information Papers, co-authored by all the Members who are also Parties to the Antarctic Treaty System, reporting on the group achievements, will give the group, through the attained accomplishments, a higher significance and impact into the Antarctic community. AFoPS Members have already achieved important results in term of Antarctic scientific research. Since 2004, there has been a sharp increase in peer-reviewed publications, and institutes located in AFoPS Members countries have contributed to 21% of the total scientific outcomes in Antarctica.

Future research could continue to monitor the submission of Working Papers to the ATCM to understand if Asian countries will play a more central role in the discussions and recommendation for action on specific topics. Furthermore, in the analysis of Scopus and WoS databases, a lack of coverage of humanities and social science' submissions have been highlighted; at present, Asian countries are focusing their research on hard science projects, however this limitation could be addressed as well.

The Asian countries that are more involved are the ones with a polar background and that have been active in Antarctica for more than thirty years. New co-operations, both logistic and scientific, are developing within Asian boundaries between countries with a well-established national Antarctic program and the ones who are still planning or have just developed their own. The first outcomes of these new co-operations are already visible thanks to the co-operative projects of Japan and the People's Republic of China's scientists with the ones from Thailand, just to mention an example. The interest towards Antarctica from countries that traditionally do not have a polar background, is still growing and these examples of co-operative projects can be only the starting point of many other rising from the sharing of expertise and knowledge.

Chapter V

Shared or joint facilities: the dichotomy of human presence in Antarctica

Abstract

The joint use of facilities has been seen by many (Keys, 1999; ASOC, 2004, 2006; Tin et al., 2009; Elzinga, 2012) as the unique way to assess co-operation in Antarctica. The only joint use of facility, at present, is represented by Concordia station, jointly run by the French and Italian national polar programs. This is not a failure of the co-operative system envisioned by the Antarctic Treaty but a nuance in the interpretation of shared activities conducted by the vast majority of programs involved in scientific research in Antarctica. In fact, 97% of the actors actively running an infrastructure in Antarctica declared that they are sharing their assets with other international programs. This chapter will present similarities, but differences, between two areas that have been considered as analogues: Antarctica and Outer Space. Antarctica has been used as a laboratory in preparation to future human expedition in the Outer Space; also, the legal regimes governing those present similarities. Cooperative projects, scientific and science-support, are pivotal to conduct expeditions here. Analysing the past experience of shared facility, and using Asian countries as a case study, will evaluate the present situation and future opportunity of co-operation in Antarctica.

Acknowledgments

Thank all those who found time in their busy schedules for the insights during interviews and to my supervisory team for their support on this project. This work was supported by the Gateway Antarctica scholarship, University of Canterbury, the Christchurch City Council Antarctic scholarship, and the Ministry of Foreign Affairs and Trade (MFAT) of New Zealand through the Gateway Antarctica Ministry of Foreign Affairs and Trade Scholarship in Antarctic and Southern Ocean Studies.

5.1 Background

The AT and the Protocol are the legal documents regulating direct human engagement with Antarctica. These agreements stress also the importance of co-operation between Parties operating in the Antarctic Treaty Area. In particular, Article III of the AT states

> [i]n order to promote international co-operation in scientific investigation in Antarctica, as provided for in Article II of the present Treaty, the Contracting Parties agree that, to the greatest extent feasible and practicable: (a) information regarding plans for scientific programs in Antarctica shall be exchanged to permit maximum economy and efficiency of operations; (b) scientific personnel shall be exchanged in Antarctica between expeditions and stations; (c) scientific observations and results from Antarctica shall be exchanged and made freely available.

Furthermore, Article 6 of the Protocol focuses on the co-operation in conducting activities in Antarctica and how the parties shall "where appropriate, undertake joint expeditions and share the use of stations and other facilities". Previous scholars analysed the environmental footprint of research infrastructures in Antarctica (Keys, 1999; ASOC, 2004, 2006; Tin et al., 2009; Elzinga, 2012), identifying and supporting the joint use of facilities as one of the possible solutions to reduce the human footprint on the continent. The joint use of a facility is often seen as the 'Holy Grail' of human interaction with Antarctica. Hemmings (2011) describes how the use of the verb 'to share' in relation to the use of stations "can mean many things short of a *joint* facility" (p. 6). The Cambridge dictionary defines the adjective 'joint' as "belonging to or shared between

two or more people" and the verb 'to share' as "to have or use something at the same time as someone else". It is the nuance between 'joint' and 'share', especially in the use of the verb 'to belong', that could be used as an index to measure the success or failure of future co-operation in regard to facilities in Antarctica.

COMNAP is an association whose Members that are the only government-approved organisations operating or maintaining assets in the Antarctic Treaty Area. COMNAP is an Observer to the ATCMs and, in such role, can submit Working Papers, Information Papers and contribute to the discussions. COMNAP gave presentations to ATCM XXII (Tromsø, Norway) 1998 on IP007 Rev.4, to ATCM XXXI (Kyev, Ukraine) 2008 on IP092, and to ATCM XXXVII (Brasilia, Brazil) 2014 on IP047 on the extent of scientific and logistic collaboration in Antarctica. According to the results presented by COMNAP, 97% of the respondents stated that their national Antarctic programme shared their facilities with other Parties. It means that twenty-eight of the twenty-nine Members shared Antarctic facilities with other Members. The sharing is not only limited to logistics. In fact, IP092 presented in 2008, showed that 96% of the stations hosted scientist from other countries. That is a clear demonstration that most Antarctic facilities, even though they are not jointly run, are shared between multiple countries.

One of the main aims of AFoPS is to foster international co-operation within Asian countries. To do that, AFoPS implemented exchange programmes for its Members to permit them to conduct research also in areas where researchers of a specific country are not present. This chapter will firstly present Asian assets as a case study of co-operation in Antarctica by AFoPS Members. The attention will then move to the Outer Space, used as an Antarctic analogue, to provide examples of co-operation

and shared facilities outside Antarctica before moving to the analysis of the current situation of shared facilities in Antarctica. The last decade saw a shift in the balance of power, intended as investment and presence on the continent, for the actors involved in the Antarctic scenario, and Brady (2012a) underlines that

> the change in budgets reflects relative declines and rises in hard power. China, India, and the Republic of Korea are looking for ways to assert international influence and build national pride (p. 1).

It is important to assess Asian countries' current assets and what they can achieve, in terms of science-support and logistics capabilities, as a regional group through the AFoPS because these countries continue to demonstrate their interest towards Antarctica and through their increased polar budgets.

5.2 Asian Assets in Antarctica

Brady (2012c, 2017a) stresses that Asian countries increased their national polar programs budgets with particular relevance to Antarctica. At present, India, Japan, the People's Republic of China, and the Republic of Korea are the only AFoPS Members to have a year-round presence in Antarctica through a total of nine facilities currently operated (COMNAP, 2017). Consequently, these four countries will be the focus of the Asian assets' analysis. Additionally, Pakistan, which signed both the AT and the Protocol, has maintained a station in Antarctica, the Jinnah Antarctic Station located in Dronning Maud Land run by the Polar Research Cell within the National Institute of Oceanography since 1992 (Mills, 2003; Hund, 2014). However, Pakistan is not part of AFoPS.

Scientists from Malaysia, Mongolia, Thailand, and Turkey conduct scientific research in Antarctica while hosted by other international Parties. Every year Japan and the Republic of Korea host international researchers, for periods from two weeks and up to three months, at their mainland national facilities[51]. Asian countries, sharing their assets, en route to or in Antarctica (Table 5.1), to conduct research and to help smaller countries to build their polar knowledge, present additional examples of scientific co-operation and hosting of personnel. In fact, AFoPS, supports also joint logistics activities through the use of aerial and maritime assets operated by, or for, Asian national Antarctic programs (Interviews with senior employees of Asian research Institutes, 2016).

Table 5. 1 Aerial and maritime assets operated by/for Asian countries

[51] Interviews conducted with senior employees of Japan and Republic of Korea polar programs on August 2016.

Country	Asset Name	Type	Use
India	AS 350 B2	Rotary-wing	Science support
	MV *Ivan Papanin*	Vessel	Cargo, Research, Science support
	Kamov 32	Rotary-wing	Cargo
Japan	AS 350 B2	Rotary-wing	Science support
	CH 101	Rotary-wing	Science support
	Hakuho-Maru	Vessel	Patrol
	RV *Shirase*	Vessel	Research, Science support
	Umitaka-Maru	Vessel	Research
People's Republic of China	Dolphin B-7102	Rotary-wing	Science support
	Kamov 32	Rotary-wing	Cargo
	Snow Eagle 601 (Basler BT-67)	Fixed-wing	Cargo, Science support
	RV *Xiangyanghong 01*	Vessel	Research
	RV *XueLong*	Vessel	Cargo, Research, Science support
	RV *XueLong 2* (Under Construction)	Vessel	Multipurpose
Republic of Korea	RV *Araon*	Vessel	Cargo, Research, Science support
	AS 350 B2	Rotary-wing	Science support

Source: COMNAP, 2018c; Secretariat of the Antarctic Treaty, 2018b.

Aviation capability includes fixed and rotary-wing aircrafts. While all Asian countries operating in Antarctica have rotary-wing aircraft capability, only the People's Republic of China owns a fixed-wing aircraft for intra-continental flights. With regard to extra-continental flights to reach Antarctica, all the five Asian countries co-operate and share air-lifting capability with other Antarctic players who own or charter aircrafts.

Maritime vessels play a pivotal role in research and supporting science in Antarctica, especially for Asian countries with Antarctic coastal facilities (seven facilities in total). Research vessels are fitted with a variety of laboratories enabling scientists to conduct research in multiple zones in the Antarctic Treaty Area and to host international researchers.

International collaborators are not only hosted during these sea voyages but also on station to conduct a vast array of research (Table 5.2). Japan is one of the most

proactive countries in hosting international, including Asian, researchers at its facilities and on its vessels. Since the establishment of its first station, Syowa, in 1958, every summer Japan invites and hosts international researchers. In 1993, a Chinese physicist scientist was hosted as part of the winter-over party (National Institute of Polar Research, 1995). Equally, every year Japan sends one scientist to a foreign station to conduct collaborative research. The People's Republic of China and the Republic of Korea often host Asian researchers at their stations, especially from countries that "have [a] limited budget"[52]. Through AFoPS, there is an opportunity to help these countries "to develop a more solid Antarctic science programme"[53]. AFoPS aims to avoid overlap, in research moving towards multinational and multi-stakeholder projects fostering collective outcomes[54]. One of the main goals of AFoPS is to provide a foundation for cooperative research activities by Asian countries.

[52] Interview with senior employee of the Korea Polar Research Institute on August 2016
[53] Interview with senior employee of the Korea Polar Research Institute on August 2016.
[54] Interviews with senior employees of the Korea Polar Research Institute on August 2016.

Table 5. 2 Antarctic facilities operated by Asian countries and scientific research conducted

	India		Japan				People's Republic of China					Republic of Korea	
	Bharati	**Maitri**	**Asuka**	**Dome Fuji**	**Mizuho**	**Syowa**	**Great Wall**	**Kunlun**	**Taishan**	**Victoria Land**	**Zhongshan**	**Jang Bogo**	**King Sejong**
Astrophysics				+		+		+					
Atmospheric chemistry and physics	+	+	+	+		+		+		+	+	+	
Climate change	+	+	+	+		+		+		+			
Climatology						+	+						
Ecology						+							
Environmental sciences	+	+				+	+					+	
Geocryology						+							
Geodesy		+				+							
Geology	+	+	+			+	+				+	+	+
Geomorphology	+	+	+			+							
Geophysics	+	+	+			+							
Glaciology	+	+	+	+	+	+		+	+	+		+	
Human biology	+			+		+							
Isotopic chemistry	+	+				+							
Limnology						+							
Mapping	+	+	+			+		+					
Marine biology						+	+			+			+
Medicine						+							
Meteorology					+				+		+		
Microbiology						+					+		
Oceanography						+						+	
Paleolimnology	+	+				+							
Physic and astronomy												+	
Pollution						+							
Sedimentology	+	+											
Seismology								+					
Space physics observation									+				
Terrestrial biology						+	+			+	+		+

Source: COMNAP, 2017; Polar Research Institute of China, 2018.

Two of the most recent examples of co-operative efforts by AFoPS Members are the agreement to share "bases and icebreakers and joint research" (Brady, 2017b, p. 176) which was signed by the People's Republic of China and the Republic of Korea in 2013, and the Agreement of Cooperation on Polar Research signed by the Polar Research Institute of China and the Korea Polar Research Institute in Davos, Switzerland, in June 2018. The latter agreement will be in force for five years and aims to promote co-operation, both scientific and science-support, in order to create a framework for better co-ordination of future activities.

5.3 The analogies between Antarctica and Outer Space

Antarctica has often been seen as an analogue for Outer Space for both human adaptation and from a legal perspective. Smith and Jones (1962) state that "the Antarctic situation, taken as a whole, is about as similar to the astronaut's as we are likely to find on earth" (p. 162). Lugg and Shepanek (1999) add that the Antarctic environment "with its total physical isolation, cold and marked photoperiodicity is arguably the most extreme and certainly the most isolated on Earth" (p. 693). From a legal perspective, Jessup and Taubenfeld (1959) add that, similar to Antarctica, "there is an area above the surface of the earth over which each terrestrial state is entitled to claim and exercise its sovereignty" (pp. 364–365). However, this area above the surface, often referred as Outer Space, created problems for governments that were not ready to legislate for it. Peterson (2005) analyses that the three main categories of place used by international laws in 1957, *res nullius*, *res communis*, and state domain, do not fit with the definition and characteristics of the Outer Space.

The human experience in the Antarctic, and especially for personnel contracted as winter-over crew, involves a period of prolonged isolation and necessitates sharing of the experience with a small group of peers. The Antarctic environment presents various features suited for using Antarctica as a "behavioral [sic] laboratory for outer space" (Harrison, Clearwater, & McKay, 1989, p. 253). Additionally, as presented by Smith and Jones (1962) "the element of exploration, of adventure and hazard, … is common to both space and to the Antarctic" (p. 162). Also, Palinkas (1987; 1988) sees some of the peculiarities of Antarctica as the analogue for the human presence in space stating that

> Antarctica has relevance to the space program not merely in terms of the synchronic examination of human factors in extended space missions but also in terms of the diachronic examination of process of exploration and associated activities. … the pattern of exploratory activity in Antarctica provides a useful analog [sic] for understating processes of adaptation and adjustment at different stages in the human exploration of Mars (Palinkas, 1987, p. 5)

Not only the physical and physiological conditions the human body is exposed to in Antarctica are similar to the ones in Outer Space, but also some of the technologies used are comparable. Due to the distance of Antarctic stations from the countries running them and the difficulty, or sometimes impossibility, to evacuate in case of medical emergency, telemedicine equipment is increasing in quality and capacity in Antarctica. Today, some Antarctic stations are equipped with real-time telemedicine capability. Ohno et al. (2012) analyse how the Japanese Antarctic Research Expeditions

have been using telemedicine, since the first expedition in 1956, and the improvement that telemedicine had during the years helped Japanese expeditioners to solve an array of medical conditions. Similarly, telemedicine is used in space activities, and

> space agencies have recognised Antarctica as a useful analogue for assessing telemedicine. The extreme remoteness, difficulty of evacuation, limitations of medical cover, of both Antarctica and Space mean that the ability to communicate with distant health professional is extremely desirable (Lugg & Shepanek, 1999, p. 697).

As mentioned before, the similarities between Antarctica and Outer Space are not only on human adaptation to extreme environment, but also in relation to governance (Salazar, 2017). First of all, the activities in Antarctica and Outer Space are regulated, in international law, by the AT and the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies[55], respectively. Both treaties prohibit the establishment of military bases in the territories they govern, and the testing of military weapons there (Article I AT, Article IV Outer Space Treaty) and ensure the peaceful uses of these areas. The adoption of these two treaties happened at a specific historical moment of tension during the Cold War (Collis, 2017; Martinez et al., 2018) and represents a turning point also for legal geography scholars. Before the entry into force of these two treaties, and since the 1648 Peace of Westphalia, the world was divided into territories possessed by states (Ó Tuathail, 1996) and sovereignty, was defined as:

[55] The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, opened for signature 27 January 1967, 610 U.N.T.S. 205, entered into force 10 October 1967. [Hereinafter Outer Space Treaty].

> the supreme legal authority of the nation to give and enforce the law within a certain territory and, in consequence, independence from the authority of any other nation and quality with it under international law (Morgenthau, 1967, p. 305).

Both Antarctica, despites the claims advanced by seven countries but not accepted by the other Parties involved in activities in the continent, and Outer Space were considered *res nullius* at the time the treaties were signed.

> *Res nullius* is an un-owned space that is possessible through the conventional means of territorial possession; *res communis* is an un-owned space that is not capable of being transformed into the possession of a single actor (Collis, 2017, p. 290).

The AT and the Outer Space Treaty introduced, through Article IV (AT) and Article II (Outer Space Treaty), made it impossible for any signatory parties to claim sovereignty over part or all of the territories in question (the Antarctic Treaty Area, and Outer Space) while these treaties are in force. Territories previously defined as *res nullius* conceded to *res communis*, intended as territory jointly managed by Parties but owned by none (Chaturvedi, 1996; Collis, 2010, 2017). Ku (1990) argues that international spaces have to fulfil two criteria to be considered *res communis*: "the absence of territorial sovereignty and its prohibition" (p. 470). Both Antarctica and Outer Space fulfil these two criteria. With regard to Antarctica, territorial sovereignty is not abolished but it is in abeyance. These territories also started to be seen by some as Common Heritage of Mankind (Joyner, 1986; Tenenbaum, 1990; Zou, 1991; Loan, 2004; Collis, 2009).

Article II of the AT and Article I of the Outer Space Treaty support the freedom of investigation and co-operation between countries. There have been various examples of international co-operation and joint expedition, both in Antarctica and in the outer space, which will be analysed here.

5.4 Co-operative Initiatives in Outer Space

The exploration of Outer Space is a relatively new human endeavour. Since 1961, when the first human journeyed into space, there have been several examples of cooperative efforts in activities conducted by spatial agencies. Two examples of shared use (the Apollo – Soyuz mission and the International Space Station (ISS)) and one example of an agreement to co-operate are presented in this chapter.

The latter agreement was to analyse the most suitable way to conduct a joint expedition to Mars. On 29–30 June 2008, the European Space Agency (ESA) and the National Aeronautics and Space Administration of the United States of America (NASA) met and established the Mars Exploration Joint Initiative (MEJI). Thanks to the bilateral agreements that form MEJI, the two agencies are willing to co-operate in the development of a projects which aim to return samples from Mars in the 2020s (National Aeronautics and Space Administration of the United States of America, 2009).

The Apollo – Soyuz mission was the first international space mission to be organised. Soyuz 19, a spacecraft funded by the Soviet Union, was launched on 15 July 1975 from Baikonur Cosmodrome, Kazakistan, and the Apollo capsule, funded by the United States of America, departed seven hours and thirty minutes later from the Kennedy Space Center, Florida, United States of America. The two capsules travelled into space for two days before docking together above the Atlantic Ocean where the

four astronauts, two from the Soviet Union and two from the United States of America, shared a space and undertook research together for nineteen hours and fifty-five minutes (National Aeronautics and Space Administration of the United States of America, 2010).

The ISS is a joint effort of five space agencies and governments, namely the Canadian Space Agency (CSA), ESA, the Government of Japan (GOJ), NASA, and the Russian Space Agency (RSA). The ISS is regulated by the Memorandum of Understanding between the NASA and the RSA Concerning Cooperation on the Civil International Space Station[56]. This Memorandum of Understating considered the previous bi-lateral agreements between the Members – NASA-CSA Agreement[57], NASA-ESA Agreement[58], and NASA-GOJ Agreement[59] – all signed in the early 1998 (Broniatowski, Faith, & Sabathier, 2006), describing, with Article 2.1 the role played by the spatial agencies in this project, stating that

> NASA, RSA, the GOJ, ESA, and CSA will join their efforts, under the lead role of NASA for overall management and coordination, to create an integrated international Space Station (hereinafter "the Space Station"). NASA and RSA, drawing on their extensive experience in human space

[56] The Memorandum of Understanding between the National Aeronautics and Space Administration of the United States of America and the Russian Space Agency Concerning Cooperation on the Civil International Space Station, signed on 29 January 1998 in Washington D.C. [Hereinafter NASA-RSA Agreement].
[57] The Memorandum of Understanding between the National Aeronautics and Space Administration of the United States of America and the Canadian Space Agency Concerning Cooperation on the Civil International Space Station, signed on 29 January 1998 in Washington D.C.
[58] The Memorandum of Understanding between the National Aeronautics and Space Administration of the United States of America and the European Space Agency Concerning Cooperation on the Civil International Space Station, signed on 29 January 1998 in Washington D.C.
[59] The Memorandum of Understanding between the National Aeronautics and Space Administration of the United States of America and the Government of Japan Concerning Cooperation on the Civil International Space Station, signed on 24 February 1998 in Washington D.C.

> flight, will produce elements which serve as the foundation for the Space Station. The GOJ and ESA will produce elements that will significantly enhance the Space Station's capabilities. CSA's contribution will be an essential part of the Space Station.

Under Article 2.2 of the NASA-RSA Agreement, all the Members are subject to provide elements supporting the utilization of the other elements forming the stations in orbit, and Article 9.3a states that "NASA, RSA and the other partners will equitably share responsibility for the common system operation costs or activities". The Members own their equipment and share the use of that equipment with the other parties involved in the scientific missions. This type of ownership is also likely to impact on the life-time of the ISS because if one of the participants withdraw from the mission, this has implications for the whole project. A peculiarity of the station is the need of support from all the Members to be able to maintain the station, both from a cost (NASA covers 23% of the shared cost for the station) and technical (RSA provides crew transport to and propulsion to the station) perspective (Martin, 2018). In addition, Martin (2018) examining the future of the station underlines that even if the probable life-span of the ISS is to 2028, the future of the station beyond 2024 would not be clear. The future uncertainty is related to the continued presence of the other Members, in particular ESA and RSA whose "participation hinges on issues ranging from international politics to differing space exploration goals" (Martin, 2018, p. 4).

The issues presented by Martin (2018) are also relevant for Antarctica. Hemmings (2011) underlines how sovereignty issues were one of the reasons behind the difficulties of having a joint station in Antarctica. Furthermore, a senior representative of a national

Antarctic program, during a presentation given on 21 November 2017 at the University of Canterbury, New Zealand, underlined that one of the main obstacles in having joint facilities in Antarctica is related to operation and maintenance costs and which member of the joint activity is sustaining it.

5.5 Co-operative Initiatives in Antarctica

Using the Heroic Era of Antarctic exploration as a starting point to human engagement in Antarctica, there are a few early examples of co-operative use of facilities. Before the entry into force of the AT, the first example of a shared facility dates back to 1949–1952 with the Norwegian – Swedish – British Antarctic expedition. During this expedition, which undertook geology, glaciology, and meteorology research (Ahlmann, 1949), the joint Maudheim station was erected in Queen Maud Land. During the IGY 1957–1958, although many national stations hosted foreign scientists, there was only one example of a joint facility established: Cape Hallett station, Victoria Land. Cape Hallett Station was established in 1956–1957 as a joint year-round facility run by New Zealand and the United States of America. The station had capacity for up to fifty people during summer months and twenty people during winter and, initially, its main purpose was weather forecasting (Carson, 2008). Later, during the IGY, the focus shifted to research on meteorology and geomagnetism. The station was jointly operated until 1964 when New Zealand formally withdrew from the operation of the facility. In the same year, the main scientific laboratory was destroyed in a fire. The Unites States of America continued to occupy the station during the summer months only until 1973, when it was abandoned leaving the building in place for future use. The facility was never occupied again. New Zealand and the United States of America, during the ATCM XXIX

(Edinburgh, United Kingdom) 2006, presented IP115 updating all the Parties on the situation of Cape Hallett Station. They informed the Parties that a clean-up of the location had been conducted over three summer seasons and nothing was left in place. Thus, what began as a joint station, ended, finally, in a timely joint clean-up of an unused Antarctic facility.

During the IGY 1957–1958, as part of one of the seven station established in this period, the United States of America inaugurated Wilkes station, Wilkes Land, East Antarctica, on 29 January 1957. At the end of the IGY, in 1958, the United States of America offered Australia the opportunity to use the station, and Australia agreed on a shared use of the station with a ceremony held on 7 February 1959. This shared use lasted for two additional years when, in 1961, Australia became the sole operator of the station until 1969, when it was replaced by Casey station.

5.5.1 Modalities of co-operative use of facilities

The ASOC (2006) presents six modalities of co-operative use of facilities that have been employed over the years by multiple Parties as an alternative to having a new station built. Those modalities were: no station, joint station, joint logistics, new partnership, annexes, and station transfers. At present, 100 facilities are being operated in the Antarctic Treaty Area[60] (COMNAP, 2018a).

The only example of partnership was between Australia and Romania for the joint occupation of the Law-Racovita station but is no longer in place. Australia opened

[60] The count of these facilities, that are currently open in the Antarctic Treaty Area, includes airfield camps, camps, depots, laboratories, refuges, and stations, as defined in the COMNAP Antarctic Facilities List.

Law station in the Larsemann Hills, East Antarctica, in 1986 and subsequently, in 2005, signed a 10-year Memorandum of Understanding with Romania for joint use of this facility (Hemmings, 2011). Romania was a new, relatively minor, player in the Antarctic, and was unable to establish and maintain its own facility. After signing the Memorandum of Understanding, Australia and Romania started the joint use of the facility, newly named Law-Racovita, on 13 January 2006; in 2011 the station was renamed Law-Racovita-Negoita. In 2015, the agreement on the joint use of the facility was not extended, principally due to lack of Antarctic activity by Romania, and the facility returned to be solely used by Australia under the original name of Law base.

The categories "no station" and "annexes", as presented by ASOC (2006), can be combined in a unique group including three examples of laboratories and facilities located within another country's station. The Netherlands inaugurated on 27 January 2013 the Dirck Gerritsz laboratory, located at the United Kingdom's Rothera station. The Dirck Gerritsz laboratory is formed by four containers, each one with specific requirements to permit researchers to conduct multiple projects (Netherlands Polar Programme, 2018). The Netherlands decided to establish only this containerised laboratory instead of building a new station to minimise their environmental impact in Antarctica in accordance with their government's policy which aligned with Protocol Articles 3, 6, and 8. Similarly, the German Alfred-Wegener-Institute Helmholtz Centre for Polar and Marine Research is running the Dallmann laboratory within Argentina's Carlini station on King George Island, Antarctic Peninsula. The laboratory was inaugurated in 1994 and is staffed with German researchers from October to March every year. During the winter months "one person provided by the Instituto Antártico Argentino (IAA) / Dirección National del Antártico (DNA) conducts measurements and

maintains the laboratory" (COMNAP, 2017, p. 76). The Germans are also, through the German Aerospace Center and the Federal Agency for Cartography and Geodesy, running, with the logistics support of Chile's Instituto Antártico Chileno (INACH), the German Antarctic Receiving Station (GARS) (Neidhardt, Plötz & Klügel, 2012) in the vicinity of the Chilean O'Higgins station.

The logistics support provided by INACH to the GARS is not an isolated situation in Antarctica. For example, Finland and Sweden share some of the logistics at their two stations. Finland manages Aboa station and Sweden Wasa; both the stations are located in the Vestfjella Mountains area, Dronning Maud Land, and are 200 meters apart. These two facilities together form the Nordenskiöld Base Camp and share both logistics and research activities (COMNAP, 2017).

5.5.2 Station transfer

Even though a station transfer is not a way of sharing facilities, in the strict meaning of shared use as something that occurs at the same time by different parties, it is worth mentioning five infrastructures that have been transferred from one country to another. The first example is Oasis station, in the Bunger Oasis, Dronning Maud Land, which was established by the Soviet Union and, with a ceremony held on 23 January 1959, handed over to Poland and renamed Antoni Boleslaw Dobrowoski station (Polish Polar Research, 1985). The United Kingdom transferred the highest number of stations, four, to other countries. Adelaide station, also known as Station T, located on Adelaide Island, Antarctic Peninsula, was inaugurated on 3 February 1961 by the United Kingdom and operated until 1 March 1977. On 14 August 1984 the station was transferred to Chile, and in May 1985 renamed Lieutenant Luis Carvajal. At present the station is operated

by the INACH from October to March (COMNAP, 2017). The United Kingdom also handed View Point station, also known as Station V, over to Chile. Station V was inaugurated on 3 June 1953 and remained in operation until 25 November 1963. On 29 July 1996, the station was transferred to Chile and renamed after General R. C. Montalva. At present, Chile is operating this facility during winter months, in August and September, as a refuge under the name General Jorge Boonen Rivera. On 6 February 1996, Faraday station, or Station F, was transferred to Ukraine and renamed Vernadsky. Faraday had been inaugurated on 7 January 1947 and served as research station for geophysics and meteorological studies until the hand over. Finally, Hope Bay station, Station D, firstly built in 1945 before being destroyed by a fire and rebuilt on 1952, was transferred to Uruguay and renamed Ruperto Elichiribehety. Ruperto Elichiribehety station is currently occupied during the summer months by the Uruguayan Antarctic Institute personnel (COMNAP, 2017).

5.5.3 The unique example of joint facility

The above examples show a shared used of facility rather than a joint use. The only example, at present, of joint use of a facility in Antarctica is Concordia station at Dome C, Antarctica. This cooperative project started in 1992 when France during the ATCM XVII (Venice, Italy) submitted IP035 *Study of the environmental impact of the construction and operation of a scientific base at Dome C*. Subsequently, in March 1993, an agreement between the Italian Ente per le Nuove Tecnologie, l'Energia e l'Ambiente and the French IPEV was signed "defining a joint venture between the two organisations with equal participation in the enterprise of building and operating of a scientific station

at Dome C … participation being opened to other partners at any subsequent time" (Gendrin & Giuliani, 1994, pp.1–2).

The main difference between Concordia station and other examples of shared facilities lies in the equal participation of these two countries in this project. France and Italy built this station between 1999 and 2005, and have occupied it ever since (COMNAP, 2017). The location makes the station particularly suitable for astronomic, ice coring and human adaptation projects. ESA nicknamed Concordia station 'White Mars' as it runs research on human adaptation at extreme conditions using Antarctica as laboratory with a view to human mission to the moon or Mars (European Space Agency, 2013).

5.6 Conclusion

Hemmings (2011) underlines that one of the reasons behind a lack of joint Antarctic facilities is the territorial claims issue. However, only seven countries, out of the fifty-three that signed the AT, or the thirty that are currently operating at least one facility in Antarctica, claim a portion of Antarctica, plus two that reserve the basis to claim in the future. Such a view on the territorial claims issue appears to be too narrow. Pragmatism may ultimately play a key role. The reason for having only one joint station in Antarctica could be related to nationalistic ideology, funding, and daily operating requirements including cultural, geographical, linguistic differences, even preferences for food choices. A senior employee of the Korea Polar Research Institute affirms[61] that

[61] Personal interview, August 2016.

> all national polar programs need a sponsor, whether this is a government or a Royal society; in modern days the sponsor is the government. When government grants funding, they need a reason to do it and they are not willing to share it with others. One of the strong motivations for Asian countries to be involved in Antarctica, very much rely on national pride.

The funding problem is not solely related to Antarctica, and neither are the nationalistic values, but is also visible in the case of the ISS, specifically on the issues related to its working time-frame. Additionally, there could also be possible legal, practical and technical issues. If one of the parties involved in the project is no longer able to fulfil its part of the agreement it can mean a failure for the entire project. Applying this example to Antarctica, two or more countries could jointly establish a station but suddenly, one of the parties is no longer able to fund scientists to conduct research and afford maintenance for the building. Will this party be considered liable for the removal of the station from Antarctica? And, how could this party afford several seasons of cleaning-up without funding? A future in which Antarctica will be sprinkled with joint stations will not be as easy to achieve as it may seem. It could be wrapped up in this simple but effective sentence: "you can come to my house, use my house whenever you like; you are more than welcome to come but we are not going to build it together" (Personal interview with a senior employee of the Korea Polar Research Institute, 2016).

However, past examples indicate that the shared use of facilities is something that all the countries already conducting research in Antarctica are doing, are willing to

continue to do and even implement. Referring to co-operation under an AFoPS umbrella, a senior employee of the Korea Polar Research Institute states[62] that

> we are quite open, especially towards Malaysia; we can share our stations and we invited Malaysian researchers many times to visit our facilities. Some Asian countries have not enough resources to have their own and it is the perfect opportunity to share. However, to jointly build a station is much different than share existing space. There are not only scientific needs, it is a kind of strategy, that's different.

Some scholars (Keys, 1999; ASOC, 2004, 2006; Tin et al., 2009; Elzinga, 2012) imply that the joint use of facilities should be recognised as the way forward for the future human presence in Antarctica and the lack of these kind of co-operation is a failure. However, the presence of 100 infrastructures on the Antarctic continent alone enables a greater number of opportunities to understand how

> atmospheric and oceanic teleconnections communicate climate variations at low altitude to Antarctica and the Southern Ocean, influencing the polar atmosphere, ocean, ice sheet, sea ice and biosphere. Likewise, Antarctica and the surrounding Southern Ocean affect the rest of the globe (Rintoul et al., 2018, p. 233)

The infrastructures that are already in place are widely distributed across the whole continent, giving scientists the opportunity to research within twenty-one environmental-geographical regions, as presented in Resolution 3 (2008) *Environmental*

[62] Personal interview, August 2016.

Domains Analysis on the Antarctic continent as a dynamic model for a systematic environmental geographic framework, and sixteen Antarctic Conservation Biogeographic regions, as per Resolution 3 (2017) *Revised Antarctic Conservation Biogeographic Regions*. Additionally, the presence of these facilities gives 'new-comers' in the Antarctic community an opportunity to share space with actors with an already established programme and improve their knowledge through co-operation. A hypothetic scenario with only joint facilities in Antarctica will reduce the possibility for countries with limited resources to join Antarctic activities and will go against the concept of Antarctica as the Common Heritage of Mankind. On the other hand, a shared or co-operative use of a facility already in place will grant better opportunities to all researchers to conduct their projects.

A senior representative of an Asian polar programme affirms that he has "a plan to rent [out] a space during the summer months to scientists from 'new-comers' countries; we can give it on loan for specific scientific projects" (Personal interview, 2016). The renting of a space within a facility could be the way forward to continue to have cooperative projects with other countries and further increase co-operation. It can be valuable for actors, such as Malaysia, Thailand, or Turkey, with a limited or recent experience to improve their knowledge to better develop their national Antarctic program.

To conclude, the joint use of a facility is not the only indicator of international co-operation between countries as prescribed by AT and the Protocol. In fact, there is already an extended degree of co-operation between actors in Antarctica, in multiple ways: through facilities, vessels and institutions in one's own country. In fact, in 2014,

the results of the survey presented by COMNAP during ATCM XXXVII (Brasilia, Brazil) showed that twenty-eight of the twenty-nine COMNAP Members were sharing their facilities with other Parties of the AT. These results are extremely significant because COMNAP Members, that since 2015 become thirty, are the only governmental entities operating infrastructures in Antarctica.

Chapter VI

Synthesis and Conclusions

The work presented here focused on AFoPS' role in the wider Antarctic theatre. The scientific presence, the support to policy-making mechanisms, and co-operation within members of this regional group have been analysed. The same analysis could be conducted also on the other regional groups operating in Antarctica to have a more comprehensive approach to the co-operative efforts that many countries are conducting to achieve results that could not be possible to accomplish as a single country.

The following section summarises the main conclusions from the work described in Chapters III, IV and V, identifying how each chapter contributes to the research goals outlined in Chapter I and improves our understating on the relation of Asian countries and AFoPS towards Antarctica. Chapter I gave an overview of the current situation on the Asian involvement in Antarctic issues underlining a gap of knowledge with regard to co-operation and regional activities that I tried to bridge with this thesis. In fact, many scholars analysed the Asian presence in Antarctica and focused on the results achieved by single countries. However, few scholars considered the influence that regional groups can have.

6.1 Presence in the Antarctic Treaty System

While AFoPS as a group is not recognised as a Party or Observer during the ATCMs, five of the six countries that are Members of this group are AT Parties –

India, Japan, the People's Republic of China, and the Republic of Korea with Consultative status, and Malaysia with non-Consultative status. Japan was also one of the original signatories to the AT, and the other aforementioned countries have been involved in the policy-making and Antarctic governance processes for a long time. Although their long-standing presence during ATCMs does not find validations in their participation during those meetings. Participation is not merely physical and vocal presence; all Asian Consultative Parties send numerous delegations and submit papers to the meetings. Missing the opportunity to submit Working Papers leaves Asian countries without the ability to shape ATCM recommendations and actions. In fact, during ATCM XXXIV (Buenos Aires, Argentina) 2011, France, Australia, and New Zealand tabled Working Paper 036 *A proposed new approach to the handling of Information Papers* in which they proposed that Information Papers would only be submitted to support a Working Paper. With this proposal, Information Papers would be briefly introduced only in conjunction with the relevant Working Paper. The decision-making procedure in the ATCM works on a consensus basis (Shibata, 2015). During the same ATCM, Resolution 2 (2011) *Revised Rules of Procedure – Annex Procedures for the Submission, Translation and Distribution for the ATCM and CEP* entered into force. Resolution 2 (2011), while stating that a Consultative Party could request the translation of an Information Papers, affirmed that papers that had not been translated into all the of the four official ATS languages should not be tabled for discussion during an ATCM. The above-mentioned Working Paper 036 and Resolution 2 (2011) reinforce the role of Working Papers. However, Table 6.1 presents an overview of Information Papers that have been tabled for discussion since 2011, even though these were neither related to a Working Papers nor translated into all of the four languages.

The introduction and discussion of these papers, however, did not lead to substantial actions during the ATCMs. Rather, these Information Papers stimulated discussion amongst the Parties mentioned in the papers or the Parties that were worried about the information presented in these papers. At the CEP Meeting during the ATCM XXXVI (Brussels, Belgium) in 2013, ASOC presented IP062. This is the only Information Paper to have been introduced not in conjunction with a Working Paper after Resolution 2 (2011) was agreed on. IP062 (2013) raised an issue on climate change that was noted and considered by the CEP Intersessional Contact Group (ICG).

If not through the submission of Working Papers, Consultative Parties can avoid approving new initiatives by not implementing them. Since the establishment of AFoPS, three Measures have been agreed by the Parties but have not yet been implemented. However, it has to be noted that not only Asian countries were not approving these Measures. As shown by Table 6.2, many countries have yet to implement these three Measures; in accordance with AT Article IX, paragraph 4, the approval of all the countries listed in Table 6.2, with the exception of the Czech Republic, is required for the Measures to become effective. In the period preceding the establishment of AFoPS three Measures agreed at ATCMs have not been become yet effective: Measure 5 (1989) *Environmental monitoring activities*, Measure 1 (1991) *Antarctic legislation and information exchange*, and Measure 12 (1991) *Seismic Data Library System*.

Table 6. 1 Discussions raised by Information Papers post Resolution 2 (2011)

Information Paper	Title	Year	Party(ies)	Language(s)	Discussion – Results
IP 047	United States-Russian Federation Report of Inspection	2012	United States of America, Russian Federation	English	Debate with all the countries which stations were inspected and especially Italy and France on disparity of salary at Concordia (not related to CEP issues)
IP 054	Implication of Antarctic krill fishing in ASMA No. 1 – Admiralty Bay	2012	ASOC	English	Discussion involved numerous Parties, ASOC introduced also IP 028 and Brazil informed about revision of IP 066. Committee underlined the importance of krill fishing in ASMA No. 1
IP 045	Report of Russia – US joint Antarctic Inspection, November 29 – December 6, 2012	2013	Russian Federation, United States of America	English, Russian	Debate on second part of inspections presented the at the previous ATCM, concern on non-governmental entities activities at some stations
IP 062	An Antarctic Climate Change Report Card	2013	ASOC	English	Committee noted that the issue raised by this paper could be included in ICG Climate Change
IP 073	New Antarctic Stations: Are they justified?	2014	ASOC	English	Many Parties were concern about the inaccuracy of the data proposed
IP 062	National Antarctic Programme use of locations with Visitor Site Guidelines in 2015-16	2016	United Kingdom, Argentina, Australia, United States of America	English	Need to give consideration in the future to this issue
IP 066	Blue Ice Runway by Romnæsfjellet	2017	Norway, Belgium	English	Paper in response to ATCM XXXIX request on update post-inspection
IP 053	On regulation of yachting in Antarctic waters	2018	Russian Federation	English, Russian	Many parties discussed on this paper on non-authorised vessel skipped by a Russian captain sailing in Antarctic waters

Source: Secretariat of the Antarctic Treaty (2018c).

Table 6. 2 Measures not yet effective since 2004

Measure	Year	Subject	Countries not yet approving
Measure 4	2004	Tourism and Non-Governmental activities	Brazil, Bulgaria, Germany, India, Italy, People's Republic of China, Peru, Republic of Korea, Spain, Sweden, United States of America
Measure 1	2005	Annex VI (Liability)	Argentina, Belgium, Brazil, Bulgaria, Chile, Czech Republic, France, Germany, India, Japan, People's Republic of China, Republic of Korea, United States of America
Measure 15	2009	Landing of Persons from Passengers vessels	Argentina, Belgium, Brazil, Bulgaria, Chile, Germany, India, Italy, Norway, People's Republic of China, Peru, Poland, Republic of Korea, South Africa, Spain, Sweden, Ukraine, United States of America

Source: Secretariat of the Antarctic Treaty (2018d).

Similarly, with a below-the-average submission of Information Papers, Asian countries have underutilised the opportunity to inform other countries of their activities.

It is through the use of Information Papers submitted by their countries ATCM delegates that AFoPS Members could reach one of their goals of presenting their achievements to the other Parties. After the establishment of AFoPS, few Information Papers have been submitted to inform the other countries on this group's activities. However, this effort has not been continuous. It is of strategic importance for AFoPS future to continue to submit, in an ongoing manner, Information and Working Papers to the ATCMs to inform the Antarctic Treaty System.

Two main reasons have been highlighted behind this lack of papers: language and the purpose of AFoPS. None of the AFoPS Members, and Asian Parties to the AT, have their native language represented as one of the official languages of the Antarctic

Treaty System. During one of the interviews, a senior employee of a polar program of one AFoPS Member country affirmed that not having native English speakers as delegates to various Antarctic meetings diminishes their participation and influence. With regard to AFoPS' purpose, Kim et al. (2010) state that

> AFoPS provides a forum to seek a common view on polar affairs among member countries and members agree to work together to develop and support cooperative programs on polar research, joint science projects, personnel exchange program between polar expeditions and institutes and convene joint symposia and workshops for polar sciences and support Asian countries to develop their national polar programs (p. 4).

During interviews, participants stated that AFoPS' purpose is to facilitate and foster scientific and logistic co-operation and there are no intentions of being a policy-making organisation. Answering a specific question on the role of AFoPS in policy-making within the Antarctic Treaty System, participants state that AFoPS "is not interested in political issues" (Personal interview with a senior employee of an AFoPS Member organisation, 2016), that the group's aims are "more related to science and logistics rather than policies" (Personal interview with a senior employee of the Korea Polar Research Institute, 2016) and that at present AFoPS "will not extend its interest to policy matters" (Personal interview with a senior employee of the Korea Polar Research Institute, 2016). Additionally Kim and Jeong (2015) note that AFoPS "has served as an important medium of Asian collective endeavors [sic] for polar affairs in human and information exchange, research collaboration, and logistics co-operation for the last decade" (p. 338). While attending to the AFoPS AGM 2016, I have witnessed that all the

meeting papers presented and the discussions around these were not covering any governance or policy-making issues but only science and science-support themes.

Noting their non-political purposes, it is also important to underline how scholars (Berkman, 2002; King, 2017; Hughes et al., 2018) cover the importance of the relation between science and policy-making. So, AFoPS, with the submission of Information Papers through one of its Members, can inform also the Parties of their scientific Antarctic know-how.

It is possible that different agencies take part in different fora representing the same country. Dey Nuttall (2018) presents how, within the Consultative countries that are Parties to the ATCM, various organisations represent their country during ATCM, COMNAP and SCAR meetings:

> [a] national Antarctic operating agency is invariably part of a much larger government organization or institution. Some have responsibilities in other areas, for example those that are region-specific like the Arctic, or science-specific such as oceans, environment or earth sciences, or politically-specific such as foreign affairs. The list of such operating agencies therefore includes a considerable range of government departments, ministries, national research institutes, and national funding bodies, all with widely differing terms of reference. The degree of executive control and oversight of Antarctic scientific activities in these organizations varies from one country to another (Dey Nuttall, 2018, p. 299).

All AFoPS Members are research institutes, underlining the scientific purposes of the group, and only one of these institutes is forms the delegation of its country's Consultative Party to the ATCMs, as shown in Table 6.3. This clearly represents a limitation on AFoPS' capacity to inform other Parties and influence the Antarctic Treaty System. At present, only the Republic of Korea through KOPRI has the possibility, within the same organisation, to report to the other Parties on AFoPS achievements. All other AFoPS Members have to convince their governments and ministries on the importance to show their results to a wider and non-scientific audience. Nevertheless, for the future of this group, it is important that the Members communicate efficaciously with their organisations to have their papers included. Similarly, AFoPS, as an organisation, cannot directly take part in the consensus decision-making process during ATCMs, and it does not have the capacity to influence the choice of other countries' governments to become Parties to the ATCM. Nevertheless, while AFoPS Members cannot discuss with governments, exchange of information on the importance for a country to sign the AT could happen between scientific organisations. Well established-polar research organisations can inform new Members. Thailand is a good example in regard to the role that science could play in the Antarctic Treaty System and on how scientist can report to their governments and influence them.

Table 6. 3 Competent authorities representing Asian countries in Antarctic organisations

	AFoPS	ATCM	CCAMLR	COMNAP	SCAR
India	National Centre for Polar and Ocean Research	Ministry of Earth Sciences, Government of India	Government of India	National Centre for Polar and Ocean Research	National Committee for Antarctic Research; Ministry of Earth Sciences; National Centre for Polar and Ocean Research
Japan	National Institute of Polar Research	Ministry of Foreign Affairs of Japan; Ministry of Education, Culture, Sports, Science and Technology; Fisheries Agency of Japan; Ministry of the Environment of Japan	Tokyo University of Marine Science and Technology	National Institute of Polar Research	National Committee for Antarctic Research; National Institute of Polar Research
People's Republic of China	Polar Research Institute of China	Chinese Arctic and Antarctic Administration / Ministry of Foreign Affair of China	Distant Water Fisheries	Chinese Arctic and Antarctic Administration; Polar Research Institute of China	National Committee for Antarctic Research; Polar Research Institute of China; Chinese Arctic and Antarctic Administration
Republic of Korea	Korea Polar Research Institute	Ministry of Foreign Affairs of the Republic of Korea; Korea Polar Research Institute	Ministry of Oceans and Fisheries	Korea Polar Research Institute	Korean National Committee for Antarctic Research; Korea Polar Research Institute

Source: AFoPS, 2017; CCAMLR, 2018; COMNAP, 2016; Dey Nuttall, 2018; SCAR, 2017.

To conclude, AFoPS' aim to improve the advance of polar sciences among Asian countries, as presented in the group initial agenda, is not observed in the ATCM because its Members are not the same organisations participating in these meetings. It is important to underline that one of AFoPS Members, Thailand, has not yet signed the AT nor the Protocol, and all the activities conducted by Thailand are not regulated by the Antarctic Treaty System. However, all the other AFoPS Members that host scientists

from Thailand are signatories of the AT and the Protocol and ensure that Thailand is following them as well. In the future, AFoPS should re-think the requirements for membership status to ensure that all its Members are complying with the Antarctic Treaty System.

6.2 Scientific participation

From 2004 to 2018, 21% of the scientific peer-reviewed outcomes on Antarctic research was submitted by at least one author affiliated with an organisation located in one AFoPS Member or Observer's country. This, supported by an increment in the budget allocated for polar activities highlights the interest that Asian countries have in Antarctic affairs. These countries, considered as a single entity, have produced a high number of scientific activities that worked towards a better understating of the relation between Antarctica and the rest of the world. However, co-authored publications, even though co-operative projects under AFoPS umbrella are already in place, are still low. One of the reasons behind this could be related to the fact that many of those co-operative projects started in recent years and need more time to produce results that can be published.

To analyse the AFoPS participation in scientific outputs, I have used the databases of two indexing services, Scopus and WoS, which generate around 18,000 return of publications each. This data, limited in a specific fourteen-year period of time, is representative and can give a snapshot of a trend in publications. Scopus and WoS, however, do not include all the scientific disciplines and all the worldwide peer-reviewed journals. Nonetheless, the raw data obtained by using these two databases has

been recognised as an effective starting point to evaluate the scientific presence of Asian countries, and the number of co-authored papers on Antarctica.

This research underlined how the investments made by Asian countries in Antarctic research and presence, through their increased budget dedicated to polar activities, is not only designated for new infrastructures but also for science. In fact, taking into account only the Consultative Parties to the AT as a sign of continued interest in Antarctica, it is evident how researchers from the four Asian countries out of the total twenty-nine have authored around one-fifth of the totality of published journal articles with an Antarctic science focus. This demonstrates the Asian countries' commitment to conduct scientific activities in Antarctica.

This research has possible limitations related to the indexing services used and the language analysed. None of the official languages of any of the AFoPS Members' countries is English. Due to the background of the author, and his language proficiency in English, only papers published in English have been analysed. It is worth mentioning that generally scientific papers that want to have an international impact on the worldwide Antarctic knowledge have to be written in English. Nevertheless, being able to reach one's own national scholars is important, too. Future research can expand the scope of this doctoral project by including in the research also publications written in the native languages of these countries. From a software perspective, the author used two indexing services to limit the possibility of missing relevant data. It might be advisable to include the other indexing software that were not included into this research to continue and expand the analysis of AFoPS scientific capability in the future.

6.3 Regionalism and co-operation

Interregional and intraregional groups play an important role in Antarctica. In fact, due to an increasing number of 'big science' projects, co-operation between national Antarctic programs is more than ever pivotal in supporting researchers. 'Big science' projects, with the most recent being the Thwaites Glacier project that the United Kingdom and the United States of America will launch in the 2018–2019 Antarctic season, might not be supported by a single country due to logistical difficulties, such as distance from the main research hub, limited knowledge of a particular skills-set, and economical reasons.

There are many examples of intra-Antarctic co-operation, both scientific and science-support projects: DROMLAN is probably the most well-known project. DROMLAN not only serves national Antarctic programs purposes for supporting science, but it has also been used to support inspection conducted by Parties under the Protocol. In the region operated by the DROMLAN consortium, there is also an example of two facilities that not only share their mean of transportation to Antarctica but also the scientific and logistic activities at their stations; for example, Aboa and Wasa stations that are located 200 meters apart.

Asian countries currently, with reference to the 2017–2018 scientific season, operate nine facilities in Antarctica, with a tenth under construction. The variety in geographic location of these facilities gives the opportunity to scientists from AFoPS Members countries, under the co-operation projects promoted, to operate in areas that were not easily accessible previously because their national program could not support the project. Representatives of Asian polar programs declared their interest and

positivity in sharing their facility with other Asian countries, especially the ones that could be considered 'new-comers' to Antarctic activities.

It is important to underline that Asian countries are not the only ones supporting co-operative projects and the sharing of infrastructures: in fact, a survey conducted by COMNAP in 2014 showed that 93% of its Members, currently thirty and representing 94% of the organisations running a facility in Antarctica, already share facilities with other countries. The same survey showed that the respondents will likely see an increase in the number of shared facilities, using infrastructure already in place, in the future.

Antarctic facilities are hubs that enable scientific activities without whose presence it will not be possible to conduct research in Antarctica. As highlighted in the previous chapters, since the establishment of the first station in 1904, there has been a cyclical trend in the number of new infrastructures built in Antarctica, and this number is not related to whether a country is a Consultative Party to the AT or not. While maintaining a station in Antarctica is not only important for scientific purposes but also for national pride, it is important to note that the majority of actors operating in the continent share their assets with other Parties. 97% of the countries operating infrastructures in the Antarctic currently share part of their facilities with international personnel involved in co-operative projects, both logistic and scientific.

6.4 Future work

Considering its short history, AFoPS has already achieved some important results for the group but still needs further achievements before being able to shape Antarctica with an Asian 'flavour'. The results that have been achieved are both within the Asian community and with the other organisations active in Antarctica. An example within

the Asian community is the involvement of Asian countries without a tradition of polar activities to participate in Antarctic research hosted by a country with a long-term history of research. Externally, the value of AFoPS, as a regional organisation, was also recognised by other organisations operating in Antarctica, such as SCAR, as demonstrated by the MoU signed between these two organisations and IASC.

Since its establishment, AFoPS has fostered scientific projects and collaboration between its Members. Researchers from Asian institutes are producing peer-reviewed publications that are adding to the compendium of information and knowledge that we have on Antarctica and its interactions with the rest of the globe. In doing that, they provide opportunities for countries without a polar background to be involved in Antarctic research at their Antarctic facilities. Sharing facilities with new actors represents an opportunity to the countries that have not the ability to regularly maintain a facility, due the initial stage of their Antarctic activity.

However, more can be done to improve AFoPS as a group. As previously underlined, for a few years, there was a gap in submission of Information Papers on AFoPS activities. As previously mentioned, the country hosting the AFoPS secretariat could be the one whose representatives submit the paper to the other Parties. However, it has to be noted that every Member has to host the secretariat. These changes in locations and organisations taking care of AFoPS secretariat responsibilities disadvantages the whole forum. A stable location of the secretariat could benefit all the Members by supporting their projects better. I attended the AFoPS AGM a few weeks before a change of location of the secretariat, from the Korean Polar Research Institute to the Polar Research Institute of China. Observing the discussion around the duties of

the secretariat, its daily activities and organisation, a sense of unease in relation to this change was clear. In the following months, difficulties arose with the AFoPS website, which was now lacking updates and maintenance. These small every-day problems could also have a negative impact on the group's ability to be represented in international fora and could result in fewer publications or co-operative activities. Additionally, some countries participate more than others during the meeting, which can have a bearing on the overall significance and impact that AFoPS as a group can achieve. Japan and the Republic of Korea, both founders of the group, were the two most active countries during the meeting, both in presenting their achievements and in fostering co-operative projects with the other Members and Observers. The People's Republic of China, on the other hand, despite participating in the meeting with the biggest delegation, was the least active in sharing information with the other organisations through Working Papers and personal communications.

A senior employee of a polar agency with Member status within AFoPS underlines[63] how the five action groups that were created in 2004 are no longer current and are not fostering co-operative activities as expected. At present, for the future of AFoPS, it is important to search for commonalities in the six countries' polar scientific programs to avoid repetitions in research and take advantages of overlapping areas to generate co-operative outputs. In these overlapping areas, it is also possible to create new initiatives to involve new-comers in Antarctic research that intend to conduct research in a particular field.

[63] Personal interview, August 2016.

From a scholarly perspective, it is important to continue monitoring the future evolution of this regional group and expanding the comparison on co-operation, scientific production and policy-making participation also to the other two regional groups operating in Antarctica. Nevertheless, a future work should not avoid including actors that, at present are not Members of any regional group (Turkey for example) and also those countries that are not part of a regional group but are continuously building and intensifying co-operation activities with other Antarctic actors.

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Appendix 1

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Beyond AFoPS:
How the presence and the rising interest of Asian countries will shape Antarctica

Information Sheet

This project aims at evaluating the co-operation between Asian countries and Antarctica. So far, scholarly research has looked at the Antarctic engagement of Asian states in a singular fashion, focussing on individual states rather than studying the development of international relations and coalitions between these countries regarding polar matters. The role of the Asian Forum of Polar Sciences (AFoPS) within the wider Antarctic geopolitical framework has not been studied from a scholarly perspective. The research proposed here attempts to address this gap of knowledge and aims at analysing how the growing importance and impact of Asian countries, through AFoPS co-operation, could modify the balance of power in, and with regard to, Antarctica. In order to understand the impact of AFoPS on Antarctic geopolitics and operations, it is important to assess the perspectives and roles of all the countries that are currently, or will be in the future, AFoPS members.

Your involvement in this project will consist of an audio-recorded interview, which should not be longer than 90 minutes. The interview records will be stored on a password-protected hard-drive and any paper copies of transcripts will be stored in locked file cabinets or locked rooms.

Participation is voluntary and you have the right to withdraw at any stage without penalty. The withdrawal of your participation will also include the withdrawal of any information and material you have provided as long as this remains practically achievable.

The results of the project may be published, but your identity will not be made public without your explicit prior consent. Unless you consent to your identity to be revealed, full confidentiality will be ensured through the use of pseudonyms in the thesis or any other publications. The thesis is a public document and will be available through the UC Library. You will receive a copy of the project results at the conclusion of the research.

The project is being carried out as a part of a PhD research conducted by Andrea Colombo (andrea.colombo@pg.canterbury.ac.nz) under the supervision of Dr Daniela Liggett (daniela.liggett@canterbury.ac.nz) and Prof Anne-Marie Brady (anne-marie.brady@canterbury.ac.nz). I am happy to discuss any concerns you may have about your participation in the project.

This project has been reviewed and approved by the University of Canterbury Human Ethics Committee, and participants should address any complaints to the Chair, Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz).

If you agree to participate in the study, you will be asked to complete and sign the consent form.

Thank you for your support,
Andrea Colombo

Appendix 2

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Beyond AFoPS:
How the presence and the rising interest of Asian countries will shape Antarctica

Consent Form

I herewith declare that I have been informed about the general purpose and objectives of the above-named research project, that I have had the opportunity to ask questions about the project and that I understand my rights and responsibilities in relation of participating in this research.

I realise that participation is voluntary and that I may withdraw my participation at any time without penalty. Withdrawal of participation will also include the withdrawal of any information and material I have provided, should this remain practically achievable. I also understand that I am free to withhold my response to any particular question. My participation in this research is not expected to involve any risks of harm greater than those encountered in daily life.

I understand that all data collected for the study will be kept in locked and secure facilities and in password protected electronic equipment and will be destroyed after ten years.

I also understand that, before any publication of the research results will take place, I will be provided a transcript of my interview, and will be given a review period of two weeks for the purpose of verifying and/or correcting factual data, requesting removal of confidential information, and providing comments on the transcript. I will also receive a copy of the project results at the conclusion of the research.

I understand that I can contact the researcher Andrea Colombo (andrea.colombo@pg.canterbury.ac.nz) or supervisors Dr Daniela Liggett (daniela.liggett@canterbury.ac.nz) and Prof Anne-Marie Brady (anne-marie.brady@canterbury.ac.nz) with request for clarification or further information. If I have any complaints, I can contact the Chair of the University of Canterbury Human Ethics Committee, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz).

I realise that any information or opinions I provide will be treated in accordance with the University of Canterbury Human Ethics requirements. My identity will be kept confidential unless I give my explicit permission for my identity to be revealed, and the original data will only be accessible to the researcher and his supervisors. I understand a thesis is a public document and will be available through the UC Library.

I acknowledge that I understand my rights as a research participant as outlined above and consent to participate in this research.

This authorisation has no expiry date.

I give the unambiguous consent to reveal my identity, as specified hereafter YES ☐ NO ☐

I give the unambiguous consent to reveal my organisation affiliation, as specified hereafter YES ☐ NO ☐

I would like to receive a summary of results at the end of the research YES ☐ NO ☐

Name _____

Organisation/Institution _____

Signature _____

Date _____