The science-policy interface in the creation of marine protected areas in the Southern Ocean

Comparative analysis of the multi-level governance process through three national delegations and the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)

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Summary

The Southern Ocean is home of a unique and high biodiversity, but the conservation of its ecosystems faces serious challenges. The Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) targets the management of marine resources on an ecosystem-based approach and has agreed to create a representative system of antarctic marine protected areas (MPAs) by 2012, including no-take zones. So far, this ambitious goal is not achieved as only one MPA has been established around the South Orkney Islands and several proposals have been stalled. International political disputes are obviously a core explanation of the current status quo but this study suggests that understanding and improving the interactions between science and policy actors could also provide a way forward in the process. The Antarctic, a continent *devoted to peace and science*, is indeed a case of special interest with regard to the science-policy interface.

In the social science literature on environmental governance, a debate takes place on the character and effectiveness of the interaction between the realms of science and policy. Models differ from a linear transfer of knowledge from science to policy, to knowledge brokering and joint knowledge production where science and policy actors actively cross the boundaries of their realm.

This research explores the establishment of the marine protected areas by relating the practices and views of actors to the two models. The case is approached as a policy arrangement that takes on multi-levels. The national level is studied through three national delegations from the United Kingdom, France and Belgium and the international level is studied through the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR). The analysis targets the roles and expectations of scientists, policy makers and environmental NGOs in the Antarctic science-policy interface and eventually recommends on how interactions could become more effective. The study demonstrates that the linear model, with knowledge flowing from science to policy as two separate entities, is perceived by many actors as the way the science-policy interface should ideally function. Nevertheless, interviewees also report that boundary crossing is occurring regularly and is also needed. In line with the international literature, we argue that good practices in blurring boundaries do exist and can lead to higher effectiveness to establish marine protected areas in the Southern Ocean.

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Finally, I want to thank you as well, the reader who takes time to open this thesis and shows some interest in the relation between two realms acting in such a fascinating environment. I ask you, when reading this report, to keep in mind that this is the work of a master student. Also, I have never attended the meetings of the Commission for the Conservation of Antarctic Marine Living Resources and I had to figure it out from the blue. The interviews have been really helpful in this regard. All data have been treated with the highest level of seriousness.

Before you start reading, I like to express my sincere gratitude to the Rotary International and the Rotary Club of Wageningen-Bergpoort that allowed me a scholarship for my study in Wageningen University and followed with much attention my academic progress. Of course, I am really thankful as well to my friends and family who continue to support me in my projects.

I do not expect that my conclusions will have unanimous agreement, but I hope they can at least bring some relevant points for the actors involved in or around the issue and raise some interesting discussions.

I wish you good reading!

Audrey Legat

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Abbreviations and acronyms

AOA	Antarctic Ocean Alliance
ASMA	Antarctic Specially Managed Area
ASOC	Antarctic and Southern Ocean Coalition
ASPA	Antarctic Specially Protected Area
ATCM	Antarctic Treaty Consultative Meeting
BAS	British Antarctic Survey (United Kingdom)
CAMLR Convention	Convention for the Conservation of Antarctic Marine Living Resources
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CEP	Committee for Environmental Protection
CM	Conservation Measure
DG	Direction General
EARSMPA	East Antarctic Representative System of Marine Protected
EEZ	Economic Exclusive Zone
FCO	Foreign and Commonwealth Office (United Kingdom)
FPS	Federal Public Service (Belgium)
MPA	Marine Protected Area
NGO	Non-Governmental Organization
SCAR	Scientific Committee on Antarctic Research
SC-CAMLR	Scientific Committee of the CAMLR Convention
WG-EMM	Working Group on Ecosystem Monitoring and Management
WWF	World Wildlife Fund

There are few places in the world where there has never been war, where the environment is fully protected, and where scientific research has priority. But there is a whole continent like this - it is the land the Antarctic Treaty parties call *"*... a natural reserve*, devoted to peace and science"*.

XXIII Antarctic Treaty Consultative Meeting, Peru, May/June 1999

Introduction

The two last centuries have seen radical developments and changes in human life style whose consequences and environmental impacts are visible today. There has been need to include new concerns in policy to preserve the environment, and hence the emergence of the concept of environmental governance. This concept expresses "the means by which society determines and acts on goals and priorities related to the management of natural resources" (IUCN, 2014). This mode of governance entered the international agenda in the early 1970's[1] and took shape in many new international or regional organizations targeting the management of natural resources all over the world. Among these resources are those of the Antarctic and its surrounding Southern Ocean. This region is home to a unique and high biodiversity but the conservation of its ecosystems is faced with serious challenges that require appropriate management. For this purpose, the Convention for the Conservation of Antarctic Marine Living Resources (CAMLR Convention) was created in 1982, based on an ecosystem approach. A strong decision was the agreement to create a representative system of Antarctic Marine Protected Areas (MPA) by 2012, including no-take zones (CCAMLR, 2009a). This was an ambitious goal but so far only one MPA has been established around the South Orkney Islands Southern Shelf and several proposals have been stalled due to international political disputes.

The process of establishing the marine protected areas is complex and illustrates the difficulties in the conservation of international zones. While political conflicts linked with economic interests are seen as a prior explanation, other aspects are worth discussing. The task of the Commission for the Conservation of Antarctic Marine Living Resources is to "formulate, adopt and revise conservation measures on the basis of the best scientific evidence available" (CCAMLR, 1980: art.IX). This clearly states the important link between science and policy in the management of natural resources. Nevertheless, the science-policy interface is not self-evident. There is a current debate in social science literature on environmental governance about the effectiveness of science-policy interactions. Models differ from a linear transfer of knowledge from science to policy, to a joint knowledge production where science and policy actors actively cross boundaries and reinvent former practices. The implications of these different model practices are actually really significant.

> "Especially in the area of environment, […] an improved dialogue between the scientific and policy-making communities is necessary to improve linkages between policy needs and research programmes as well as to enhance the accessibility of scientific knowledge to policy makers" (EU, 2014).

[1] The United Nation Conference on the Human Environment in Stockholm, Sweden in 1972 and the creation of the United Nation Environmental Programme started an era of international environmental law.

In regard to the importance of an effective interface between science and policy, we propose to study it specifically for the Antarctic and the creation of marine protected areas. The research statement is that understanding and improving the interactions between science and policy actors could provide a way forward in the creation of marine protected areas. The Antarctic is of great interest to the study of the relationship between science and policy. First, the changes happening there are a sort of preamble to what will happen here later. Managing the information from the Antarctic can help in making decisions here hopefully in time (UK-S-1). Secondly, the science in the Antarctic enjoys a very specific role. Scientists are the only human inhabitants in the area, which makes their influence on policy very direct and dominant. This leading role of science is illustrated by two facts: to reach the Consultative Status at the Antarctic Treaty, countries must demonstrate their "interest in Antarctica by conducting substantial *research activity* there" (Antarctic Treaty, 1959: art. IX.2); as the continent is "devoted to peace and *science*" (Environmental Protocol: art. II), military presence is forbidden. The only national representation in the area happens through science. Scientists and scientific stations, by their presence in the area, are the only visible sign of their countries. Hence scientists represent a sort of political soft power. Thirdly, the Antarctic offers a specific interest because, as Antarctica does not count inhabitants, there is no so-called local or traditional knowledge. It results in a monopoly of science on knowledge. Those three aspects clearly demonstrate the dominance of science in the Antarctic. Therefore the understanding of the science-policy interface in the Antarctic is of particular importance.

Research objectives

The research question can be formulated as following:

> How is the interface between science and policy in the creation of marine protected areas in the Southern Ocean and how can it be better adapted to the roles and expectations of the actors?

An interface is "a point where two systems, subjects [or] organizations meet and interact" (Oxford Dictionaries, 2014). Therefore, the science-policy interface is the point where scientists, policy-makers and other relevant actors meet and interact in a decision-making process. Van den Hove (2007: 8) defines it more specifically as "processes which encompass relations between scientists and other actors in the policy process, and which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making". It is a social process.

To answer the research question, the study pursues three research objectives:

> 1) the assessment of both the practices and knowledge production for antarctic marine protected areas,
> 2) the assessment of the roles and expectations of scientists, policy makers, and environmental NGOs and
> 3) the recommendation on how to adapt the science-policy interface towards improving its effectiveness to establish Southern Ocean MPAs.

The political process in the creation of marine protected areas falls under a multi-level process of governance. The Convention for the Conservation of Antarctic Marine Living Resources (CAMLR Convention) gathers 36 Parties that prepare proposals and submit them for adoption to a Commission after recommendations from a Scientific Committee. In the study, the two levels – national and international – have been considered. The national level will be studied through three delegations from the United Kingdom, France and Belgium. The international level will be studied through the CAMLR Convention. Next to reviewing relevant documentation, semi-structured interviews have been conducted with key actors involved in and around the creation of antarctic MPAs. The initial focus was on the case of the South Orkney Island Southern Shelf but in a second phase, this has been opened up to include the new proposal on the East Antarctic. The data collection methods are detailed further in the report.

Structure of the report

The study is divided into eight chapters. The first chapter treats the relationship between science and policy in a change of paradigm and analyses two models of knowledge production. A distinction is also made on the roles of scientists. The second chapter develops the methodology used in the study, the scope delimitation, the data collection techniques and the data analysis. In chapter 3, the Antarctic Treaty System and its institutions are briefly presented while chapter 4 focuses more specifically on the case of the marine protected areas as an ecosystem-based tool for marine protection. It also details the objectives fixed for the Southern Ocean and the achievements reached so far. In the fifth chapter, the science-policy interface at the national level is studied through three national delegations. For each case, the actors and their interactions are described and analysed together with the two models of knowledge production. Chapter 6 leads the same analysis for the Convention for the Conservation of Antarctic Marine Living Resources. Chapter 7 finally discusses the distinction between science and policy. Based on the analysis of the roles and expectations of the actors in the Antarctic, general recommendations are made how interactions can become more effective. Finally, chapter 8 steps back to look at the limitations of the study and the extent to which it can concretely enhance the creation of marine protected areas in the Antarctic. It ends with some more concrete actions to further the situation.

Chapter 1

Knowledge production: theoretical perspectives

With the development of environmental governance, the literature on the interaction between science and policy has largely increased, in an attempt to theorize the relationship between the two realms. This chapter looks at the evolution of the perceptions of science, based on the paradigm of normal and post-normal science. A parallel is made with two models of knowledge production that correspond to different models of interactions. The roles that scientists can play in a decision-making process are developed afterwards, based on the four categories theorized by Pielke (2007). The way to conceive science and scientists has evolved over time, and understanding this evolution will help to draw a conceptual framework in order to have a basis for the analysis for the next chapters.

1.1. Science and the social context: change in paradigm

Science has been characterized by changing paradigms over time. A paradigm is "a set of methods [...] that define a scientific discipline during a period of time" (Kunseler, 2007: 2). In 1962, Thomas Kuhn introduced the paradigm of normal science in his book *The Structure of Scientific Revolutions*. Normal science, also called mode 1 of science, refers to the routine work of a scientist, accumulating knowledge towards the truth. Normal science works on the principle of universality and disinterestedness: the knowledge developed is universal and value-free, when scientists do not have any interest in the result of the research (Kunseler, 2007). In the 1990s, Funtowicz and Ravetz suggested a change in paradigm, towards post-normal science. Post-normal science, or mode 2, makes the link between science and its social context. It assumes that facts are uncertain and values are in conflict. It recognizes that there is a plurality of legitimate perspectives and that analysis and criticism must accompany the learning of facts. Despite deep and irresolvable uncertainty, science can continue to legitimately inform and influence decision-makers. However, "the previous belief that scientists should and could provide certain, objective, factual information for decision-makers is now being increasingly recognised as simplistic and immature" (Ravetz, 1999: 648). There is a co-production between the scientist and the social context in which science is embedded. This co-production mechanisms are, however, difficult to perceive (Hegger et al., 2012). Post-normal scientists have developed new methods to deal with this uncertainty towards improving objectivity. Extended peer reviewed communities are a mechanism to remedy the objectivity shortcomings, maintain and enhance the quality of information (Kunseler, 2007). This change of paradigm is also related to a period where the drawbacks of scientific progress appeared. Since the end of the Second World War, the threat of nuclear weapons, chemical accidents and the awareness of pollution among others, belief in scientific rationality has been decaying

(Hoppe, 1999: 202). Science does not always evolve towards a common and beneficial progress but can follow different pathways. Post-normal scientists do not look for a universal truth but they rather focus on the enhancement of quality while overcoming inherent objectivity and uncertainty shortcomings. This is the challenging task of post-modern age and post-modern science.

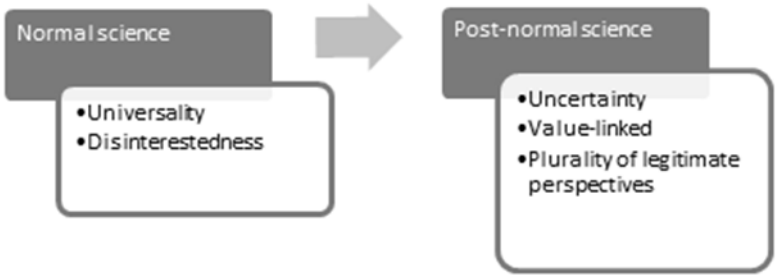


Figure 1 - From normal to post-normal science: change in paradigm

1.2.The knowledge production models

To some extent, the knowledge production between science and policy has followed a similar evolution: towards co-production. Two models give a different view on the production of knowledge and the manner how science and policy are involved in the process.

1.2.1. The linear model of expertise

The first model is what Beck (2011) called the linear model of expertise. It assumes a linear relationship between science and policy. Science provides knowledge which is afterwards transferred to policy-makers who will hopefully use it, and use it correctly in decision-making. The relationship is conceived as unidimensional and linear: from science to policy (Beck, 2011). This model encompasses three propositions (Beck, 2011 : 298): 1.more research will necessarily lead to more certainty; 2.more and better science will help solving political disagreements; 3.by keeping problems away from the political "whirl", science makes policies evidence based and thus more rational. A preliminary consensus within science is supposed to bring subsequently a consensus within policy. The linear model assumes the neutrality of science, whose results are supposed to be value-free. It claims independency and autonomy of science, and disconnects the discipline from its political context. Science simply provides knowledge and information to policy, no prescription. It is an ambiguous relationship, that is translated in the willingness to be "policy relevant but not policy prescriptive" as in the reports of the Intergovernmental Panel on Climate Change for example (Beck, 2011).

Figure 2 - The linear model of knowledge

However, in the course of time, voices raised against this simplistic model which assumes that a sharp distinction can be made between science and policy (Hoppe, 1999; Pielke, 2007; van den Hove 2007; Beck, 2011). This can be linked to the paradigm change to post-normal science recognizing that science cannot be kept out of its social and political context. The linear model of expertise makes the role of the scientist clear, constant and direct but it "leads to the schizophrenic position of having an awareness of the political terrain while at the same time ignoring it" (Beck, 2011: 299).

1.2.2. The joint knowledge production

A second model has been developed in reaction to the linear model: the joint knowledge production, also called co-production (Pohl et al., 2010; Edelenbos et al., 2011) or stakeholder model (Pielke, 2007). It "implies that scientists, policymakers and sometimes other society actors cooperate in the exchange, production and application of knowledge" (Hegger et al., 2012: 53). It involves social processes, is interactive, allows exchanges and takes a step from a unidimensional relationship. It brings other assumptions of science: 1.more and better scientific knowledge does not necessarily decrease uncertainty; 2.more science does not automatically resolve value conflicts and disagreements (Beck, 2011: 303). The production of knowledge here happens at the borders between the two realms. The borders are blurred. "The role of science changes from simply providing technical information to the 'much more diffuse activity' of 'assisting in the process of governance" (Funtowicz et al., 2000, cited by Pohl et al. 2010: 269). It is not only a knowledge translation and transfer: knowledge production happens as well (Turnhout et al., 2005). Together they redefine common group's perceptions, vocabulary and agenda to overcome the difference in time frames, epistemologies and goals between science and policy (Hegger et al., 2012). The joint knowledge production can help bridging the gap and ensuring scientific information is well understood and well relevant to policy information. Boundary organizations can be useful as "organizations that provide the opportunity and sometimes the incentives for the creation and use of boundary objects, that involve the participation of actors from both science and policy and that exist at the frontier of the different worlds of science and politics, having distinct lines of accountability to each" (Guston, 2001: 401). In this model, the way science is effectively used in the decision-making process becomes an important aspect (Pielke, 2007). It is important, however, to distinguish joint knowledge production and joint decision-making. The joint knowledge production does not imply that scientists take part in the final decision or the final vote.

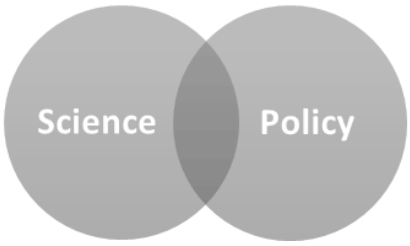


Figure 3 – The joint knowledge production

Joint knowledge production requires that everyone is seen as equal in the discussion process and that everyone can perceive the relevance of the others. Similarly, it requires "that the communication is not seen as a one-way transfer from a knowing subject to a supposedly ignorant one" (Pohl et al. 2010). However, with this model, the role of the scientists becomes more complicated, more diverse and less direct. Scientists are in a situation that Ravetz identifies as "divided identity" (Ravetz, 2001: 391). They take up tasks that do not belong to the traditional scientific role.

1.3.The roles of scientists

In cases where the role of the scientist is not simply limited to providing information in a linear way, the new tasks of science are various. Pielke (2007) established a classification of four ideal typical roles. The *pure scientist* is the traditional role, linked to the linear model. In this role, a scientist wants to share fundamental information and does not have consideration for its use or utility; does not have interest in the decision-making process. He wants to remain disconnected and simply brings knowledge as if to a reservoir where policy-makers could pick up the information they need. The *science arbiter* also provides factual information, but recognizes that policy-makers can have questions that require the knowledge of an expert. For that reason, he has more interactions with politics, but does not provide any personal consideration, and avoids normative questions. In contrast, the *issue advocate* seeks to be part of the decision-making process in order to advocate a specific outcome. He uses his expert status to engage his opinion. However, it is a big debate within the scientific community if a scientist should be allowed to include his personal opinion. The *honest broker of policy alternatives* also takes part in the decision-making but by providing policy-makers with a range of best options. He seeks to integrate scientific knowledge in possible policy alternatives. Unlike the issue advocate, he seeks to expand the scope of available choices instead of reducing it. The border between the roles is not very sharp and scientists can go from one to another. All four roles are critically important (Pielke, 2007), but scientists have to choose and to be aware of their own role in a specific context. Pielke (2007) stated that the first two roles are connected with decision contexts where there is value consensus and low uncertainty. It corresponds to the linear model of expertise while the last two roles require a joint knowledge production model that allows exchanges and interactions, in a context of values in dispute and high uncertainty. This last context can be thought to be the case in the Antarctic.

Table 1 - Roles of scientists

Linear model of expertise	Joint model production
Pure scientist	Issue advocate
Science arbiter	Honest broker

Chapter 2

Methodology

To study the interface between science and policy, the Antarctic offers a specific and opportune context that is tackled here more specifically through the issue of marine protected areas. The creation and implementation of those protected areas will be studied by the roles and expectations of scientists, policy-makers and environmental NGOs in relation to the two models of knowledge production developed in chapter 1. A scientist is defined here as a person studying and having expert knowledge in natural or social sciences. A policy-maker is "a person who has the authority (usually a shared authority) to set the policy framework of an organization" (Dictionary.com, 2014). Environmental NGOs are NGOs showing a priority or a specific interest in environmental issues. This chapter details the methodology that was used to collect and analyse data for the study.

2.1. Scope delimitation

The Antarctic continent has not been considered as a whole, as it gathers different realities under different political regulations. To delimitate the scope, it was decided to focus on marine protected areas. The South Orkney Islands have been the starting point: as the protected area is already created, it allowed a good understanding of the process before opening it to the new proposals. The first idea was to focus only on the South Orkney Islands in an analysis between the national and the international levels, but it quickly appeared that it was much more interesting to include it in a comparative analysis with other cases. This is also believed to increase the objectivity of the conclusions. Therefore, three countries in total have been selected, on criteria of geography, language and involvement in MPAs proposals. First, countries within a reasonable distance allowed us to give priority to face to face interviews. Secondly, the priority has been given to countries where documents and interviews could be in English or in French. Finally, countries have been selected for their different characteristics regarding their involvement in the process of MPAs creation. The first country selected was the United Kingdom that proposed the marine protected area around the South Orkney Island Shelf, the only one adopted so far. The proposal has been adopted pretty quickly but is effecting the negotiations today. The second country is France, that is part of a joint proposal stalled already three times and that will be discussed again at the next meeting. The last country is Belgium, gathering a small-scale delegation, that did not make or take part in a proposal but that fully supports the process. Other countries would have been interesting as well of course. It would have been highly valuable to address the case of countries which are opponents to the current proposals, but this was too difficult to realize in the modalities of this thesis. This can be illustrated by the devil's triangle, also called the iron triangle (Aktinson, 1999), showing

that the success of a project depends on three constraints: time, budget and scope. Those constraints interact with each other in a way that they can not all be optimized at the same time, therefore the devil's triangle. The time and budget available to complete the project will affect the scope of the research. In turn, the larger the scope of the analysis, the higher the costs will be. For every research, a choice is to be made regarding the constraints to favour and the resources available. The quality is always dependent on the devil's triangle. In the present case, much attention was given to the quality of the end product, but the budget and time were two strong constraints which definitely influenced the scope and depth of the research.

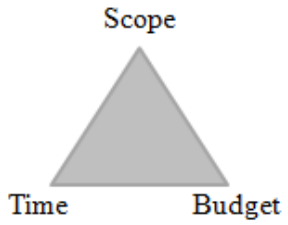


Figure 4 - The devil's triangle of projects management

The devil's triangle also brings a bias in the analysis of profiles of scientists and policy-makers. The study considers scientists individually and policy-makers through their institutions. This is probably a bias in the study but this is explained by the fact that two delegations among the three studied have only one scientist mainly involved in the marine protected areas and the third country has two. Interviews could be done with all of them, and even with a few more working around the case of MPAs. Of the policy-makers on the contrary, only one representative could be met from each institute. This did not allow doing an analysis of the role of each policy-maker individually.

2.2. Data collection

For data collection, the research has been based on a review of relevant documentations. On the one hand, the documents gathered and analyzed were related to the science-policy interface and models of knowledge production. Scientific articles and books have been the main materials. The topic of science-policy interface is subject to more and more research due to the development of environmental governance. Van den Hove (2007) explains that many initiatives are undertaken at the local level on new forms of interactions between science and policy, and that at the regional level, there is a call for more research and analysis of current experiences, especially around environmental issues[2]. An example of such a project is 'STAGES – connecting science and policy for healthy seas'[3] that is running for two years and was funded by the European Union. On the international scene as well, the topic is becoming more important. A famous case is the study of the interface through the process of the International Panel for Climate Change (IPCC). "Hence, science-policy interface is rapidly emerging as key elements of environmental governance" (van den Hove, 2007: 2). On the other hand, the literature review focused on information related to marine protected areas, the Antarctic and the Antarctic Treaty System. This was found mainly on Internet, on websites of relevant political institutions, NGOs or in press

[2] For more information, see EU, 2014.
[3] For more information, see http://www.stagesproject.eu/

articles. Finally, information on the antarctic marine protected areas and the decision-making process was found in the reports from the CCAMLR annual and special meetings. All reports are online[4], and easily accessible. The three themes gather an abundant literature, but very few documents deal directly with science and/or policy in relation to the creation of MPAs in the Antarctic.

Next to documents review, semi structured interviews have been conducted with relevant key actors involved in and around the creation of marine protected areas in the Southern Ocean. A semi-structured interview is a qualitative method of inquiry for which the interviewer does not follow a rigorous set of predetermined questions. The interview is instead conducted with a fairly open framework. It allows a flexible interview, a conversational and two-way communication. An item list has been created, focused on the topic but broad enough to be adaptable to all interviews. The study focuses on three types of actors: scientists, policy-makers and environmental NGOs. The interviews have been conducted with those three categories. In total, fourteen persons have been selected, and for each national delegation (United Kingdom, France, Belgium), at least one scientist and one policy-maker have been interviewed. Except for two, all interviewees are current representatives or advisers at CCAMLR meetings. The interviews were mainly divided in two phases: the national delegations and the international context through the meetings under the Convention for the Conservation of Antarctic Marine Living Resources. They focused on the current situation, and on the needs and expectations for science and policy. Generally speaking, all interviewees were keen to participate and showed a real interest in the topic. For most interviews, we have directly met the interviewees in their respective countries. For practical reasons, one has been done by phone, another one by Skype and a last one by e-mail. All interviews have been done between November 2013 and March 2014. To respect the anonymity of the respondents, the interviews are organized and referred to by an assigned code (see bibliography).

2.3. Data analysis

The purpose of the data collection was to lead a comparative analysis of the case studies. To analyse the interviews and compare the cases, we have drawn an analytic grid, based on two articles: the first one is *Political Modernisation and Policy Arrangements: A Framework for Understanding Environmental Policy Change* written by Arts, Leroy and Van Tatenhove (2006); the second is *Conceptualising joint knowledge production in regional climate change adaptation projects: success conditions and levers for action* from Hegger et al. (2012). Hegger et al. have proposed seven conditions for a successful process of joint knowledge production and those conditions helped to define the data needed for this study. Arts et al. developed the concept of *Policy arrangements* as "the temporary stabilization of the content and organization of a policy domain" (Arts et al., 2006: 96).

[4] Available from: http://www.ccamlr.org/en/meetings/26

Also, policy arrangements may evolve at different level of policymaking: they take on a multi-level character (Arts et al., 2006; Arts and Van Tatenhove, 2002). They remain, however, under pressure of constant change and the stabilization is only temporary as they are composed of four dimensions in constant interaction (Arts et al., 2006; Hegger et al., 2012):

- the actors involved and their coalitions
- the resources available
- the rules of the game currently in operation
- the current policy discourses and programs

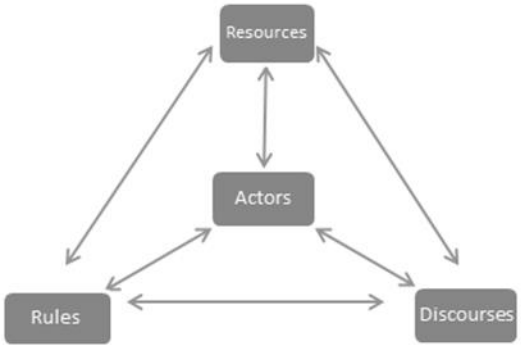


Figure 5 - Four dimensions to understand the joint knowledge production

Source: Arts et al., 2006

Figure 5 illustrates that a policy arrangement includes factors from the four dimensions. A change in one dimension induces a change in the policy arrangement as a whole. This explains why policy arrangements are in temporary stabilization. The four dimensions are of great interest for this study because they help to deconstruct the process of creation of antarctic marine protected areas. This process is a policy arrangement, shaped by four dimensions, that moreover takes on a multi-level character. The national level will be studied through three national delegations and the international level through the Convention for the Conservation of Antarctic Marine Living Resources.

In the second article, Hegger et al. (2012) used those four dimensions to organize the eleven success conditions for joint knowledge production in regional climate change adaptation projects. The key items of those conditions have facilitated the development of an analytical grid to help organizing our comparative study. The report will not be structured exactly around those categories but they will clearly appear in the research development.

2.3.1. The actors involved

By looking at the actors involved in the process, it will be mainly the national delegations in their internal and external relations within the national and international contexts. Three categories of actors are focused on: scientists, policy-makers and environmental NGOs. It will be aimed at looking how the delegation is composed.

2.3.2. The resources available

This will take into account resources of hard power, mainly staff, skills resources and the organization of the delegation. As suggested by Hegger et al. (2012), soft resources will also be studied, such as boundary objects, facilities or forms of organizational embedding that stimulate the interfacing and sharing forms of knowledge. Guston (2001) finds three criteria for boundary organizations: first, they involve the participation of actors from both sides of the boundary, secondly they exist at the frontier of two relatively different social worlds of politics and science, but they have different lines of accountability to each and thirdly, they provide the opportunity and incentives for the creation and use of boundary objects. Boundary objects are "concepts adaptable to different viewpoints but at the same time robust enough to maintain identity between them" (Hegger et al., 2012: 57).

2.3.3. The discourses

Discourses are here defined as "ensemble of ideas, concepts and categories through which meaning is given to social and physical phenomena, and which is produced and reproduced through an identifiable set of practices" (Hajer and Versteeg, 2005 cited in Hegger et al, 2012: 56). The actors have different epistemologies with different ways of perceiving the world. The important aspect in this section is to understand if they define the problem similarly, as they can have different perceptions on what the problem is and what the expectations are. Boundary objects can here be helpful in the development of a common language.

2.3.4. The rules of the game

Based on the distinction done by Hegger et al. (2012), the section looks at three aspects defined as the rules of the game. First, the section is an analysis to which knowledge production model is applied. The distinction between the linear model of expertise and the joint knowledge production will be studied. Secondly, the section also looks at the role of the researcher as such. The classification made by Pielke (2007) will help in this purpose. Particular attention will be given to the difference between perceptions and practices. Thirdly, we also look at the rewards for scientists to be part of the decision-making process.

Table 2 - Analytical Grid

Actors	Resources	Discourses	Rules
- Scientists - Policy-makers - Environmental NGOs	- Staff and skills - Delegation organization - Boundary objects /organizations	- Different perceptions - Boundary objects/ organizations	- Model of knowledge production - Role of scientists - Rewards

Chapter 3

Environmental governance in the Antarctic

Antarctica is a unique part of our planet, host of rare and high biodiversity value. More than 10.000 species live there, and most are endemic (AOA, 2012). The first expeditions started in the late 1820's, which is quite recent in human history. In 1840, Antarctica was recognized as the seventh continent, the fifth in term of size. The chapter looks at the definition and the particularities of the ice continent before going into the political system that has been adopted to regulate it.

The geographic boundary of the continent relies on the Antarctic convergence, a physical phenomenon where cold and warm water encounter between the 48° and 61° latitudes South (Roberts, 2012). The political boundary defines it a bit differently, as the water and land under 60° latitude South (Roberts, 2012). Within this boundary lies the continent of Antarctica, associated ice shelves, Antarctic islands and a part of the Southern Ocean. It encompasses 14 million km² in total. The land is constituted of about 98% thick ice sheet and 2% barren rock, with an average altitude between 2.000 and 4.000 meters high. Antarctica is the coldest, driest and windiest place on earth. Combined with the remoteness, those factors kept humans away for centuries. However, the development of technologies, particularly in the 20th century, allowed for an easier access to the continent that quickly became of political interest. Seven countries came to claim territorial rights over Antarctica. Parallel to this, the area gradually became investigated for research. There is no indigenous human population, though some permanent or summer research stations were beginning to be established, that today host between approximately 1.000 to 5.000

Figure 6 - Antarctic: physical and political definitions

Source : Roberts 2012

scientists during the winter and during the summer respectively (World Population Statistics, 2013). In a few decades, Antarctica became a new area of great interest for both science and policy.

Facing these political claims and this scientific eagerness in such a pristine area, countries found the need to establish rules. In 1959, twelve countries started negotiations and ended up with the Antarctic Treaty which determines that "Antarctica shall be used for peaceful purposes only" (Antarctic Treaty: art. I). In the course of time, a set of instruments have been developed that coordinate and manage actions in the area. They form the Antarctic Treaty System. The Antarctic Treaty was the first one. It did not say much about environmental protection while some living marine resources of the Southern Ocean were extensively exploited and later on the Parties developed more attention to environmental protection. In 1964, Parties adopted the Agreed Measures for Conservation of Antarctic Fauna and Flora that applied until 2011. In 1978, the Convention for the Conservation of the Antarctic Seals came into force, followed in 1982 by the Convention for the Conservation of Antarctic Marine Living Resources (CAMLR Convention). In 1998, the Environmental Protocol dealt with the protection of the environment in a broader sense, and eventually replaced the agreement of Agreed Measures of 1964. This section will briefly depict the legal status and actors in Antarctica to understand the development of the organization that will be specifically under study.

3.1. The Antarctic Treaty

The Antarctic Treaty was signed in Washington on 1 December 1959, by twelve countries[5] whose scientists had been active in Antarctica during the International Geophysical Year (IGY) in 1957-1958, the first large international research program ever executed in Antarctica (NERC-BAS, 2013). By the middle of the century, those nations realized the political tensions around the Antarctic, crystallized by the territorial claims and the threat those tensions represented for future scientific collaborations. The International Geophysical Year was recognized as being pivotal to the scientific understanding of Antarctica (NERC-BAS, 2013) and it led the nations to agree that their political differences should not interfere with their research program and that a peaceful scientific collaboration should continue indefinitely.

The Treaty came into force in 1961 and since then thirty-eight other countries have acceded to the Treaty. Sixteen have acquired the Consultative Status as they demonstrated their interest in Antarctica by "conducting substantial research activity there" (Antarctic Treaty, Article IX.2). The twenty-two other countries are non-consultative Parties, which means that they cannot join the decision-making. The fifty Parties meet once a year for the

[5] Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, Russia, South Africa, the United Kingdom and the United States.

Antarctic Treaty Consultative Meeting (ATCM). Among those fifty countries, seven claim territorial rights in the area: Argentina, Australia, Chile, France, New Zeeland, Norway and the United Kingdom. The Treaty neither defers nor suspends those claims. It freezes, however, any other claim (Antarctic Treaty, Article IV).

Figure 7 - Antarctic Treaty membership *Source :www.wikipedia.com, 2013*

Besides freezing the new territorial claims, the Treaty also provides in its first article that "Antarctica shall be used for peaceful purposes only" (Antarctic Treaty: article I). The purpose of the Antarctic Treaty is to recognize that it is "in the interest of all mankind that Antarctica shall continue forever to be used exclusively for peaceful purposes and shall not become the scene or object of international discord" (idem, Preamble). It prohibits therefore any military measure, except if it is used for scientific purpose (idem, art.I). The Treaty also "promotes the freedom of scientific investigation and international cooperation towards that end" (idem, art.II) and claims that the "exchange of information and personnel, of data and results should be made freely available" (idem, art.III).

3.2. The Environmental Protocol

In October 1994, the Protocol on Environmental Protection to the Antarctic Treaty (or Madrid Protocol) was signed in Madrid, and came into force in 1998. The Parties to the Protocol committed themselves to the "comprehensive protection of the Antarctic environment and dependent and associated ecosystems" (Environmental Protocol: art.10). The Protocol designates Antarctica as a *"natural reserve, devoted to peace and science"* (idem, art.2) and article 3 sets basic principles to limit adverse effect of human activities on the environment. It also requires the Environmental Impact Assessment (EIA) of all activities beforehand (idem, art.8). The Protocol is only open to Antarctic Treaty Parties and it currently consists of 28 Parties.

The Annex V, which only came into force in 2002, relates to "Area Protection and Management" initiated a comprehensive framework for protection areas in Antarctica. It

distinguishes two types of protected areas: Antarctic Specially Protected Area (ASPA) and Antarctic Specially Managed Area (ASMA). The first aims "to protect outstanding environmental scientific, historic, aesthetic or wilderness values, any combination of those values, or on-going or planned scientific research" (Environmental Protocol, Annex V), while the second aims "to assist in the planning and co-ordination of activities, avoid possible conflicts, improve co-ordination between Parties or minimize environmental impacts (idem, Annex V). There are currently 73 ASPAs and 7 ASMAs. They are usually small and do not encompass many marine zones, as marine protection is under the responsibility of another Convention.

3.3. The Convention for the Conservation of Antarctic Marine Living Resources

Extensive fishing activities in the sub-Antarctic during the late 1960s and mid-1970s, along with the emergence of interest in the large-scale exploitation of antarctic krill, raised concern about the sustainability of such fisheries. The Convention for the Conservation of Antarctic Marine Living Resources (CAMLR Convention) was established in 1982 in response to this increasing commercial interest in antarctic resources. It is an ecosystem-based Commission with the attributes of a Regional Fisheries Management Organization (RFMO)[6]. It targets the protection of marine environment and species as it is "the interest of all mankind to preserve the waters surrounding the Antarctic continent for peaceful purpose only [...] and to ensure the conservation of Antarctic marine living resources" (CAMLR, 1980: preamble). Figure 7 shows the convention area, which is slightly different from the Antarctic Treaty (see annex for a comparison).

The Convention gathers 25 members and 11 acceding states (see annex 1). Joining the CAMLR Convention can be done independently from joining the Antarctic Treaty, but certain provisions commit the Parties to essential parts of the Antarctic Treaty such as the legal status of territorial claims (ATS, 2011). The Commission meets annually and can meet besides at the request of one third of the parties (CCAMLR, 1980: art.XIII). It adopts decisions by consensus. Those decisions are Conservation Measures that determine the use of the marine living resources in the Antarctic. The Convention refers to an ecosystem-based management approach. Harvesting is not excluded as long as it is carried out in a sustainable way, taking impacts on the whole ecosystem into account (CCAMLR, 2014a). The Convention introduces the concept of rational use for the management of marine resources. Those resources include all living organisms found in the convention area such as finfish, mollusks, Crustacea or even birds, but specifically exclude seals and whales which are subject to other conventions (CCAMLR, 2014b).

[6] There has been an internal debate to know if the Commission for the Conservation of Antarctic Marine Living Resources was a Regional Fisheries Management Organization at all that has been solved in 2002 by the acceptance that « its role as a conservation organization with responsibility for managing fisheries in the Southern Ocean gives it the attributes of an RFMO » (CCAMLR, 2002, Report of the XXO meeting of the Commission, Hobart, Australia, page 86, paragraph 15.2). Source : Molenaar et al., 2013: 220.

The CAMLR Convention stresses the special relationship between science and policy in the Antarctic. First, the limit of the CCAMLR area itself is based, not on political borders, but on an ecosystemic line, the Antarctic Convergence. Secondly, the Convention established a Scientific Committee that provides scientific information on harvesting levels and management issues to the Commission (SC-CAMLR). The Commission is obliged to take full account of the recommendations and advice of the Scientific Committee when making decisions. As the institution is responsible for the living marine resources, it is also in charge of the creation of marine protected areas.

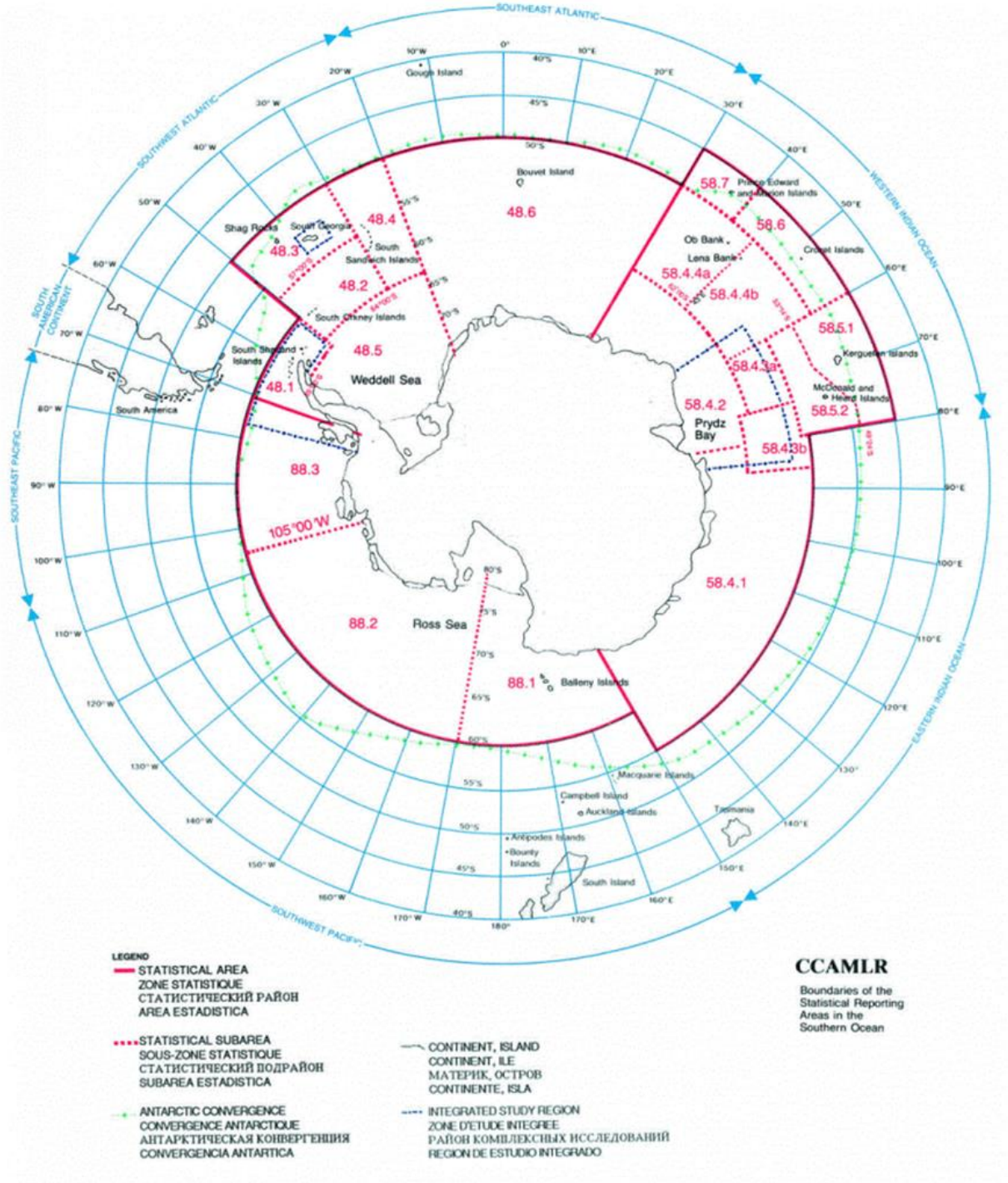


Figure 8 – CAMLR Convention area

Source: CCAMLR, 2012

Chapter 4

Marine protected areas in the Southern Ocean

The previous chapter concluded that, in the context of the Antarctic Treaty, the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) is responsible for the creation of marine protected areas. This chapter takes an interest in this specific management tool and in the objective targeted by the CCAMLR. The last section looks at the achievements of MPAs in the Antarctic Ocean, detailing the South Orkney Southern Shelf Marine Protected Area and the two proposals that have not yet succeeded to reach consensus.

4.1. Marine protected areas and ecosystem-based management

The Antarctic is a fragile marine environment that faces serious pressures such as climate change, pollution and invasive species from human activities (AOA, 2012). To preserve marine resources and their ecosystems, marine protected areas became an important tool. By marine protected area, is meant "any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment" (IUCN, 2006: 5). It includes marine environment but may also include coastal land and islands. It is commonly called an MPA when the total area of sea exceeds the area of land, or when the marine part of a large protected area is sufficient in size to be classified as an MPA (IUCN, 2006). They can be of different sizes, they can be permanent or being reviewed and possibly modified after a lapse of time. The degree of protection can also vary between areas as well as across one same area (IUCN, 2006). The process to create marine protected areas has been boosted in recent years mainly when policy settled objectives of halting biological loss. The protection aims at an ecosystem-based management, considering the ecosystem as a whole. The ecosystem is "a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit" (CBD, 2014). An ecosystem approach "is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way" (CBD, 2014). Marine protected areas have been recognized as an instrument of considerable potential for furthering conservation of pristine and fragile areas. In 2002, the World Summit on Sustainable Development (WSSD) called for the "establishment of marine protected areas consistent with international law and based on scientific information, including representative networks by 2012" (WSSD, 2002). In the context of the Antarctic as well, "MPAs aim to contribute to sustaining ecosystem structure and function, including in areas outside the MPAs, maintain the ability to adapt in the face of climate change, and reduce the potential for invasion by

alien species, as a result of human activity" (CCAMLR, 2011b). The marine protected areas have various purposes, including representativeness, protection of areas vulnerable to human activities, protection of ecosystem function but also scientific purposes (SC-CCAMLR, 2005). They are also useful in research and monitoring of the antarctic marine living resources as they help "for monitoring general response of the antarctic ecosystem to environmental and human-induced change" (SC-CCAMLR, 2005: 591). In conclusion, the marine protected areas potentially fulfil a variety of purposes from conservation to science.

4.2. CCAMLR objective

As the Parties in the Commission for the Conservation of Antarctic Marine Living Resources recognized the value of marine protected areas, they have agreed on developing a representative system of antarctic marine protected areas by 2012, including no-take reserves. This objective is in line with the decision of the World Summit on Sustainable Development in 2002. A representative system aims at creating a network of MPAs or group of MPAs that have a common objective. The general idea is that a network can achieve more than one MPA alone. The network should "capture a wide and representative range of habitats and ecosystems and include key biodiversity hot spots. These include different environmental types, as well as pelagic and seafloor features" (AOA, 2012: 3). To encompass the various environmental types, the Commission has developed a system of bioregionalisation. The variation in climate, topography and other physical factors forms different types of habitat that in turn determine a range of associated species. "Bioregionalisation is the partitioning of large ecosystems at a range of spatial scales, according to their environmental and biological characteristics" (Grant, Constable et al., 2006). With this process of bioregionalisation, the Commission identified in 2008 eleven priority areas, likely to be of high ecological importance. Those priority areas should be submitted to the process of marine protection.

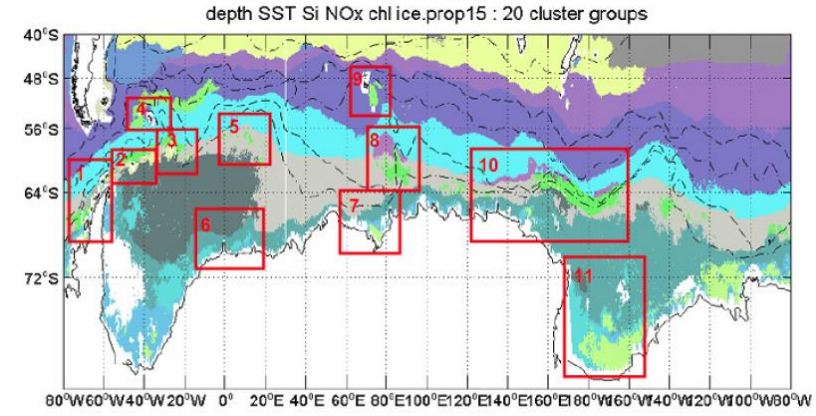


Figure 9 - Eleven priority areas for antarctic marine protected areas

1 = Western Antarctic Peninsula ; 2 = South Orkney Islands ; 3 = South Sandwich Islands ; 4= South Georgia ; 5 = Maud Rise : 6 = Eastern Weddell Sea ; 7 = Prydz Bay ; 8 = Banzare Bank ; 9 = Kerguelen ; 10 = Northern Ross Sea/East Antarctic ; 11 = Ross Sea Shelf.

Source : Ainley, Ballard and Weller, 2010

The establishment of MPAs is in line with the objectives of the CCAMLR, derived mainly from articles II and IX.2(f) and 2(g) (CCAMLR, 2005; CCAMLR, 2011b). Article II aims at the conservation of antarctic marine living resources and introduces the concept of rational use. Article IX specifies how to reach objectives of article II and includes the possibility to designate opening or closing of areas or regions for the purpose of conservation or of scientific study. The creation of MPAs shall follow mainly objectives of conservation, but can also have more scientific purposes by the "establishment of scientific reference areas for monitoring natural variability and long-term change or for monitoring the effects of harvesting and other human activities on antarctic marine living resources and on the ecosystems" (CCAMLR, 2011b).

4.3. Achievements

The goal of having a network of marine protected areas in Antarctica has not been achieved yet. So far, only one MPA has been established in 2009 around the South Orkney Islands and two other proposals have been stalled. Despite the key milestones set in a work plan by the Scientific Committee to scale the work until 2012 (SC-CAMLR, 2011: 9), no other has been created. In 2011, the Commission agreed on a General Framework for the establishment of CCAMLR marine protected areas. It defined that a Conservation Measure that designates an MPA must include the specific objectives of an MPA; its spatial boundaries; the activities restricted, prohibited, or managed in the area, priority elements for a management plan and for a research and monitoring plan (CCAMLR, 2011b). A marine protected area should be reviewed every ten years. Lately, the United States and New-Zealand proposed the creation of an MPA in the Ross Sea and France, Australia and the European Union made a conjoint proposal for seven conservation zones in the East Antarctic. Both were blocked at a special meeting in July 2013, and were rejected again in October. The proposals will be reviewed and discussed again at the next meeting, in 2014. A closer look is given to each case below.

4.3.1. The South Orkney Islands Southern Shelf Marine Protected Area

In 2009, the Commission for the Conservation of the Marine Living Resources adopted the Conservation Measure 91-03 that designates the protection for the South Orkney Islands Southern Shelf. This protection followed a proposal made by the United Kingdom. It is so far the only marine protected area in the Antarctic. This first case still has a large impact today on the discussions about future MPAs.

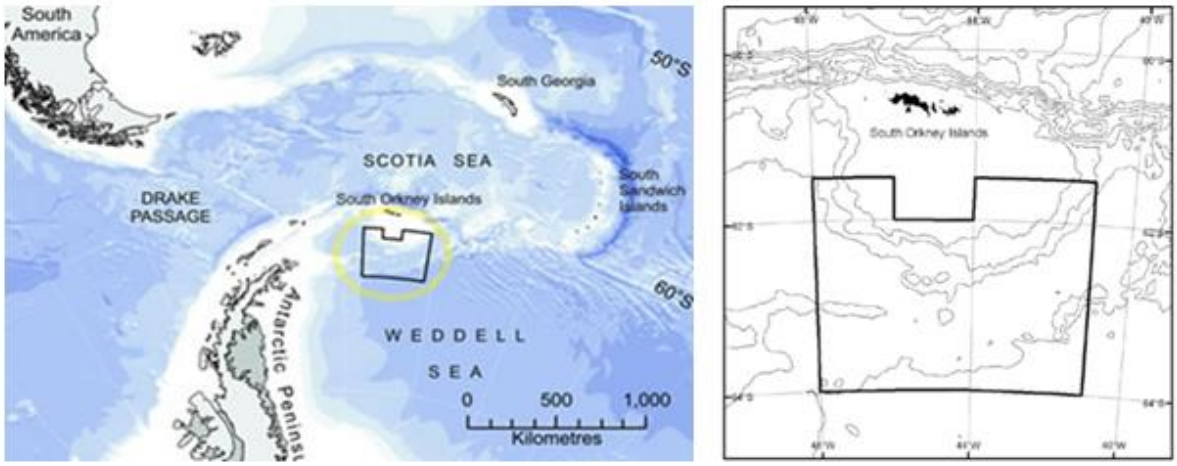


Figure 10 - Protection of the South Orkney Islands Southern Shelf

Sources: 1) NERP (2009) and CCAMLR (2009)

In 2005, CCAMLR hold a workshop in the United States to discuss the use of MPAs as a tool for managing the ecosystem[7]. The United Kingdom has been part of this workshop and realized they had data and expertise in areas that could be useful in the development of MPAs in Antarctica. The national delegation started looking for an area that could be proposed as the first example of MPA. In about 2006, the UK "started putting in some general papers about marine protected areas – what they are and the sort of tools that might be used to establish them – and […] were building up the kind of profile that might be followed through in order to establish a marine protected area" (House of Commons, 2013). At that time, there was no general framework establishing how to designate an MPA. The Conservation Measure 91-04 was indeed adopted in 2011, after the designation of the South Orkney Islands. There was no preconceived idea and no procedure on how to implement an Antarctic MPA (UK-S-3). The procedure for Antarctic Specially Protected Area (ASPA) and Antarctic Specially Managed Area (ASMA) managed by the Environmental Protocol has helped a bit, but they are not tools of the CCAMLR.

In 2009, however, the Commission designated as MPA an area of 94,000 km^2. It prohibits all types of fishing activities, waste discharge and dumping by any fishing vessel, and transshipment activities (CCAMLR, 2009b). The measure provides an exception for scientific fishing research activities agreed by the Commission. The South Orkneys MPA became the world's first entirely high seas marine protected area and the first no-take marine reserve in CCAMLR's network of Southern Ocean MPAs (AOA, 2012). However, the revised UK proposal excluded an area where fishing activities are carried out. Japan, the Republic of Korea and Russia "were able to accept the revised UK proposal because the area where fishing activity is carried out has been excluded from the original proposal

[7] CCAMLR workshop on marine protected areas, Silver Spring, MD, USA, 29 August to 1 September 2005. For the report, see http://www.ccamlr.org/en/system/files/e-sc-xxiv-a7.pdf

so as to avoid restricting the fishery" (CCAMLR, 2009a: 21). This MPA has to be reviewed after a five-years period, in 2014.

Following the designation of the area, some countries have asked for the clarification of the steps to designate marine protected areas. The Parties established the Conservation Measure 91-04 (CCAMLR, 2011b) to give a general framework for the establishment of CCAMLR marine protected areas. The case of the South Orkney Islands has certainly helped in developing this framework; however, this provides that the Conservation Measure establishing the MPAs must include a management plan as well as a monitoring plan. Those were not included in the Conservation Measure establishing the MPA of South Orkney Islands. In this regard, the South Orkney MPA remains a special case, and those management and monitoring plans should still be added. In 2013, the United Kingdom delegation came up for the first time with a proposal for a monitoring program, established in collaboration with Norway. When the South Orkney Islands MPA will be reviewed in 2014, after five years, the proposals for these plans will be discussed.

4.3.2. The East Antarctic Representative System of Marine Protected Areas

In 2011, Australia, France and the European Union have presented to the Scientific Committee a joint proposal for an East Antarctic Representative System of Marine Protected Areas (EARSMPA). It consists of seven marine protected areas in the East Antarctic. The Scientific Committee endorsed it and established that it is based on the best science available (CCAMLR, 2011a: 43). In 2012, the proposal has been submitted for adoption to the Commission, simultaneously with a proposal for the Ross Sea. No consensus was reached, and the proposal was rejected a first time. Its importance has, however, been recognized as the members decided to hold a special meeting in Bremerhaven, Germany in July 2013, to discuss specifically the two proposals (European Commission, 2013). This second meeting failed again to reach consensus. At the annual meeting in October, a reviewed proposal brought an option for adoption in two phases: a first phase for four marine protected areas, and a second one later for the three others or those considered as necessary to complete the representative system in the East Antarctic. This proposition has been rejected as well. Russia and Ukraine blocked the consensus, while China withdrew its support to the proposal. However, the Scientific Committee endorsed the proposal again as containing the best scientific evidence available. The discussions are now postponed again to the next annual meeting in October 2014.

Australia was first developing the proposal, and has been joined by France and later by the European Union. The proposed EARSMPA covers 1.6 million km². "Each MPA contains representative areas of biodiversity of the region, and the proposed representative system of MPAs would be a multiple-use system in which activities, such as fisheries, can be undertaken when those activities do not undermine the objectives of individual MPAs or the representative system as a whole" (CCAMLR, 2012: 29). The proposal is not aimed at

the closing of fishing areas but follows a precautionary principle, with reference zones for climate change among others. The objective for this region is to have a protection of representative habitats that are characteristic of a particular community (House of Commons, 2013).

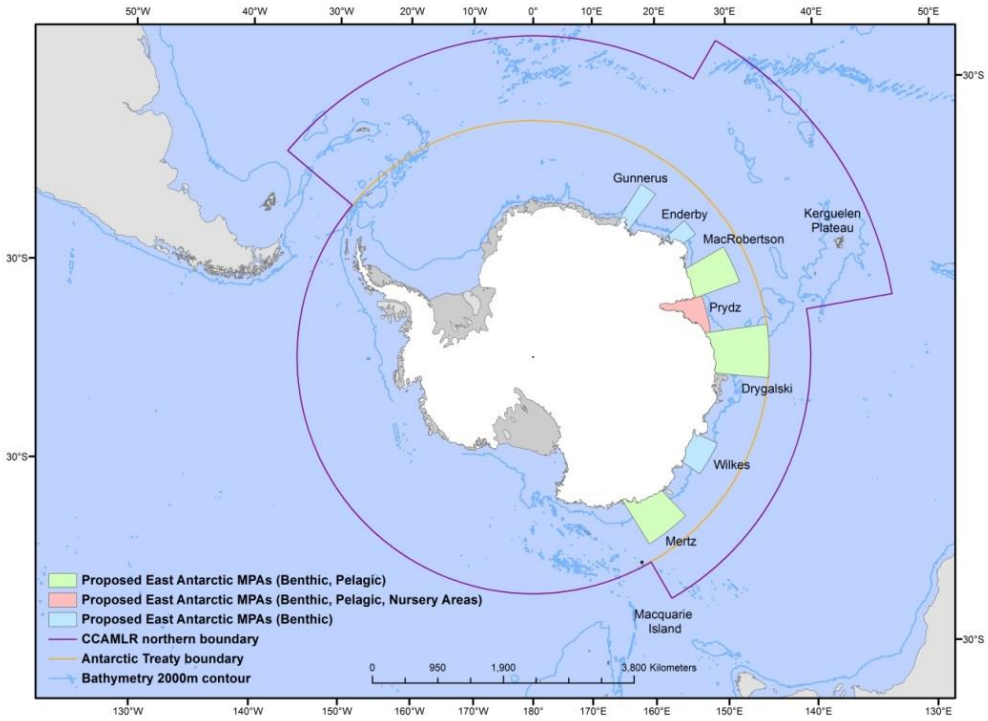


Figure 11 – Proposals for East Antarctic marine protected areas

Source : AAD, 2013

4.3.3. The Ross Sea Marine Protected Area

In 2011, both New Zealand and the USA have introduced a proposal for the Ross Sea to the Scientific Committee. The Ross Sea is one of the least impacted open ocean marine areas on Earth (Halpern B. et al., 2008). In a part of the world that includes many of the most rapid changes due to global warming, the Ross Sea is changing remarkably little. However, it is a multi-use zone, with lots of conflicting interests between different nations. The Scientific Committee has endorsed the scientific basis of both scenarios put forward by New Zealand and the USA, recognizing that they were based on the best science evidences available (SC-CAMLR, 2011: 39). Regarding the two proposals, "the Scientific Committee agreed that the scenarios reflected different objectives and choices for implementation, in particular, the relative weight given to the displacement of fishing effort, but that these were matters for the Commission" (SC-CAMLR, 2011: 40). In 2012, the same year as for the East Antarctic, the two proposals were submitted to the Commission for the Ross Sea that asked for a merging. During the meeting, New Zealand and the USA merged their proposal into a single proposition encompassing 2.3 million km²

for the Ross Sea, including a fully protected area of 1.6 million km². The proposal was rejected, and postponed to the special meeting in July 2013 where it did not get any full support either. The two countries have announced prior to the annual meeting a reduction of more than 40%, with 1.32 million km² for the Ross Sea, with 1.25 million km² no-fishing zone. Again, the proposal has not reached consensus, blocked by the same countries as for the East Antarctic.

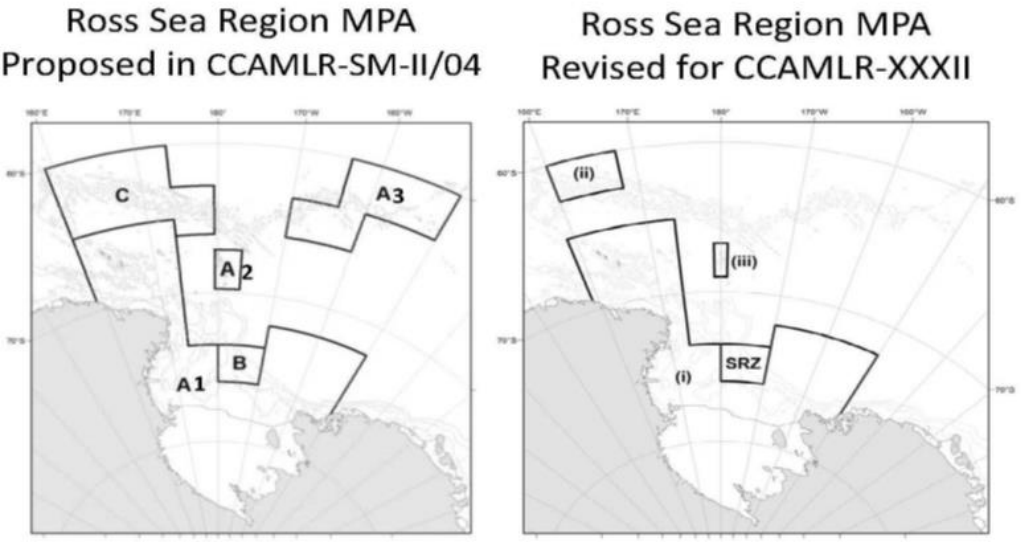


Figure 12 - MPA proposal for the Ross Sea

Source : Delegations of New Zealand and the United States to CCAMLR (2013)

4.3.4. The future proposals

Other proposals are now under development for future agreements. Those proposals have not yet been ready to present to the Commission for the Conservation of Antarctic Marine Living Resources, but nations are moving forward in their research and development (D. Mattfield cited in K. Rajgopal, 2013). In 2012, Germany announced that they would undertake the preparations for the designation of marine protected areas in the Weddell Sea (AWI, 2012). Russia offered its support and collaboration in this process process (SC-CAMLR, 2013: 50). In April 2014, a working group gathered in Bremerhaven to go further with this proposal (F-S-1). The second area is the Antarctic Peninsula, where Chile seems to lead the preparation. A workshop has been organized in May 2012 to discuss the compilation of data, but no proposal has been introduced yet. The third area is Amundsen/Bellingshausen Seas region off West Antarctica. Sweden offered to lead the development and the US and South Korea offered their support for scientific information and/or expertise (K. Rajgopal, 2013; SC-CAMLR, 2011).

Chapter 5

Science-policy interface in three national delegations

Having in mind the background of the proposals for Marine Protected Areas and the institutional context, it is now possible to look closer at the connection between science and policy. The issue of the Marine Protected Areas is considered a policy arrangement that takes on multi-levels. A proposal is prepared by one country or a group of countries in a joint proposal. Papers are submitted for adoption to the Conservation of the Antarctic Marine Living Resources through the Scientific Committee for advising and the Commission for the vote. This chapter aims to understand the national level via the work of national delegations from the United Kingdom, France and Belgium. The international level will be developed later on. The analysis will be done in the light of the two knowledge production models developed in the first chapter: the linear model of expertise and the joint knowledge production model. Each case is structured in a similar way, based on the analytical grid developed in the methodology. It starts with the description of the delegation and describes afterwards the organization of the delegation, staffs and skills. The analysis tries to link it with the model of knowledge. A specific case is finally made for the boundary organizations and/or objects and the role of scientists. Those various aspects have already covered many items of the analysis grid and address each of the four dimensions. The roles of other actors, the rewards and the different perceptions, however, will be developed in a following chapter.

5.1. United Kingdom

The United Kingdom has a long history as a maritime country, and has been early involved in Antarctica. In 1773, the British James Cook crossed the Antarctic Circle for the first time (de Lichtervelde, 2008). The expeditions of Robert Falcon Scott between 1900 and 1911 to reach the South Pole also remain in memory. A Norwegian took this challenge a few days before him, but his expeditions stimulated the British interest for the continent and its knowledge. It is also significant to mention that after days in dreadful conditions, on their way back from an expedition that decimated half of its men, Scott and his team still stopped to gather ice samples while they should die anyway a few days later (Transpol'Air, 2014). Following those expeditions, however, the United Kingdom made a territorial claim in Antarctica already in 1908. The claims include the South Shetland Islands, South Orkney Islands, the Ronne Ice Shelf in the Weddell Sea, the Antarctic Peninsula and other parts of central continental Antarctica (FCO, 2013), some overlapping with other countries. The first station was established in 1944, at wartime, mainly to control the enemy's presence in the Antarctic water and to ensure the British presence in the area (BAS, 2014). After the war, the stations turned more to science goals and the

United Kingdom has maintained a continuous presence since then. Today two stations are open all around the year on the continent, and one more is occupied during the austral summer on the South Orkney Islands (BAS, 2014). Two more stations are on the South Georgia Islands. The British research on and around the Antarctic is mainly undertaken by the British Antarctic Survey (BAS), based in Cambridge. It employs over 400 staff.

5.1.1. The British delegation (actors involved)

The British delegation to the Commission for the Conservation of Antarctic Marine Living Resources gathers a fairly "mixed delegation of scientists and officials" (FCO, 2013). It is supervised by the Polar Regions Department of the Foreign and Commonwealth Office (FCO), based in London. Jane Rumble is currently the Head of the Department. Besides four or five representatives from the FCO, the delegation also counts scientists from the British Antarctic Survey. Phil Trathan and Susie Grant led the scientific work that supported the MPA proposal, but they worked closely with other scientists from the British Antarctic Survey that they could consult for specific topics of expertise (UK-S-4). Other scientists can join delegation meetings whenever necessary. Several scientists from the Centre for Environment, Fisheries and Aquaculture Science (Cefas) are part of the delegation, but provide knowledge more about fisheries. It is, however, a member of Cefas that is the representative to the Scientific Committee of the CAMLR Convention. At the time of the proposal for the South Orkney Islands MPA (2009), the Marine Resource Assessment Group, a consultancy group, was also part of the delegation. There is also a representative of NGOs. Currently, it is a member from the WWF-UK. His role is to centralize the overview of the NGOs (UK-P-1) and to be a link with them. The NGOs working on the issue are mainly Greenpeace, the PEW Charitable Trust and the Antarctic and Southern Ocean Coalition (ASOC). The representative of WWF-UK is fully involved in the delegation meetings and discussions. He questions and requests for information, but also gives opinions and recommendations. The FCO organizes meetings with other stakeholders during the year to meet and discuss their interests. It happens once a year in an industry meeting and once a year in a scientists meeting (UK-P-1).

FOCUS 1: Antarctic and Southern Ocean Coalition and Antarctic Ocean Alliance

ASOC is an international coalition created in 1978 dedicated to the preservation of the Antarctic Continent and its surrounding Southern Ocean (ASOC, 2013). It consists of over thirty NGOs interested in Antarctic protection, in order to coordinate their position and action. In 1991, ASOC received the observer status in the Antarctic Treaty System. The Antarctic Ocean Alliance is a similar international alliance of 23 environmental organizations – including ASOC and indirectly, its members – created specifically on the issue of the marine protected areas. The Alliance aims to work with the members of the CAMLR Convention and their scientific bodies to develop appropriate protection in the Antarctic (ASOC, 2012).

5.1.2. The organization of the delegation (resources)

The whole delegation meets four or five times a year for formal meetings, but remains constantly in contact besides those meetings (UK-S-3). They communicate mostly by e-mail. The work is organized around two main entities: the Polar Regions Department from the FCO for policy and the British Antarctic Survey for science. Those two institutes gather policy and scientific teams working full-time and on long term on polar issues, and even more specifically on the Antarctic. Therefore, it is striking how small the polar community in the United Kingdom is: everyone knows each other very well and seems updated on the current work and actuality of the colleagues. The scientists are mainly concentrated in the British Antarctic Survey. Some work in universities, but they are anyway in contact (UK-S-4). This link is even stronger when some can go to work in another association, such as the representative of WWF-UK, who had been previously working at British Antarctic Survey for 14 years. It happened as well in the past for scientists joining the Polar Regions Department. This happens less the other way around (UK-S-4).

The link between the actors also comes from funding. The FCO finances Cefas and the British Antarctic Survey is mostly financed by the Natural Environment Research Council (NERC), the UK's main agency for funding and managing research, training and knowledge exchange in the environmental sciences (BAS, 2013). The annual funding of NERC comes in turn from the Department for Business, Innovation and Skills (NERC, 2014). Therefore, the British Antarctic Survey is indirectly funded by the British Government. In turn, the British Government depends on the British Antarctic Survey for high quality environmental science, but also to assure a "country's strategic presence in Antarctica" (NERC, 2014).

FOCUS 2: The South Orkney Islands proposition and adoption

In 2005, the Commission and Scientific Committee for the Conservation of Antarctic Marine Living Resources held a workshop in the United States to discuss the use of MPAs as a tool for managing the ecosystem[8]. The United Kingdom has been part of this workshop and realized they had data and expertise in areas that could be useful in the development of MPAs in Antarctica. The delegation's members decided together to look for an area that could be proposed as the first example of MPA. The scientists at the British Antarctic Survey were in charge to propose such an area. Scientists provided information on areas that they considered scientifically, biologically and ecologically important and that met the criteria as a candidate for protection (UK-S-3). They "discussed pretty

[8]CCAMLR workshop on marine protected areas, Silver Spring, MD, USA, 29 August to 1 September 2005. For the report, seehttp://www.ccamlr.org/en/system/files/e-sc-xxiv-a7.pdf

carefully with the FCO to make sure that what [they] were doing was going to help develop a broader understanding for the CAMLR Commission" (UK-S-4)". The scientific analysis has highlighted a number of different regions that were worthy of protection. But they felt that for some of them it might have been more difficult to follow through as a first example (House of Commons, 2013). This clearly underlines how scientists also take political considerations into their analysis. The policy-makers have studied this information in the light of the other requirements to take into account, and came back to scientists for advice (UK-S-3). Lots of consultations followed on the basis of "a collaborative approach" (UK-S-3). "The final decision for the proposal sent to the Commission for the Conservation of Antarctic Marine Living Resources was really different from the initial one, but scientists have had much input into it and wrote much of the proposal in a discussion process with the FCO, based on what policy-makers were saying" (UK-S-3).

5.1.3. The model of knowledge

This description of the process particularly underlines the joint knowledge production model. The scientists, policy-makers and other societal actors such as the NGOs come together, are in regular contact and cooperate in the production of knowledge. Through the interviews, it was made clear that the relationship was not unidirectional but implied feedbacks and exchanges. This is also made clear in the choice of the Marine Protected Area. "The South Orkney Islands have been part of the British Antarctic Territory since 1962, and prior to this the islands were a Falkland Islands Dependency. Under the 1959 Antarctic Treaty, however, the Islands' sovereignty is neither recognized nor disputed by the signatories and they are free for use by any signatory for non-military use" (Miliband, 2009). It does not question that the area is worth to protect and that the British scientists do have special expertise in this zone, but it underlines the link between the political aspects and the scientific research. In conclusion, scientists "work very close with [their] policy colleagues in the Foreign and Commonwealth Office" (UK-S-4). This is clearly enhanced first by the fact that the polar community is in close contact in the country. This is seen as an advantage because it makes it easier to find the right person to talk with (UK-S-3), it creates a good network (UK-S-3) and favors trust between actors (UK-O-1). It also makes it easier for the communication, as "it is easy to pick up the phone and talk to the person [you] want to talk with" (UK-O-1). Some stress that it can be a sort of challenge for advocacy (UK-O-1) as so close contacts make independence of science more difficult but the general opinion is positive. Secondly, the joint knowledge production is also enhanced by the fact that most of the members in the delegations are involved for a long time. This facilitates the exchanges and communication inside the delegation as they get experience enough to be able to understand each other (UK-S-4; UK-S-3). Jane Rumble, the Head of Delegation entered in the Polar Regions Department in 2003 and became Head in 2007.

She is only the fourth Head of the Department since 1943 (Arctic Frontiers, 2014). She has attended the meetings of the CAMLR Commission every year since 2006 (CCAMLR meetings reports). Looking at the yearly reports of the CAMLR Commission and the Scientific Committee, it appears that most members of the British delegation stay for a few years. In the delegation, there has always been a number of persons who have been there for a very long time (UK-S-3) and this facilitates a good understanding of what the UK position is (UK-S-3).

5.1.4. The boundary organizations

Boundary organizations are organizations "that involve the participation of actors from both science and policy and that exist at the frontier of the different worlds of science and politics" (Guston, 2001: 401). WWF-UK, besides bringing another perspective in the delegation, has probably filled the role of Boundary Organization for the proposal of the South Orkney Islands. The NGO has financed a big set of science on the South Orkney Islands that has put the research forward and that would not have been possible without this funding (UK-S-4). In turn, it is a way for the NGO to direct science into conservation goals (UK-O-1) and to get arguments to recommend to the UK government. In 2010, WWF has also awarded the British Antarctic Survey and the CAMLR Convention with the Gift to the Earth Award for the establishment of the South Orkney Islands Shelf MPA and their commitment to a representative network (WWF-UK, 2012). More significant is also the position of the British Antarctic Survey. It is of course a scientific institute, but mainly financed by policy institutions. The institute originated from a group that was actually controlled by the Foreign and Commonwealth Office. Moreover, as there has always been a close connection between science and policy in the Southern Ocean, British Antarctic Survey has a long history of working with the policy department responsible for CCAMLR and Antarctic Treaty (UK-S-4). Issues that the United Kingdom have or have had with South American countries for example, probably fostered the link between science and policy (UK-S-4). Nevertheless, not all scientists in British Antarctic Survey are closely working with policy-makers and they do not all perceive their role in the same way. It is interesting to look at it a bit closer.

5.1.5. The role of scientists

During the study, contacts have been made with different scientists working at the British Antarctic Survey, and four interviews have been conducted. The discussions have revealed different profiles of scientists working within the research center. Two scientists have mainly led the scientific research on the South Orkney Islands Marine Protected Area. But they relied as well on advice from the rest of their colleagues (UK-S-3), or even from scientists in other institutes. Whenever necessary, they have asked for help, for example from someone wiith specific knowledge in data management or in Geographic Information System (UK-S-4). Based on the classification established by Pielke (2007), those two

scientists have acted as an *Honest Broker of Policy Alternatives*. They tried to provide policy-makers with a range of best options, and tried to integrate scientific knowledge in possible policy alternatives. They tried to figure out "how they can use that knowledge to inform policy" (UK-S-4). This has clearly been the case when the scientists of the British Antarctic Survey were in charge to propose an area for the creation of a marine protected area. Scientists provided information on areas that they considered scientifically, biologically, ecologically interestingly important and that met the criteria as a candidate for protection (UK-S-3). The scientific analysis has highlighted a number of different regions that were worthy of protection, but they felt that for some of them it might have been more difficult to follow through as a first example (House of Commons, 2013). This clearly underlines how scientists tried to integrate scientific knowledge in possible policy alternatives already. Due to their background, they also had knowledge in policy, and had profiles completing each other well: one had more knowledge on policy aspects of the Antarctic Treaty, the other more on policy aspects of the CAMLR Convention (UK-S-4). They had interdisciplinary skills and it was useful to prepare the proposal. The border between science and policy is also a bit blurred when scientists meet other delegations to discuss the proposal. Scientists "do not need to be only good scientists; it is also important to present the points in the right manner" (UK-S-4). Both scientists have been involved for many years, and they worked in close relationship with the rest of the delegation. They work for a scientific organization but it is clear that they have also experienced enough to understand most of the policy constraints. During the research, it appeared that they also act in between science and policy. This typically reflects the joint knowledge production model. It assumes a change in the role of the scientists that does not consist anymore of simply providing information. "The role of science changes from simply providing technical information to the 'much more diffuse activity' of 'assisting in the process of governance' (Funtowicz et al., 2000 cited by Pohl et al., 2010: 269).

However, roles are not fixed and they also depend on the choice from scientists themselves. Not all scientists do have the same role: they do not all have interdisciplinary skills and do not all wish to have them. Another interviewee explained how important it is for him to remain out of the policy process. Driving science into policy is not the way he would see a scientist's role. He does not disagree with the fact that others do it, but he would not himself (UK-S-1). He described scientist's role as "provision of the information and crucially of unbiased information to law makers and decision takers and let them take the decision on the basis of the information you provide" (UK-S-1). More importantly, he underlined that unbiased information should be provided to both parties (UK-S-1). In this case, the scientist is willing to adopt the role of a *Pure Scientist*. But the distinction between the roles might not be so sharp, and they should be considered on a gradient instead of as in closed categories.

It is indeed a large debate on how much the scientist should be involved in decision-making process and where the limit is between biased and unbiased information or between neutral and non-neutral information. It is actually interesting that most of the interviewees have ambivalent discourses, recognizing the importance of science in a sound political decision but stressing that if the system is working well, there should be a very clear distinction between science and policy. There is a sort of reluctance to accept a closer cooperation between science and policy, and a role of the scientist in close connection with policy actors. It is almost as if many would prefer to look at the process through the Linear Model, with Pure Scientists or Science Arbiters for main roles. There are attempts to extend the number of people doing policy oriented science in the British Antarctic Survey, but this middle position does not seem so well accepted. The position is indeed specific because they are based in a scientific institute and even if most of what they do is scientific work, it is unusual to work so much on policy issues (UK-S-3). Some people find it really a frustrating position (UK-S-3). They are in a scientific organization so their position is probably not valued (UK-S-3). However, they would like to get more colleagues in their position as having people that can do both science and policy and talk both science and policy is really valuable (UK-S-3).

5.2. France

France is also a country that has a long history with Antarctica. The first French expedition has been led by Jules d'Urville, in 1837-1840, who discovered Adelie Land. France has two stations in Antarctica, one of which is managed in collaboration with Italy. There are also three stations in the Sub-Antarctic Islands: Crozet, Kerguelen and New Amsterdam Islands. There are almost sixty scientific programs led per year in the Antarctic or Sub-Antarctic regions. For many of them, France collaborates with other countries. They cover many disciplines such as climatology, oceanography, ornithology, biology, astronomy… (France Diplomatie, 2014). The Institut Polaire Français Paul Emile Victor (IPEV) coordinates and facilitates the research in the Antarctic and Sub-Antarctic. It is an agency of resources and expertise that provides support for the institutions leading scientific research in the region (IPEV 2014) but many science institutes are involved in the research in Antarctica.

5.2.1. The French delegation (actors involved)

The French delegation is led by the Ministry of Foreign Affairs, Legal Affairs Directorate – Law of the Sea, Navigation Law and the Poles. Also involved is the Ministry of Ecology, Sustainable Development and Energy (MEDDE), through the Directorate for European and International Affairs and the Directorate for Sea Fisheries and Aquaculture. The French Southern and Antarctic Lands (TAAF) are also part of the delegation, representing the Antarctic and Sub-Antarctic territories of the country. For the scientists, Philippe Koubbi,

from the University Pierre et Marie Curie - Paris VI, coordinates the French scientific research for the MPA project in the East Antarctic. He is representative for the CAMLR Scientific Committee. However, at the moment of the study, there were discussions about the extension of his funding for scientific representation in the delegation. A three years funding program ended at the end of 2013, and it was to be decided if it would be extended. Other scientists from the National Museum of Natural History also join the delegation, but they are more involved in the fisheries issues. There is no representation of a national NGO in the delegation. The contact with NGOs goes more through the european representatives of Antarctic and Southern Ocean Coalition (ASOC) and Antarctic Oceans Alliance (AOA). To a smaller extent, the French delegation also has contact with PEW Charitable Trust, an NGO much involved around environmental issues. With ASOC and AOA, there are regular but not frequent contacts, mainly since two years, when France started the development of the MPA proposal. However, NGOs are not involved in the meetings of the delegation. Fishing industries are also consulted, but they are more related to fishery issues than to marine protected areas as such.

5.2.2. The organization of the delegation (resources)

The French delegation is in regular contact, mainly by e-mails, and has approximately three to four coordination meetings per year. The intersessional work is divided between the actors from the delegation, and sometimes the work is done in association with other Ministries departments such as the French Navy Staff for example or other Directorates within a Ministry itself. In some cases, the two Directorates from the Ministry of Ecology, Sustainable Development and Energy (MEDDE) can ask for advice from the Directorate for water and biodiversity for instance. The delegation also has regular meetings by video-conference with the Australian delegation, regarding the proposal for the East Antarctic.

Due to all the different ministries involved, there is, less than in the United Kingdom, the impression that the polar community is really small and concentrated. It seems even pretty diffused, split over different ministries and scientific institutes. For science, the Institut Polaire Français Paul Emile Victor (IPEV) coordinates the expeditions to Antarctica but the research justifying the MPAs in East Antarctic has been spread out in mainly three institutes: the Laboratory of Oceanography of Villefranche (LOV), Museum of Natural History and the Chizé Centre for Biological Studies. Regarding the funding, the government finances research in the Antarctic but there is no permanent link with the political institutions, no perennial participation in international organization meetings.

Focus 3: The East Antarctic Representative System of Marine Protected Areas

France made the decision to join Australia for the East Antarctic proposal mainly by a demand from scientists. They had collected data together with the Australian and Japanese scientists during the campaigns of the International Polar Year (2007-2009) and wished to be part of the proposal (F-S-1). At the policy level, France was mainly involved in the Southern Ocean around its Exclusive Economic Zone (EEZ) of Sub-Antarctic islands. France and Australia have already a long cooperation regarding the halieutic stock management in their adjacent EEZ and polar research in their neighbours' territorial claims. The proposition for the East Antarctic has been divided into two phases. A first phase involved the scientists to determine the potential areas to protect, the sensitive criteria in those areas and which type of protection was the most adapted (F-S-1). There are, however, fewer data for the East Antarctic than for the Ross Sea and the South Orkney Southern Shelf. The data in the East Antarctic are relatively sparsely surveyed (House of Commons, 2013) but this is not true anymore for all areas. Some zones are today much better studied (F-S-1). At the end of this first phase, the proposal has been presented to the CAMLR Scientific Committee which endorsed it. A second phase gathered all the actors of the delegation and took more socio-economic considerations into account. It led to the introduction of the proposal to the Commission in 2012. The scientists have had a key role in the first phase as they were the main actors involved at that stage. The second phase is much longer as it is not accepted yet. It is mainly political discussion, but scientists remain associated and often consulted. At the end, it is "really a strategy that [they] have proposed conjointly, policy-makers and scientists" (F-S-1). During the meetings of the Commission for the Conservation of Antarctic Marine Living Resources as well, the scientist in the French delegation, as well as in the Australian delegation was essential. During the process, the delegation also met other delegations to discuss the project and get support from other countries. They still continue today, targeting the acceptance of the proposal at the next annual meeting. The scientist also takes part in those discussions, mainly with their foreign equivalents that can afterwards transfer the information to the rest of their delegation.

5.2.3. The model of knowledge

The French case is also to relate to the joint knowledge production model: science and policy work together and cooperate in the exchange and production of knowledge. Science is involved in both phases, and even when it is a political discussion, scientists are often consulted. However, the model suffers some obstacles. First, the delegation is organized around several ministers and ministry departments, and not around one single department. This may confuse the distribution of the roles, and also presents a risk for reaching and diffusing a common opinion within the delegation (F-S-1). This is probably even more valid for such a case as marine protected areas, rather new in the CCAMLR context. In comparison with fisheries management for example, delegations are less used to work on the topic. Secondly, for the members of the french administration, Antarctica – and even the polar regions – is not their only focus: they do not work permanently on this region. This is more difficult to keep the same focus and continuity on the topic than in the United Kingdom. However, it allows the members of the delegation to work also on marine protected area in other contexts such as the Convention for Biological Diversity (CBD) or the OSPAR Convention for the conservation of the North-East Atlantic and its resources. It can be beneficial to have a broader vision of the issue in other international and environmental negotiations (F-P-1). This may indeed be helpful for comparisons with the case of CCAMLR marine protected areas. The third obstacle is a regular turnover in policy members of the delegation. In the ministries, they usually keep the same position for only three to five years (F-P-1). On the contrary, the scientist coordinating the proposal for the East Antarctic has been in the delegation since 2009 and the previous representative has been there for twenty years (his first meeting for the CAMLR Convention was in 1988).

As mentioned, the extension of the funding for the scientist is under discussion. A three-year program of eco-regionalization for the scientific research in the East Antarctic has been financed to define areas for protection. The three years are now over, and discussions are about to know if there is a possibility to extend it. This follows more the linear model logic: as the research has been done already and is endorsed by the Scientific Committee, the involvement of the scientist is not essential anymore. The joint knowledge production requires that science and policy are seen as equal actors. In conclusion, the French case in the development of the MPA proposal followed a joint knowledge production but some aspects tend to decrease the success of the model.

5.2.4. The boundary organization

There is no boundary organization in the delegation that can exist on the border between science and policy. No NGO is involved in the delegation meetings, and there is no science institute that has the same profile as the British Antarctic Survey for example. The Institut Polaire Français Paul Emile Victor (IPEV) is an agency of resources and expertise that provides support to institutions, leading scientific research in the Antarctic but it does not

have any vocation to link research with decision-making. However, some have expressed that this would be helpful (F-P-1). Some consider that for leading expertise in such a vast area as the Antarctic gathering contrasting zones of high biodiversity value, there is a need for a team that can permanently be involved and take both policy and science aspects into account. A sort of permanent observation and activity would also prevent the risk of running out of the steam after three meetings where the proposal has been rejected (F-S-1).

5.2.5. The role of scientists

The scientific research has been coordinated by one scientist. He worked of course in collaboration with other scientists and with the Australian delegation on the case of East Antarctic. In the french delegation, he was the scientist in charge of the marine protected areas. He has carried out much work and responsibilities and considering the difficulty of the issue, it could be valuable to broaden the team (F-P-1). His funding is not perennial and might not be extended. It is, however, important for scientists to be on a clear funding scheme and the fact that the three-year program has been under discussion for renewal illustrates the difficulty for science in its involvement in the policy process.

His first involvement in the case of marine protected areas has been really important as the request for being part of a joint proposal together with Australia came from science. Afterwards, he has assisted the whole process, in the first as well as in the second phase to come up with "really a strategy that [they] have proposed conjointly, policy and scientists" (F-S-1). At this process, the role was linked to *honest broker of policy alternatives*, taking part in the decision-making by providing policy-makers with a range of best options. He worked on that with the Australian scientists. However, the proposals have been rejected and the role of scientist turns difficult in such a negotiation. The negotiations are among policy-makers but scientists can be asked to review their recommendations according to the discussions. Scientists are sometimes hesitating on how much they should follow those political negotiations. The process itself can already be difficult for scientists who do not have an interdisciplinary background. A scientist who has never had contact with policy processes before lacks knowledge in law and environmental policy and discovers that in the field (F-S-1). Agreements can change very often: a meeting can develop up to ten reviewed versions of a proposal and it is difficult in this context for a scientist to stick to what is important to know and protect what is scientifically important. A scientist has to understand critical points of view on his conclusions and be flexible enough. Depending on the countries, scientists are more or less flexible. In the case at stake, some Australians have been keen to follow the political discussions very much. Others felt that they spent some years to find out what areas were the best to protect so that they should not accept that the adopted areas take all the value out of what they want to protect (F-S-1). The balance is difficult to find and in this situation, scientists can be tempted to go back to a role closer to *Science Arbiter*.

5.3. Belgium

Belgium has never introduced a proposal for a marine protected area, but has a long history of involvement in the Antarctic and has been among the first countries to start exploration of the new continent. It is in 1897-1898 that the expedition *La Belgica* led by Adrien de Gerlache has been launched, who was the first to spend a whole summer in the area. It was the first time an expedition gathered an international crew and it was also the first purely scientific expedition in Antarctica (de Lichtervelde, 2008). Belgium opened the station King Baudouin permanently inhabited during three years, from 1957 to 1961, but it was abandoned in 1968 due to lack of funding and snow damages to the station. Belgians continued to lead expeditions in collaboration with The Netherlands, South Africa among others, but was physically back in Antarctica four decades later, with the station Princess Elisabeth, the first zero-emission station built in 2007-2008. Belgian research is mainly recognized within the fields of climatology, glaciology, biogeochemistry, geophysics, geology and biodiversity (BELSPO, 2014). Regarding the marine protected areas in the Antarctic, Belgium has already held two workshops, including the first workshop on bioregionalisation in 2007. The delegation is small and does not have the ambition of playing a central role in the MPAs proposition (B-P-1). However, each country has one vote in the final decision and this counts the same as for bigger countries (B-P-1). Belgium wishes to push forward the creation of marine protected areas and has supported the different projects.

5.3.1. The Belgian delegation (actors involved)

The Belgian delegation for the CAMLR Convention is a small-scale delegation, that gathers two persons: a scientist from the Instituut voor Landbouw-en Visserijonderzoek (ILVO) and a delegate from the Federal Public Service (FPS) Health, Food Chain Safety and Environment, more specifically from the Direction General Environment, Division Multilateral and Strategic Affairs. The FPS Foreign Affairs does not have representatives in the CAMLR Commission but is in charge of organizing a meeting once a year with the members of the delegation to define the Belgian position. However, it happens that the embassy sends a delegate to the CAMLR meetings, when the representative from the FPS cannot attend the whole meeting. To prepare the Belgian common position, other parties can be involved as well, such as the FPS Mobility for example, if they have a special interest in the issue discussed. Inside the FPS Health, Food Chain Safety and Environment, the DG Environment and the Division Multilateral and Strategic Affairs also work closely with the Direction Marine regarding the CCAMLR issues. On the scientific side, no other institute than the ILVO is directly involved. It can happen that another person is consulted or attends one meeting, but not on a regular basis. No NGO is directly involved in the delegation neither, but the Antarctic and Southern Ocean Coalition (ASOC) and PEW Charitable Trust participate in the consultation before. They are also often consulted and

they can help in editing the papers to submit to the Commission for the Conservation of Antarctic Marine Living Resources. PEW Charitable Trust has an office in Brussels, and one representative was working for the FPS previously, so they have mainly contact with them, but also with the Antarctic and Southern Ocean Coalition, and some others.

5.3.2. The organization of the delegation (resources)

The science and policy representatives do not meet often during the year, but they meet at least in the meeting organized by the FPS Foreign Affairs, two weeks before the meeting of the CCAMLR. It is called the Multilateral Coordination (CoorMulti) and it defines the Belgian common position that they also forward to the embassy. It aims at the "consistency of Belgian policy related to multilateral and global issues by stimulating and taking care of the coordination and dialogue necessary with the FPS, with other FPS, with the Communities and Regions as well as with the civil society"[9] (SPF Affaires Etrangères, 2012). The rest of the year, they meet from time to time, and it can happen that NGOs attend the meeting as well. The other contacts take place by e-mail or by phone. Despite some regular contacts between the two representatives, it seems that science and policy regarding the Antarctic still work quite independently. It is striking that until 2005, there was no Belgian policy-maker delegate to the CAMLR Commission, and the representation to both the Scientific Committee and the Commission was assured by the scientist or by the embassy in Australia. At that time, there was no common knowledge production at the national level. In 2005, a delegate of the FPS Health, Food Chain Safety and Environment started to assure the representation yearly until 2011. Since 2012, two different persons have attended the meetings. There is today another person in charge who is expected to attend the meeting on a regular basis from next year onwards. The current scientific representative has attended the meetings of the CAMLR Convention for 12 years.

Regarding the current cooperation, there are different perceptions. The opinion of the scientist is pretty positive, as some improvements have been noticed last year, with "a better preparation of the last meetings, more actors involved and a more regular communication" (B-S-1). The policy-maker is not negative, but stresses that more can be done. This difference can probably be explained by the past experiences. The scientist has been the only Belgian delegate for a few years and might see a start of cooperation as an improvement. However, both science and policy actors identified the enhancement of collaboration between science and policy regarding the Antarctic as a goal (B-P-1). This aims at improving the communication flow. At the moment, they realize for example that Belgian scientists in general do not systematically transfer their results to the ministries while the scientific conclusions can also help the policy-makers in debates on marine protected areas (B-P-1). Moreover, if Belgium supports politically the creation of antarctic

[9]From : « la cohérence de la politique belge relative aux questions multilatérales et mondiales en stimulant et en assurant la coordination et la concertation requises au sein du SPF, avec d'autres SPF, avec les Communautés et les Régions ainsi qu'avec les organizations de la société civile ».

marine protected areas, it is believed that more can be done to assist it scientifically at the international level. A lot is done nationally, but it can be better diffused towards the international research program (B-P-1). Recently for example, Germany called for science proposals for a coming workshop on marine protected areas and no Belgian would have participated if the German organization had not mentioned to the FPS that no Belgian scientist had subscribed. The science-policy interaction has been necessary to a better dissemination of science and the case underlined a need for an improvement of collaboration. This statement is not new as a proposition for a permanent structure via an online platform has been made earlier. Two meetings took place last year to improve the interface between science and policy in Belgium. They want to come up with a Belgian Polar Platform that would have a section "ocean" and a section "continent" (B-P-1). It would be a platform gathering all scientists involved and receiving funding for research in the Antarctic as well as all administrations where decisions are discussed, adopted and implemented. At the moment, the persons involved in the Antarctic often know each other, but there is still a strong division in the tasks realization. The platform aims at encouraging a more comprehensive approach among all Belgians interested in Antarctica, including universities and NGOs (B-P-1). It is also expected to enhance the influence of Belgium in the international process. Belgium is a small country but can find ways to weight also on the international arena. They have for example initiated a large global network for Antarctic biodiversity[10] that helps in the context of marine protected areas as well. But an improved communication between science and policy would facilitate initiatives. The expertise of Belgium is recognized, however, and the country wishes to continue as an important actor in the Antarctic. A stronger cooperation between science and policy, however, can help in bringing the knowledge further and strengthening the political support given to the different proposals (B-P-1).

The purpose is to settle the platform in 2014. However, such a Belgian Polar Platform already exists with the Belgian Science Policy Office[11] on a "website dedicated to the Federal Antarctic Research Program" (BELSPO, 2014). The Platform has already existed for a few years as a publication of the International Polar Foundation in 2009 already referenced the website as well as the website of SCAR that mentions the website on a page saved in August 2012. We have tried to understand to which extent the two platforms will be linked. It seems that the two projects are not linked, in which case they might be overlapping. This would require more investigation.

[10] « Funded by the Belgian Science Policy Office, biodiversity.aq is building an innovative Antarctic biodiversity information system, giving access to a distributed network of contributing database » (http://www.biodiversity.aq/).
[11] See http://www.belspo.be/belspo/bepoles/index_en.stm

5.3.1. The model of knowledge

The model of Belgium is transforming. In the past, there was no cooperation between science and policy at the national level as there was no policy delegate. It could be said that this is the most achieved form of joint knowledge production, but it clearly does not involve any exchange or cooperation. There was actually no common knowledge production and the case could not be linked to any of the two models. Today, it seems moving towards more exchanges and communication, but it is not sure yet which form this will take. The meetings organized by the FPS Foreign Affairs and the regular contacts regulated for last year, give the impression that it is evolving towards a joint knowledge production model. As the delegation has a small size and the polar community in Belgium is limited, this might be easy to implement.

5.3.2. The boundary object

There is no real boundary organization that links both science and policy, and NGOs do not really fill that role. However, the delegation seems to find an alternative with the Belgian Polar Platform that can act as a boundary object, a "concept adaptable to different viewpoints, but at the same time robust enough to maintain identity between them" (Hegger et al. 2012: 57).

5.3.3. The role of scientists

The role of the scientist in the Belgian delegation is really specific and the categories of Pielke (2007) do not really help to understand. As a scientist, he is not really working on the case of marine protected areas, but more on fish stock assessment. So his role as a scientist on the case of MPA is quite limited and there is not so much expertise to transfer (B-S-1). However, for years, he has been the only delegate to the CCAMLR, filling the tasks for both science and policy. Since seven years, he has been joined by a delegate from the FPS Health, Food Chain Safety and Environment, but continues for some years to fill the gap in the Commission whenever the representative cannot attend to the whole session. This double position can lead to a sort of dilemma, regarding the position to refer to and the credibility towards the scientific peers. It is also difficult for a scientist to fulfil tasks that he is not used to in his scientific work. When it comes to discussing with a country that is opposed to the proposal, this clearly does not belong to the usual competencies of a scientist for example. With the development of the Belgian Polar Platform, it is expected that more expertise will be transferred to policy-makers, and that more contacts between science and policy will be established. If the political delegates assist at all the meetings of the CAMLR Commission, those changes will surely impact the role of scientists.

5.4. Cross-cases analysis: political stakes and investment in science

The three delegations also coordinate their position at the European level under the European Union. There are on an average three meetings of the European Union per year regarding the policy in the Antarctic (F-P-1). It is another level in the multi-level governance, but this will not be studied further in this research.

The involvement in antarctic marine protected areas does not have the same importance among the three countries. The United Kingdom and France are two countries having territorial claims in the Southern Ocean in a way that they want to be really active and have a dominant position in the region. The United Kingdom has a particularly conflicting history due to old tensions with Latin American countries that materialized in the Antarctic. Belgium also has a long history with the Antarctic but does not have territorial claims. It aims at remaining important in the region as shown by the investment in a new station or the willingness to include science in an international scheme, despite it is a smaller country with a smaller delegation. This link to the Antarctic is felt in the investment of the three countries in polar science. The United Kingdom is in the opposite hemisphere, but has been the first country to come with a proposal for a marine protected area. It has a specific department in the Foreign and Commonwealth Office and a whole scientific institute dedicated to Antarctica. The interests of France in the Southern Ocean lie much more in the Sub-Antarctic. There is a specific Ministry for the French Southern and Antarctic Lands (TAAF), but most of those territories are located out of the CAMLR Convention area. The political coordination for the Antarctic is therefore divided over several ministries with a regular turn-over among members. The difference in investment is also perceived at the scientific level as the science is not really centralized in a scientific institute. Belgium has enhanced its position with the Queen Elisabeth station but it works mainly on continental issues. This can explain that a major work undertaken by Belgium in the Antarctic Treaty System is to underline the necessity of harmonization between the different instruments and the link between continental and oceanic science.

Table 3 - Three national delegations: comparative analysis

	United Kingdom	France	Belgium
MPAs as a priority stake/proposal submitted	✓	✓	/
Proposal already adopted	✓	/	n.a.
Centralization of policy-makers institutions	✓	/	✓
Centralization of scientific institutes	✓	/	/
Small scientific polar community	✓	✓	✓
Small policy polar community	✓	/	✓
Regular contacts between science and policy	✓	✓	Different opinions, but a new project of platform aims at improving it
Funding link	✓	✓	Not mentioned
Perennial funding	✓	/	Not mentioned
Policy-makers work on long-term	✓	/	✓ (in theory, but not for the last two years)
Scientists work on long-term	✓	✓	✓
Interdisciplinarity of scientists	✓	/	/
Scientists in policy situations	✓	✓	✓
Boundary organization	✓	/	/
Boundary object	/	/	✓
NGOs consulted	✓	✓	✓
NGOs represented in the delegation	✓	/	/
Policy-makers involved in environmental negotiations for MPAs in other regions	/	✓	✓
Model	*Joint knowledge production*	*Joint knowledge production*	
Role of scientist	*Honest Broker* *Pure scientists but not involved*	*Honest Broker*	

Legend :

✓ Present in this case / absent in this case n.a. not applicable in this case

Chapter 6

Science-policy interface in the CCAMLR meetings

Once the proposal is prepared by a country or a group of countries, it is introduced for adoption to the Convention for the Conservation of the Antarctic Marine Living Resources. This chapter will now look at this second level of the policy arrangement following the same structure as the three previous case studies. The problem of marine protected areas is relatively new for the Commission for the Conservation of Antarctic Marine Living Resources. With the objective of creating a network of representative MPAs in Antarctica, the negotiations took another dimension. The organization started to look at the conservation, a section of its mandate that had not been really central until then. For some delegations, representatives were not used to this part of the negotiation (F-P-1). With such an ambitious objective, the task is certainly a challenge.

6.1. The institutions and actors involved

The Convention gathers 36 members via three institutions: the working groups, the Scientific Committee and the Commission. Five working groups meet during the year on five specific topics: Working Group on Ecosystem Monitoring and Management; Working Group on Fish Stock Assessment; Working Group on Statistics, Assessments and Modeling; Working Group on Incidental Mortality Associated with Fishing; Subgroup on Acoustics, Survey and Analysis Methods. Their conclusions are afterwards discussed within the Scientific Committee meeting once a year. Each member of the Committee appoints "a representative with suitable scientific qualifications who may be accompanied by other experts and advisers" (CCAMLR, 1980: art. XIV). Christopher Jones is the current chairman, since 2012, and re-elected for a term of two years. The Commission meets right after the Scientific Committee. Each member is represented by "one representative who may be accompanied by alternative representatives and advisers" (CCAMLR, 1980: art. VII). The Commission meetings are chaired by a new chairman every meeting. Observers can also attend the meetings from both the Commission and the Scientific Committee: they can submit reports, but they do not have the voting right. The Scientific Committee for the Antarctic Research (SCAR), the Committee on Environmental Protocol (CEP) and environmental NGOs are among those regular observers. NGOs are represented by the Antarctic and Southern Ocean Coalition (ASOC).

6.2. The organization of the CCAMLR meetings

The process to create antarctic marine protected areas is detailed in the Conservation Measure 91-04 - General Framework for the establishment of CCAMLR Marine Protected Areas (CCAMLR, 2011). To designate a marine protected area, a country or a group of countries prepares a proposal of conservation measure. They transmit papers that can be discussed within the five working groups that formulate conclusions on specific issues to transmit to the Scientific Committee. The Scientific Committee was established by the Convention for providing scientific information to the Commission. It aims at establishing criteria and methods for conservation measures, assessing the trends of populations, analysing data on the effects of harvesting and transmitting assessments, analyses, reports and recommendations to the Commission as requested or on its own initiative regarding measures and research to implement the objective of the Convention (CCAMLR, 1980). It formulates answers in a report given to the Commission, which in turn, in its decision made by consensus, is obliged to take full account of the recommendations and advice of the Scientific Committee. The Commission meets right after the Scientific Committee during an annual meeting held in Hobart, Australia. Other meetings can be organized at the request of one-third of the members (CCAMLR, 1980: art. XIII). The working groups meet during the year while the Scientific Committee meets right before the Commission. The whole process goes from science-based to more ideology stages (UK-S-2). The whole meeting lasts for two weeks, with a tight schedule. Some expressed the difficulty to keep updated with the work completed during the meetings (B-P-1), especially when the intersessional work and (reviewed) proposals of marine protected areas are not made available in advance (B-S-1). Intersessional work is indeed an important part of the meetings, with a preparation for the national or international level through workshops or inter-delegation discussions.

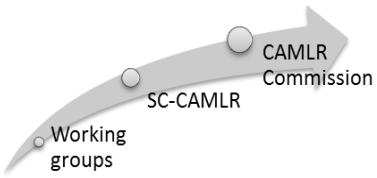


Figure 13 - The decisional process within the institutions of the CAMLR Convention

The process in CCAMLR meetings can be divided in two phases. Only scientific experts in five specific fields are present at the working groups. During the Scientific Committee only scientists are member representatives. A second phase comes right after, with the Commission meeting. Member representatives do join. Not all scientists are involved, but some can act as advisors in the delegation. Representatives and advisors are actually often the same in both the Scientific Committee and the Commission, but the labels switch according to the institution. This can probably be explained by the cost of travelling and of attending the meetings, so that the same persons stay for the two weeks. In practice, it does not mean that they attend the same meetings (UK-S-3) as various topics can be discussed at the same time, but it surely blurs the distinction between both institutions. It is, however, difficult to assess the importance of this from an outsider’s point of view.

The observers can attend the meetings but do not participate in the vote. In 2007, the CAMLR Commission appointed an external panel to undertake a performance review of the organization. The Review Panel noticed that the institutions of the CAMLR Convention manage the participation of a "significant (and potentially growing) number of observers" but it also stressed a tendency in the Rules of Procedures to refer to a passive commitment of observers (CCAMLR Review Panel, 2008). For some sessions, access to – all or some – observers can also be restricted. At the special meeting in July 2013, half of the session has been of restricted attendance (B-P-1). However, the rules for observers' attendance in restricted sessions are not the same at the Commission and at the Scientific Committee. The Review Panel noticed a difference in the Rules of Procedure: for instance, the Commission's rules allow State Observers to attend the restricted meetings while the Scientific Committee's rules do not allow attendance of any observer (CCAMLR Review Panel, 2008). The Review Panel did not see a justification for such a distinction (CCAMLR Review Panel, 2008).

6.3. The model of knowledge

The process to create a marine protected area in the context of the CAMLR Convention is quite complex to frame with the two models of knowledge. The Scientific Committee produces a report to hand in to the Commission, but does not attend the Commission's meeting. The chairman of the Scientific Committee presents the report and has the responsibility to ensure that the business of the Committee is carried out effectively and in accordance with its decisions (CCAMLR, 1983) as the Commission rules say that he "may attend all meetings of the Commission [and] shall be entitled to present the report of the Scientific Committee to the Commission and to address the Commission with regard to it" (CCAMLR, 1982). The procedure falls under the linear model of expertise as there is no exchange or co-production of knowledge. "First, science has to 'get it right' and after that policy comes into play" (Beck, 2011: 298). Beck (2011) who studies the science-policy interface for climate change, considers that the linearity is already induced in the organization and division between working groups. The sequence "science -> impacts -> response" encourages the definition of the problem from the response, and creates a division between actors defining a problem and proposing an answer.

Beck (2011) identified three hypotheses in the linear model that are verified in the case of CCAMLR meetings. The first two hypotheses are that *more research will necessarily lead to more certainty and more and better science will help solving political disagreements*. One reason pointed out by opponent members to MPA creation is the lack of scientific data[12]. The science had been endorsed in 2011 for both East Antarctic and Ross Sea proposals, but they have been introduced again to the Scientific Committee in 2013. Science, however, has to deal with uncertainty, especially in such a context as Antarctica

[12] See CCAMLR report July 2013, paragraph3.23, 3.25, 3.26, 3.34, 3.67, 3.69

where there is only one ecosystem. There is no test or replication possible (UK-S-4). However, this has been the case for the proposals of the Ross Sea and the East Antarctic but not for the South Orkney Islands. Moreover, it is important to recognize that only a minority of countries asks for such an addition of research. It is not sure, though, if by asking for more scientific data, they hope to solve political disagreements or simply to postpone the decision. The third hypothesis is that *by keeping problems away from the political "whirl", science makes policies evidence based and thus more rational.* There is currently a great concern among the actors of the CAMLR Convention regarding the tendency, in the last few years, to the politicization of the Scientific Committee. More and more policy-makers get involved in the Scientific Committee (B-S-1). The general opinion is that it is important to have only scientists in the Scientific Committee (F-P-1) in a way that policy-makers can attend the meeting but not intervene. Attending the meetings can help policy-makers during the second week (F-P-1) but it can also create a confusing situation where some parties at the Commission know what has been discussed during the Scientific Committee while others do not know (I-O-1). This depends also of course, of the communication inside the delegation and how scientists report the meeting to the rest of the delegation. However, members insist that only scientists "with suitable scientific qualifications" should take part in discussions. In some delegations, however, advisors are members of ministries. The suitable qualifications are actually difficult to assess and to control. In the last meetings, the president reminded that only scientists can sit and speak at the Committee. The same happened during working groups (the case has been reported for the working group EMM, UK-S-2) and workshops (the case has been reported for the workshop in Brest in 2011, UK-O-1) where representatives had more policy abilities than scientific skills. Chairmen sometimes refuse opinions if they are considered policy-orientated (UK-S-2).

However, this linear model is balanced by some aspects of joint knowledge production. First, the Scientific Committee on Antarctic Research (SCAR) attends meetings as observers. SCAR is a non-governmental organization that provides and coordinates the scientific research in Antarctica. It aims at being an international and interdisciplinary body to provide objective, independent and high quality scientific advice to the institutions of the Antarctic system or to other organizations on issues of science and conservation affecting the management of Antarctica and the Southern Ocean (SCAR, 2014). SCAR counts 46 members who designate delegates meeting in working groups. SCAR is an observer to the Commission and brings scientific reports. However, with the status of an observer, it does not participate as such in the discussion and production of knowledge as understood by the model. Also, SCAR is out of access for restricted meetings, and this has been the case, especially during the special meeting on marine protected areas in July 2013. However, the second aspect balances the linear model much more. Scientists may attend the Commission meetings as advisors in their national delegations. In the British delegation for example, is the Commission representative from the FCO and depending on

the topic, one expert comes to join next to him/her and gives advice. The person with the most appropriate knowledge takes part. They are not directly involved but they sit in the background and provide advice whenever necessary. Those scientists usually also participate in the Scientific Committee before and in this sense, science is not totally excluded in the Commission. Indeed, discussions are mostly policy oriented, but they are based on scientific data and require sometimes clarifications (UK-S-3; F-P-1). In some cases and if allowed by the representative, a scientist can also speak. In the case of Belgium, it is even the same person that can be representative for both the Scientific Committee and the Commission. The analysis of the three national delegations has also shown that the national process can rely on the joint knowledge model Production, while the study is restricted to only three countries that cannot be representatives of all members. Moreover, it is also interesting to underline the importance of informal discussions during the annual meetings but also during the intersessional work. The polar community is quite small and contacts between the actors do happen also outside the meetings. This aspect is difficult to assess without attending the CCAMLR meeting, however, the interviews clearly show that it also encompasses contacts between scientists and policy-makers. In conclusion, the process to create marine protected areas within the frame of the Convention for the Conservation of Antarctic Marine Living Resources follows a linear model of expertise but is balanced by some aspects of the joint knowledge production model.

6.4. The boundary organizations

There is surely an attempt from the Antarctic and Southern Ocean Coalition (ASOC) to help in facilitating the link between science and policy regarding marine protection in the Southern Ocean. Generally speaking, its role is positively assessed as being reasonably skillful at not taking a too prominent role in CCAMLR meetings itself (UK-O-1). They sit in the back and listen a lot, making useful relevant contribution when necessary. They need to adapt their role in the different countries. In France, for example, they first tried a strong lobbying before facing the fact that the delegation was not open for that. But they succeeded in adapting their activity to an extent that became helpful for the French delegation (F-S-1). ASOC has been cited in the three countries studied as an organization consulted, on a more or less frequent basis. However, it is more by the organization of intersessional work such as workshops that ASOC could be considered as a boundary organization. Those workshops can gather scientists and/or policy-makers to discuss further the creation of a marine protected area. For example, such a workshop has been organized in Norway right before the annual meeting in Hobart in October 2013. Indeed, a characteristic of such a boundary organization is to involve the participation of actors from both science and policy. This involves more than lobbying for example. ASOC is not an ideal-type but to some extent, it could be considered as a boundary organization. However, at such an international level, it is a difficult ambition.

6.5. The role of scientists

The role of the Scientific Committee cannot be linked to 'pure scientists', as it is a subsidiary body of the Commission and produces reports on request. Their role does not seem in line with the 'issue advocate' because the scientists want to keep their science out of policy influence and not to engage their opinion. This is underlined by the opposition showed against political opinions in the Scientific Committee. Their role seems more in between 'science advisers' and 'honest broker of policy alternatives'. They are not only science advisers as the Scientific Committee can also produce recommendations, adopting a sort of normative position. Moreover, it can produce assessments, reports and recommendations "on its own initiative" (CCAMLR, 1983). Their role seems to turn to honest broker of policy alternatives and this gives an argument to the model of joint knowledge production. However, the Scientific Committee gathers many scientists that are expected to perceive and fulfil their roles differently. Of course, considering the number of scientists involved, this study could not consider each of them separately. Only the roles of those from the three national delegations selected as case studies have been analysed.

From the general opinion, the science within the CAMLR process is well respected (UK-O-2; UK-S-2) and generally speaking, the Commission takes scientific advice into account. The Scientific Committee does have a big impact on the decisions of the Commission (UK-P-1). However, with the case of the marine protected areas, there is a common feeling that the policy has lately ignored the scientific advice and that decisions are made (or not made) on political rather than on scientific basis (UK-O-1; UK-S-3). This is perceived as a difficulty by the scientists who put effort in bringing science. The fact that a reason given for stalling the proposals was the lack of science is perceived as denying the role of the Scientific Committee. Some policy-makers use science as an argument not to adopt the marine protected areas while the Scientific Committee had endorsed the proposals[13], establishing that it was based on the best science available. It becomes a very confused situation where policy-makers start saying that the science is not good enough while it is really the job of scientists to say that (UK-S-3). The role of scientists is somehow denied by this argument. And the advice of scientists has not been used in the best way by policy-makers or in some cases, totally ignored (UK-S-3). This is fundamentally a problem as they should be taken as advice (UK-S-3). "I think it is a great shame that a great argument that is often used to hamper the progress is that there is not enough science. But you will never have enough science to satisfy the parties if they want to block the proposal" (UK-O-1; UK-S-2**)**. At the end, science and policy are sort of ignoring each other and denying their respective roles.

[13] The Scientific Committee has endorsed both proposals for the East Antarctic and the Ross Sea in 2011 and 2013.

Chapter 7

Adapting the science-policy interface

The last two chapters have analyzed the policy arrangement taking on multi-levels, detailing for each case the actors involved, the organization of delegation, the boundary organization and/or objects and a focus was made on the roles of the scientists. This answered to the first research objective, namely the assessment of the practices and of knowledge production for antarctic marine protected areas. It also partly answered the second objective regarding the assessment of the roles and expectations of scientists, policy-makers and environmental NGOs. In this coming chapter, it is aimed at answering this second objective in more details, by a cross-cases analysis, adopting a general overview and trying to underline some common issues. First of all, it will look at the distinction between science and policy and the practices on borders crossing. This will lead to answer the third research objective through the recommendations on how to adapt the science-policy interface for improving its effectiveness to establish Southern Ocean MPAs.

7.1. Post-normal science and the importance of the human factor

The roles of scientists regarding the creation of marine protected areas in the Southern Ocean have been detailed for each study case at the two governance levels of the policy arrangement. In most interviews, their roles were defined around the determination of the potential areas to protect, the sensible criteria for those zones and the kind of protection required. "In general, setting conservation objectives and evaluating candidate areas with respect to ecological criteria requires a sound scientific understanding of marine species, ecosystems, habitats and their susceptibility to environmental change and human impact" (Olsen et al., 2013: 24). In practice, however, the roles of scientists go deeper in assisting the political process than a simple linear transfer of knowledge from science to policy. Indeed, in the three national study cases and in the CCAMLR, most scientists did mainly approach the profile of 'honest broker of policy alternatives' where the scientists enter more actively the decision-making process. Looking at the national cases of the United Kingdom and France, two countries that introduced a proposal for marine protected areas, it became clear that the scientific assessments for the proposal already included a real dialogue with policy-makers. The definition of areas had already been submitted to political aspects. During the meetings of the Commission for the Conservation of Antarctic Marine Living Resources as well, the scientists can be advisers. They follow the discussions and in practice, they help in redefining areas according to political demands. The case of France is especially difficult as the proposal has already been stalled three times. It brings the scientist to face the difficult frontier between science and policy when the political conditions are further and further from scientific recommendations. It is

difficult to estimate how far to follow the political demands and move back from science. In the United Kingdom, the scientists leading the scientific work of the proposal do have a multidisciplinary profile, connecting policy knowledge to their scientific expertise. Other scientists who do not have that interdisciplinary expertise told indeed that knowledge in law and politics would be useful for them as well in the process of the proposals. Crossing the boundaries to get to know the mechanisms of the policy side could somehow help scientists in their difficult tasks. Along the study, many other links between science and policy have been highlighted. For instance, science may be linked to policy of funding. In the case of Belgium, it happens that the scientist is in a situation where he is the representative at both the Scientific Committee and the Commission. By this position, he goes out of the traditional scientific tasks to exercise a more political position. In many delegations also, representatives and advisers simply switch their labels at the Scientific Committee and the Commission. This illustrates that even at the CCAMLR level borders between science and policy tend to be blurred. In the field itself, there is a tendency nowadays to take policy needs already into consideration. The scientists in the field are far more aware today that their science will potentially be useful for policy. "In the past, people were largely unaware of what their science could be used for" (UK-S-1). Most of the research was systematic whereas "this measurement for measurement's sake is no longer valued. Of course the climate, the magnetic field and the ionosphere still have to be observed, but today the emphasis lies in problem solving science: a problem is raised and scientists are required to contribute to the solution" (Decleir in de Lichtervelde, 2008: 28). The research today is more orientated towards answering a political question[14] and this already translates the shift to the new paradigm of "post-normal science, which emerged from dissatisfaction with knowledge arising from the gap between policy questions and scientific answers" (Kunseler, 2007: 2).

The role of policy-makers on the other hand, is usually described as making decisions in bringing socio-economic considerations next to scientific aspects raised by science. But here as well, the study has found blurred borders. In the case of the United Kingdom for example, policy-makers are involved in the long term so that they are more equipped for understanding science. It makes the polar community pretty small, and many interviewees underlined this as an advantage, helpful for the communication. It also happens that scientists get involved in ministries even if it is not the case at the moment. If science is linked to policy by the funding, policy is also linked to science by the scientific conclusions made but also by the topics that scientific institutes or funding agencies choose to stress (van den Hove, 2007:811) or put on the agenda (Mostert and Raadgever, 2008). The balance of power between science and policy is not unidirectional. At the CCAMLR level, the fact that policy-makers tend to join and interfere in the Scientific Committee also illustrates the trend to blur borders. This shows that science and policy are far from being

[14] A distinction is made between 'science for science' and 'science for action'. This does not meanthat all science shouldbe issue-driven, but ithelps for the politicalprocess. See van den Hove, 2007 : 810-811.

two separate entities and hermetic categories, but that they are actually in strong and constant interactions. This conclusion is also depicted in the analysis of the model of knowledge production, as two cases were clearly based on a model of joint knowledge production, and that an absence of model in Belgium or a linear model in the CCAMLR do not seem supportable today but are rather evolving towards the second model.

The actors acknowledge that science and policy must come together in decision-making. It is believed that "it would be a disaster if we had just policy-makers going in and making a decision. It would be a disaster if we had just scientists going in and making a decision" (UK-O-1). This is indeed this vision translated by the joint knowledge production models in the United Kingdom and France, and the wish to go towards an enhanced cooperation in Belgium. At the CAMLR Commission, this is also illustrated by the fact that decisions must be "based on the best science available". However, it is striking to see how the vast majority of the interviewees stress the necessity of a strong distinction between science and policy: "if the system is working well, there should be a very clear distinction between science and policy" (UK-S-2). This is also expressed in terms of the independence of science: "it is important to have a good and independent science at the basis, to have a good and solid decision" (UK-S-2). It is particularly well illustrated by the vigorous opposition to the policy-makers participation in the Scientific Committee. It goes as far as demanding the publication of the CV of each participant to control their scientific qualities and being able to refuse political incursions. In the United Kingdom, the reluctance against work linking science and policy, particularly illustrated by the difficulty to find scientists for such positions, testifies of the willingness to keep science and policy as two separate entities. In many cases, actors expressed their preference for a linear model where science would be preserved of interaction with policy. This is even stronger for the international level.

In an ideal world, a clear distinction between science and policy would probably preserve science from political influence and the risk of bias. Science would be value-free and scientists disinterested, informing policy in a unidirectional and linear flow. The linear model indeed assumes the neutrality of science from which results are supposed to be value-free. It claims independence and autonomy of science, and removes the discipline from its political context. Therefore, the linear model, with knowledge flowing from science to policy, is perceived by many actors as the way the science-policy interface should ideally function. It also relates to the normal scientific paradigm where "a clear task demarcation between research institutes and authorities is advocated. The demarcation is meant to ensure that political accountability rests with policy-makers and is not shift, inappropriately, to the scientists, while it similarly serves as a means of protecting science from the political interference what would threaten its integrity" (Kunseler, 2007: 4). However, the interviews reported many connections between science and policy, and this has been confirmed by the study of the model of knowledge production and of the roles of

scientists. In the countries studied, boundaries brokering regularly happens and seems actually necessary for a sound decision-making. It forces therefore to take a distance from this normal science paradigm and linear model.

Scientists are indeed no outsiders in their study contexts. "Scientists have their values, their culture, their beliefs, and their interests. And they cannot isolate their scientific work from their values" (van den Hove, 2007: 14). On the contrary, especially in the Antarctic, scientists are really involved in their field. They work in or around the Antarctic, being very aware of the pristine and fragile environment with which they have a special connection as they are the only human beings – except tourists – who can reach those remote areas and live there. It is difficult for them not to get attached to the environment they study and not be willing to protect it (UK-S-4; UK-S-1). When working in the Antarctic, scientists get attached to "their" species so that they want to see them and their ecosystem managed and not destroyed (UK-S-4). It probably makes scientists working in Antarctica more willing to get involved in policy. Scientific reasons can also motivate them to favour protection as protected areas may help to keep reference areas intact. Not all scientists strongly advocate marine protected areas, and they actually look to base their arguments on science, but it is difficult to believe or to expect that scientists should not consider their values when they enter the policy process. Science in the Antarctic is really proactive (UK-S-2), but they are not neutrally involved. Especially that science is also the physical presence of countries in the Antarctic, a continent devoted to 'peace and science', which gives by definition a political status to the scientists.

Post-normal science recognizes the "important role of human factor" and "goes beyond the traditional assumption that science is both certain and value-free". (Kunseler, 2007: 3). The interviews made it clear that scientists are well aware of the political issues and challenges and the linear model of expertise leads to the 'schizophrenic' position of having an awareness of the political terrain while at the same time ignoring it" (Beck, 2010: 299). This is even more true in the Antarctic, where science has such a dominant role. When asked about their motivation in joining the governance process, scientists precisely answered that they like to give value behind their science (UK-S-4, F-S-1).

> "Scientists' integrity lies not in disinterestedness but in their behavior as stakeholders. Normal science made the world believe that scientists should and could provide certain, objective factual information for decision-makers. But when there are problems not of how things work, but rather issues of what should be and why, the narrow focus and single solutions have shortcomings. Facts are still necessary but no longer sufficient" (Kunseler, 2007: 4).

Therefore, how can scientists interfere with policy-makers? Kunseler (2007) defines the tasks of scientists in post-normal science as the maintenance and enhancement of quality, rather than or next to the establishment of facts. This is exactly what it is about when it comes to the creation of marine protected areas in the Southern Ocean. "Scientific facts are only one part of the relevant knowledge that is brought in as support to a decision or policy

process. Besides their legitimating, instrumental and enlightenment function, scientific policy advisers fulfil 'post-normal' tasks. They have an interpretative function in reflecting, improving and sharpening judgments of policy-makers regarding social, cultural and institutional factors, which might have a negative or positive impact on the policy issue" (Kunseler, 2007: 4). This requires accepting a new role for science and a stronger interface with policy within a joint knowledge production model.

However, it surely does not make the tasks of scientists easier to keep a balance between a sound science and a good cooperation with policy. Scientific skills and abilities need to evolve and most of all, this new role needs to be accepted and legitimized. It is actually dangerous to consider them as outsiders because it allows them "to act in an overtly political manner while simultaneously claiming to be disengaged from politics" (Beck, 2011: 299). But the involvement in political negotiations is not self-evident and is actually quite new. "We must appreciate that science advice is a little-understood sort of scientific work. There is no special training for it, nor any established career structure. It is customary for scientists who have achieved either eminence in their specialist field and/or success as administrators, to be invited to this new task. Generally they lack experience of any of the aspects of work which make it so different from conventional research" (Ravetz, 2001: 390). There is a necessity to redefine the role and to recognize the legitimacy of interactions with policy. Crossing boundaries already happen and good practices in boundaries brokering do exist. But instead of being a risk, this blurring of boundaries between science and policy can actually lead to a higher appreciation of the actors involved and to a better effectiveness to establish marine protected areas in the Southern Ocean.

This is in line with the development of science of conservation and environmental governance. Many papers today move back from a naïve vision of science and policy as two separate entities that sometimes exchange information and knowledge (Ravetz, 2001; Guston, 2001; Turnhout et al., 2005; Kunseler, 2007; Pielke, 2007; van den Hove 2007; Beck, 2011; Hegger et al., 2012). Science and policy can best be perceived in terms of a gradient. The boundaries where the overlap takes place are not so clear (Turnhout et al., 2005). It is not to say that there is no distinction at all. As Miller says, "Congress does not select Committee chairmen on the basis of the number of articles candidates have published in Nature, just as scientists do not vote on the speed of light" (Miller, 2001: 482). However, there are good practices in crossing boundaries and they are already happening today. The politicization of science and scientification of policy, if they are managed under good rules, can fit the mutual interests. In a long term, those walled institutions and divisions will face the emergence of interdisciplinary profiles in the coming generations. Science and policy are not incompatible, especially in such an environment as Antarctica where the contacts happen in a sort of closed and small community.

7.2. Recommendations for improving the roles

Based on these conclusions on the distinction between science and policy and on boundaries brokering, it is interesting to look at the role of each category of actors specifically targeted by the study in order to recommend how to adapt current practices. The purpose is not to review the whole process of the creation of antarctic marine protected areas. On the contrary, the last chapters have already stressed that the current practices mostly approach the joint knowledge production. It emphasizes instead a significant number of general pathways that can facilitate the process. They target the overall importance of linking science and policy and bringing science as an insider actor in the process.

7.2.1. On the roles of scientists

The roles of scientists are evolving with the evolution towards post-normal science. It is however a specific context of science having a monopoly of knowledge in the Antarctic, as there are no inhabitants. It is important to make a distinction between the knowledge production and the decision-making: the participation of scientists in the production of knowledge in a joint process does not imply that they have a voting right. But there is an evolution in their role and it does not make their task easier. There are, however, possibilities to facilitate the involvement of science in the policy process. Communication has not been raised as a real problem during the research but it has been noted that long-term involvement is helpful to learn about policy and adapt its role for a better cooperation. A scientist explained, for example, that knowledge of law and environmental policy would help him in the process, knowledge that he currently has to figure out in the field (F-S-1). Therefore, by their involvement on a longer term, scientists become more acquainted with the other disciplines. To facilitate this, training might be useful. A system of training is an idea already suggested in the realm of environmental science (Ravetz, 2001; van den Hove, 2007). Next to interdisciplinary competencies, it can focus on communication and translation of knowledge as well. For example, the Review Panel stressed that the quality and focus of science is not always well reflected in the reports of the Scientific Committee (CCAMLR Review Panel, 2008); this is also a matter of communication and translation of science. Similarly, science encounters difficulties to transmit uncertainty. Several times, it has been said that science has to deal with uncertainty where policy-makers do expect certainty and that this disequilibrium is really difficult to clarify (F-S-1). This can be parts of training, or for the next generations, it can already be integrated in the educational programs. The programs can be reviewed in accordance with what is necessary for connecting science and policy, and focusing on more interdisciplinarity in general. Interdisciplinarity in natural science programs is often conceived as the crossing of different natural science fields; but interdisciplinarity can also link social and natural sciences.

Besides, it is necessary to redefine the role of scientists in political negotiations, to match the needs and expectations from both science and policy. It can help in the legitimization of human factors in science. Scientists could then come back in the political process and not act as outsiders. It is important to value their work of connecting science to policy in such a way as they do not face a constant dilemma between their value and a theoretical neutrality. This is especially important in the United Kingdom where scientists involved in policy have difficulty to have their work valued enough among their colleagues, preventing some others to join the process. Nevertheless, it is also essential to reflect on the new role of science and to help providing the scientists with keys and skills for a good balance in their involvement. Generally speaking, scientists are satisfied with the role they have at the national level regarding the antarctic marine protected areas, even in Belgium where the contacts are more limited. This role is also positively assessed by the other actors. At the CCAMLR level, however, scientists raise difficulties to accept the interference of policy-makers in the Scientific Committee. A reflection needs to be done on how to regulate this positively. Also, the involvement of one scientist as representative in both the Commission and the Scientific Committee, as in the case of Belgium needs to be reviewed, as it confused joint knowledge production and joint decision-making. It does not fit the scope of tasks of the scientists and it risks altering the scientist's credibility. Here is the distinction between joint knowledge production and joint decision making.

Scientists can adopt different roles and Pielke (2007) summarized them in four categories. He did not try to prescribe the course of action that every scientist should opt for, but wanted to clarify the different possibilities. It brings a range of options where scientists can make a choice based on how they like to situate themselves in relation to policy. This choice can evolve along time and situation. Moreover, the roles of scientists can better be perceived on a gradient. Despite a real advice, Pielke (2007) looked at the most appropriate role regarding two aspects, namely the level of uncertainty and the value consensus. He concluded that with low value consensus and low uncertainty, if scientists try to expand the scope of choice for scientists, the role of 'honest broker of policy alternatives' would be the most adapted (Pielke, 2007). In the context of creation of marine protected areas in the Antarctic, there is indeed a relatively low value consensus and a high level of uncertainty. In the cases studied, those involved in political negotiations are mainly acting as 'honest brokers of policy alternatives'. In the United Kingdom, however, one of the interviewees had a totally different profile: as a 'pure scientist', he did not wish to be part of political discussions as such. Indeed, the connection with policy also depends on the scientists himself and his attitude regarding the political context. It is actually expected that those getting involved in a political process tend to accept profiles more connected with policy-makers. If the study should have taken more external actors into account, the profiles of scientists would have been much more diverse. 'Pure scientists' do not enter political negotiations as they want to stay out of this process. However, when the science is done, it does not mean that everything is clear. In political negotiations, proposals must be adapted

and it requires a dialogue between science and policy. The role of 'pure scientist' is therefore not really adapted to such situations, whereas "having personalities that can do science and policy and talk to people with policy and science is really valuable" (UK-S-4).

7.2.3. Rewards

Getting involved as a scientist in political negotiations, however, requires adapting the traditional scientific skills to another reality. This is not an easy position especially as it involves a more confrontational method in the relations to peers. Indeed, in such a process, scientists meet and discuss their results while the traditional peer-review does not imply such a direct discussion (UK-S-4). It may therefore be asked what the motivations and rewards are pushing scientists to enter a decision-making process. The analytical grid emphasized this as an important factor. Two important aspects for scientists are publications and funding. First, the reputation and the funding of scientists are based on their scientific publications. The time invested in the participation in CCAMLR meetings and its preparation, however, is not invested in publication and research. And it is not possible to value it in terms of scientific production. The reports from the Commission and the Scientific Committee to which they contribute are not valued as usual scientific papers while these are the means on what scientists are assessed. Research relies on quantitative indicators for assessment while the expertise developed for the CAMLR Commission is currently not convertible into those quantitative indicators. However, a scientist is judged on his scientific production. This is a real problem for the scientists (F-S-1). It requires reflection and a revision of the current practices within the scientific spheres. The participation in CCAMLR can possibly be valued in other ways: in France for example, scientists in universities are assessed every four to five years, also regarding the themes they developed and the transfer of knowledge and expertise to the CCAMLR is valued in those assessments (F-S-1). This possibility should be generalized.

Funding is another important aspect for scientists. In the three countries studied, science is partly funded by the governments. However, funding is not always perennial and in the case of France for example, this brings a high uncertainty on the scientist's involvement on long term. Those funding issues therefore play a role in a scientist's willingness to join a political process as one wants some certainty regarding the guarantee of their involvement. Without a clear funding scheme, scientists start an activity without certainty to get funded until the end while it is also uncertain whether their results will be good enough to be valued for publications (F-S-1). Moreover, there is often a gap between funding schedules of science and policy: policy needs quick information while science needs time to come with conclusions. Expertise can require a really long time but the funding agencies do not always match this time requirement. In the case of the marine protected area, this is particularly difficult as lots of research have to be done in a short time before the proposal while the adoption of the proposal itself takes years. Scientists do not always understand the reasons of such a situation, and if there is not a good mutual understanding, it can be

difficult to keep them motivated (F-S-1). In conclusion, the funding for science needs to be made clear, perennial whenever necessary and a discussion with scientists should be done in order to find the best common agreement. If funded by the government, scientists can be more or less forced to join the political process as a sort of duty to communicate the results to the government or other policy bodies. The level of commitment is not the same in each government. The participation to political processes, however, can also be a way to keep a funding by showing his expertise and competencies (I-O-2).

It is important to say that the motivation commonly mentioned by scientists really involved in marine protected areas in the United Kingdom and in France is their willingness to bring values behind their science. It makes their science more practical (UK-S-2). The change in paradigm that this represents has already been discussed earlier. It is interesting to know that this implication in the policy process can apparently be related to the wish for legacy. As scientists reach retirement, they would be willing to leave a legacy (UK-S-4). It is a fact that an article published, even in an important journal, reaches only a limited number of readers, often from a specific field. The discussions at the CAMLR institutions, on the contrary, are followed by a much broader audience and the impact is potentially bigger. Therefore, going to the political realm is also a possibility to leave a legacy, to mark his print before retirement. In other cases, scientists get involved in NGOs. Scientists participating in the CCAMLR usually achieved eminence in their field and being asked to join the process is also a sort of acknowledgement. However, in the scientific community, the neutrality of scientists is still highly valued in such a way that scientists involved in policy can somehow loose of their credibility among their peers (B-P-1). The small size of the polar community and the direct relationship between science and policy in the Antarctic probably enhance this aspect. This claims for a redefinition of the role of science, already developed in the previous section.

7.2.4. Roles of the policy-makers

The role of policy-makers can also be adapted to match better with the needs and expectations in the Commission and the Scientific Committee. The communication between science and policy is not self-evident. In the United Kingdom, science and policy worked closely together and this is probably enhanced by the facts that policy-makers stay for a long term and work full time on the Antarctic. In France, policy-makers do not work full time and do not stay on a long term basis, but the connection with science seems better implemented than in Belgium where science and policy still work quite independently. Therefore, the importance of MPAs for the national delegation might also play an important role. However, actors do stress that the communication can be enhanced if policy-makers stay on long term and if they work full time on the issue. The communication seems to go smoothly in delegations when the actors can stay for a while, and they learn in the course of time lots of the details (UK-O-2, UK-S-4). Hence, even if a turnover in a delegation favour the emergence of new ideas, it is good to have a few

persons staying for longer terms. Keeping a group of person active on the issue, at least regularly looking at the new developments is important to keep the topic active. Letting the motivation decrease by itself is also a strategy possibly adopted by opponents who can expect that by postponing the adoption of the proposal again and again, the topic will come out of the agenda. In that sense, the intersessional work is also vital as it keeps continuity in between the annual meetings.

The communication is also important within the policy institutions. In Belgium and in the United Kingdom, one ministry – or one department – is in charge of the issue. The policy polar community is small. In France on the contrary, several departments are involved. The case study stressed the difficulty of having different ministries in charge of one issue. A coordination and good distribution of tasks are really necessary as well as a good communication internally and externally. For external actors, this can be difficult to know which department to contact. This external communication is important as some have also expressed difficulties to get acquainted with the proposal before the meetings, and would like to have access to some documents/maps in advance (B-S-1). It is also important to talk more with the other delegations and involve them more. A key recommendation probably is to collaborate as much as possible on the new proposals and to do so before the CCAMLR meetings. This would prevent blockages during the meetings. For the South Orkney Islands, not so much has been done in terms of involvement of other delegations (UK-S-4). For the East Antarctic, a proposal has been developed but not much talk took place with countries other than those that wrote the proposal. New Zealand and the United States have developed proposals for the Ross Sea without even talking to each other. However, the members of the CAMLR Convention start realizing this and they now apply it more to the new proposals and for the revision of South Orkney Islands (UK-S-4). In the revision of South Orkney Islands, the United Kingdom takes this aspect into account and goes more to other delegations (UK-S-4). The collaboration should especially focus at the involvement of the (potential) opponent countries (F-S-1, F-P-2). The proposal developed today by Germany for the Wadden Sea for example initiated cooperation with Russia from the beginning (F-P-2). It is of course not possible to talk to everyone and this requires assessing countries that would oppose from those that would support and make a different lobbying. But discussing the proposal with other delegations beforehand can surely help in the CCAMLR meetings. This might also prevent an extended reduction of areas for fishing activities. Indeed, the annual meetings do have tight schedules forcing compromises but with a discussion beforehand, compromises can be better balanced as they are anticipated. Scientists have, of course, an important role to play in this part of the process.

Finally, the political role of the meeting's organisers is also important. In July 2013, the CCAMLR has led a special meeting on marine protected areas. During the Commission meeting, the representatives had a restricted attendance for half of the meeting (B-P-1; F-S-1). This choice made by the chairman on demand of opponent countries is a strong choice

that did not solve the situation. Also, the choice of the organization of a special meeting has been questioned as it has not really enhanced the process. Some underline that it is better to have meetings where other aspects are also under discussion, and where improvements can be made in other domains (F-S-1).

7.2.5. Roles of environmental NGOs

Some years ago, the reputation of NGOs was not really positive but it is considerably changing (I-O-2). There are different NGOs, they have different positions and use different methods as well. The role of the environmental NGO is really variable according to the organization and to the country. Only in the United Kingdom is one NGO directly involved in the delegation. In the other countries, NGOs are consulted regularly but not systematically. Also, except in the United Kingdom, only international NGOs are mobilized. This surely translates the importance of the Antarctic for the country. The means of action for NGOs are really broad: lobbying, funding research, informing and mobilizing the public opinion, providing information papers or even helping national delegations in writing such information papers (B-P-1). The common goal is usually advocacy. The general opinion is positive on the role of the NGOs as providing relevant information, usually based on a good scientific basis (I-O-2). Some organizations such as WWF-UK enhance the process. This NGO is involved within the British delegation and acts as a boundary organization. The role of some others, however, can be controversial. They are sometimes undermining the process on the way they explain science. If the science is not well explained by the NGOs, they do not have the quality of inputs that they should have (UK-S-4). This can sometimes give arguments to opponent countries.

The role of the Antarctic and Southern Ocean Coalition (ASOC) is important regarding the NGOs involvement, and its importance is generally recognized. Next to this coalition of NGOs, however, is also the short-term campaign focusing on marine protected areas: the Antarctic Oceans Alliance (AOA). The distinction between both the Antarctic and Southern Ocean Coalition and the Antarctic Ocean Alliance is somehow confusing though. They rely on the same members, and are both active in the Southern Ocean. During the study, it has been mentioned that the campaign led by AOA could have been done on behalf of ASOC to avoid some confusion. The objectives of the Alliance are actually not really clear, and the website does not bring much clarification. Not everyone sees it as a real issue, but when it comes to explain the difference, there is a general confusion on why a new entity was needed for what could be the competence of the Antarctic and Southern Ocean Coalition (UK-O-1; UK-S-4). The Antarctic Ocean Alliance targets public mobilization. It is true that NGOs also have a broad possibility of action through public mobilization. However, it is to question if it can really be done by an organization that people do not know, at such an international level. It is important to find relays in national NGOs. The Antarctic Ocean Alliance also seems focused on Anglo-Saxon countries.

If the role and reputation of NGOs have been improving in the last few years, there is for sure a possibility to go further. NGOs can probably do even more for the marine protected areas in the Antarctic. First, they should be really conscious of the science they bring and the way they spread it. This needs to be coordinated with scientists. They can facilitate the communication between the delegations during the intersessions by the organization and funding of workshops and meetings for example (UK-S-4). They already do so, like in Norway before the CCAMLR meeting in Hobart in 2013, organized by a few NGOs, mainly through ASOC and AOA (UK-O-1). They can help the countries doing a proposal to know which other country would be helpful in support. But more can be done. They could fund science for example, as it was done for the research of Phil Trathan. A vast majority of actors interviewed agreed that they should also turn their work more towards the fishing countries. National NGOs can also be integrated more systematically in the national delegations as they really involve a different point of view. It brings another perception in the delegation that also makes sense in the process. Finally, in mobilizing the public opinion, they can rely on the multi-level and they can broaden the public at issue. This public mobilization can also be enhanced in fishing countries.

7.2.6. Boundary organizations and boundary objects

Boundary organizations belong "neither to the realm of science nor to the realm of politics" (Pohl et al, 2010: 269), but they facilitate the interface between both. Environmental NGOs acting as boundary organization have been discussed with WWF-UK in the United Kingdom and the Antarctic and Southern Ocean Coalition at the international level. Boundary organizations are really believed to be a key in connecting science and policy and helping in their sound cooperation. In the United Kingdom, the British Antarctic Survey also acts at the interface. In Belgium and France, there is a lack of such organizations and this has been expressed during the interviews. NGOs can probably take this role, but no national NGO is really involved specifically on antarctic marine protected areas. Despite a whole organization, however, a group gathering members from both political and scientific institutions can take this role, by focusing on this issue full-time. As Belgium does not have the same involvement in antarctic marine protected areas, the delegation is constituted of only two persons and this is not realistic to have them working full time. Therefore, it can be coupled with other issues. In this sense, Belgium seems to look for an alternative or an incentive via the project of 'Belgian Polar Platform'. This can act as a boundary object, a "concept adaptable to different viewpoints but at the same time robust enough to maintain identity between them" (Hegger et al., 2012: 57). The Platform aims at gathering science and policy around a common objective and a common concept. Despite the questions raised about the link between this new project and an older one, this can help in linking actors if this is fully implemented.

During the research, it clearly appeared that the concept of marine protected areas is actually a boundary object in itself. It is a debate to know if science is obligatory involved

in the definition of a marine protected area. There are places on the planet where such protected areas can be decided or exist without the participation of science. At the CCAMLR, however, decisions have to be based on science. The concept of marine protected area is the result of a boundary work connecting the domains of science and policy. It is recognized as a useful concept by the scientific community, as there is a consensus among the scientific community of the necessity of the marine protected areas (F-S-1). There are debates on the size, the locations, and the level of protection but not on the tool itself. The scientific agreement around this concept is even stronger so that marine protected areas can have, not only a conservation goal, but also a scientific purpose for research and monitoring. The concept is also deeply rooted in policy and the members of the Commission have already agreed to the objective of the creation of marine protected areas. The definition of the marine protected area has been under discussion at the annual meeting in October 2013, as some members estimated that the concept was not legally defined. However, by agreeing on the objective of the creation of a representative network of MPAs by 2012, the members implicitly agreed with the definition of marine protected areas. The Conservation Measure 91-04 establishing the General Framework for the establishment of CCAMLR marine protected areas was also a chance to raise a difficulty if there was one. Raising this argument might simply be a way for postponing the adoption of the proposals. The concept of marine protected area seems on the contrary reaching a general consensus and succeeds in maintaining an identity in both science and policy spheres in such a way that it helps to link both.

7.3. Recommendations for a joint knowledge production model in the CCAMLR

The analysis of the Convention for the Conservation of Antarctic Living Marine Resources led to the conclusion that the process for the creation of marine protected areas follows a linear model, tempered by some aspects of joint knowledge production. Therefore, it is interesting to reflect on possible improvements at the CCAMLR level, towards a "more distributed and participatory approach" (Beck, 2011). The annual meetings of the CCAMLR take place around two main institutions: the Scientific Committee and the Commission. The involvement of policy-makers in the Scientific Committee has been discussed as policy-makers attend and interfere more and more in the scientific meetings. At the moment, this raises strong opposition. However, policy-makers may have valuable reasons to wish getting involved earlier in the scientific process which is in line with the joint knowledge production. Instead of forbidding any participation and establish difficult control rules – such as asking for the CV of each participant – it may be better to reflect on how to regulate the participation and involvement of policy-makers in a way that would be beneficial for all. This might require the implementation of smaller discussion groups or of a delegation from the Commission for example. Ultimately, this may probably respond better to the expectations of policy-makers and enhance the joint knowledge model. If it respects the requirements of science and scientists, this would lead to a soundest decision.

Similarly, the joint knowledge production can also advocate for an inclusion of scientists in the Commission meetings. At the moment, the chairman can assist at the meeting, to ensure that the business of the Committee is carried out effectively and in accordance with its decisions (CCAMLR, 1983). However, this allows a transfer of knowledge but not an exchange and cooperation in knowledge production. Therefore, a delegation of the Scientific Committee in the Commission can also be an option. As mentioned during several interviews, it is not because the science is done that everything is clear. "How scientists knowledge is used and interpreted by stakeholders [is] dependent on their interests" (van Koppen, 2011: 165). If the science would be more involved, it would also avoid the situation where scientists can pick up the uncertainties and inconsistencies in order to point out the indeterminacy of the scientific results brought by those presenting proposals that do not fit their interests (Beck, 2011). If this is true at the national level, this is also true at the international level. And the joint knowledge production is possible at the national level, so it is surely possible to enhance it at the international level.

Finally, it is not about merging both institutions. Joint knowledge production is not the same as joint decision-making. The scientists would not have the voting right. It is about allowing an interface as a common space where actors can sit together and discuss necessary measures with all the considerations that need to be taken into account. This would be the basis for the adoption of the decision by the policy-makers. There are two aspects which require reflection and on which the joint knowledge model might have an impact. It is the argument of science and the level of commitment. As already mentioned, a reason given for not adopting the Conservation Measures is the lack of scientific data. However, once the Scientific Committee has endorsed a proposal, it is not the task of the Commission to question this anymore. The scientists already expressed their disappointment about this situation, as they work consciously and with passion, they feel denied in their role when the Commission ignores their conclusions (UK-S-3). The members of the Commission should take their responsibility and accept their failure when they do not reach the objective, instead of rejecting the responsibility on scientists and science in general (F-S-1). This has been mentioned as a big problem during the interviews and there is a real risk that the trust gets eroded by this behaviour (UK-S-3). With an involvement within the Commission, science would also have a voice to defend itself against the argument that there are not enough data. Secondly, it is surprising that in the reports of the CAMLR Commission, policy-makers are referred to by their countries while scientists are referred by their names (sometimes followed by the country). This can surely be explained by the fact that science wants to remain independent, but this puts a burden on scientist's discourses and the personal commitment is not the same (F-S-1). In the reports, science is judged on a personal basis. This is accentuated by the fact that the polar community is small so that scientists are not anonymous. It may be good to adapt those practices one way or another. And connecting the actors by an improved science-policy interface would already facilitate the dialogue.

Chapter 8
Towards the development of antarctic MPAs

This last chapter aims at looking at the limitations of the study before assessing the extent to which an improved science-policy interface may concretely be useful in enhancing the creation of marine protected areas. The chapter also gives some insight into possible directions to go ahead in the negotiations.

8.1. Research limitations

Before coming to the conclusions on the science-policy interface, it seems appropriate to have a look at the limitations of the study and examine the weaknesses that inevitably exist in this study. Each research process is constrained by some items and it is important to highlight them and keep them in mind when coming to the conclusions. The main limitation of study is probably related to the number of study cases as well as their characteristics. Three countries have been studied. This is a fair number but it can not represent the whole situation, especially seeing that none opponent country to the new MPA proposals was included. The case of opponent countries would be extremely relevant and interesting to study, and this would probably bring different conclusions on the current practices in the science-policy interface. The selection criteria have been explained in the methodology together with the reasons for studying three countries. It is always possible to bring the analysis further but time, budget and scope constraints limit the research possibilities. This is the devil triangle developed in the second chapter. This also constrained the number of interviews but in the end, the study is believed to cover the main points of view. It would have been interesting to interview more policy-makers from the same national delegation, but this is actually difficult to arrange except when several departments are involved. Gathering the opinion of scientists which are not directly involved in the political process is also another possibility that could have been investigated more. This has been done once in the United Kingdom and it presented indeed a really different view on the interactions between science and policy. Of course, it is always possible to look for more, but it was necessary to limit the research.

The second limitation is probably the restricted access to the institutions studied. The research did not encompass an observation phase for instance, or any attendance to meetings within ministries, among national delegations, or even at the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR). This would, of course, have added a great value to the study, but the access is strictly limited and also requires a budget available. This outsider status might have induced some bias in the final conclusions, but the interviews and meeting reports brought much detailed explanations.

An extensive work was done also to cross-check the information and to execute the analysis as deeply as possible.

8.2. Concrete impacts of joint knowledge production

The science-policy interface has been studied here in relation with the creation of marine protected areas in the Antarctic. It came up with recommendations how to improve the interface towards the joint knowledge production model. But at the end of the process, it is also necessary to step back and wonder to what extent an improved science-policy interface can enhance the creation of marine protected areas in the Antarctic. Indeed, the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) agreed to create a representative system of antarctic marine protected areas by 2012 but so far, only one MPA has been established around the South Orkney Islands. Two other proposals have already been stalled for two years. The introduction stressed that the core explanation of the blockage lies in international political disputes regarding economic and political interests. Diplomatic issues are at stake but they were not the purpose of the study. This study suggested that understanding and improving the interactions between science and policy actors could also provide a way forward in the process. It concludes that an effective interface should allow a model that really connects actors and disciplines. But to what extent can it concretely provide a way forward? Improving the science-policy interface could not solve the political disputes and come to a quick and successful conclusion with the adoption of the new proposals. However, it is believed that it can facilitate the process in gathering the actors on the same pathway. Sitting together from the beginning and developing a common dialogue, a common objective which takes into account the strengths and weakness of all stakeholders would enhance the interactions. It facilitates the dialogue and helps to find solutions to difficulties encountered during the process. Once again, the role of boundary organizations and boundary objects is crucial. At the end, the goal is easier and quicker to reach. Giving the situation, improving the science-policy interface would be beneficial in at least one more way. Due to the blockage of the marine protected areas, the actors lose patience and trust in the CAMLR institutions. Moreover, the fact that policy-makers in the CAMLR Commission mentioned the lack of science as a reason for postponing the adoption of marine protected areas is badly perceived by scientists and weakens the relationships. Trust starts to erode (UK-S-3). The interactions between the actors are therefore essential in such a situation. Also, with the marine protected areas, the Convention for the Conservation of Antarctic Marine Living Resources started to look to a new part of its mandate, more turned on the conservation, and this requires some adaptation (F-P-1; UK-O-1). Looking at roles in assessing their difficulties, and listening to the expectations from the different actors is a way to prevent the crystallization of relationships.

However, the benefits from a science-policy interface do not emerge simply by bringing the actors together. It needs to be correctly managed, at the risk of worse consequences if the interactions are not conducted well. The previous chapters precisely tackled recommendations how to facilitate and manage the science-policy interface. If so, a successful process leading to an effective science-policy interface can pave the way for the adoption of marine protected areas in the Antarctic.

8.3. Directions for improvement with an effective science-policy interface

Some more possible actions towards the creation of marine protected areas emerged during the study. They are more indirectly related to the science-policy interface but they definitely find relevance in this report. They will be briefly presented in this last section.

8.3.1. Introduction of several proposals

The proposals for the East Antarctic and the Ross Sea have been introduced at the same time and they follow so far a similar pathway in the CCAMLR meetings. For instance, when the proposals of New-Zealand and the United States for the Ross Sea merged into one common proposal, the new proposal was submitted again to the Scientific Committee. The proposal for the East Antarctic did not go through such changes but it also got submitted once more to the Scientific Committee. By looking at several proposals at the same time, there is a potential risk to associate their process to adoption. Also, it is probably more difficult for the opponent countries to accept several proposals at the same time. This even led to a revision of the proposal for East Antarctica in October 2013 to suggest to adopt the seven marine protected areas in two phases. However, the deadline for a representative network of marine protected areas by 2012 has been voted by all members. The objective is not reached and this clearly does not let time for the introduction of each proposal one by one. A solution could be to opt for the opposite strategy and introduce more proposals at the same time. If the link and coherence between the protected zones is well explained and that a real cooperation allows a coordinated network, this can be a strong argument for going on with the process. Future proposals are currently under preparation and eleven priority areas have been designated, so that the basis for new proposals is already settled. A key aspect in realizing this is the collaboration between the national delegations, including the opponent countries.

8.3.2. CCAMLR proposals

The proposals for marine protected areas introduced at the Commission are prepared by one country or a group of countries but they aim at becoming CCAMLR marine protected areas. Yet, there is a tendency among the members to assess it as a national project and the country or countries that introduced the proposal may feel reluctant to defend an individual project instead of reflecting together on a common objective (F-S-1). At the end, this can

undermine the motivation to take the lead on new proposals. It is important for both scientists and policy-makers to realize that a MPA proposal is a proposal for the CCAMLR as a whole to respond to a common objective.

8.3.3. Harmonization in the Antarctic Treaty

The Convention for the Conservation of Antarctic Marine Living Resources is included in the Antarctic Treaty System that encompasses also the Antarctic Treaty and the Environmental Protocol. Therefore, it is important to assure a harmony between the instruments. In terms of participation, most of the policy-makers of the three national delegations studied are involved in the different institutions but the scientists are in only one of them. For this study, mainly the participation in the Antarctic Treaty Consultative Meetings (ATCM) next to the Commission for the Conservation of Antractic Marine Living Resources (CCAMLR) has been investigated. The participation in the Committee for Environmental Protection (CEP) should have been further assessed as well, but the utility of this aspect did not appear early enough in the interview process. In the United Kingdom, the staff of the Foreign and Commonwealth Office attends both the ATCM and the CCAMLR. On the contrary, in the British Antarctic Survey, most members are involved in only one of them (UK-O-1). In France and Belgium, the members of the ministries do attend the ATCM but the scientists only go to the CCAMLR. A decision in one institution might have consequences, however, in the other institutions. The continent and the ocean are linked in many ways. Therefore, the members themselves demand to harmonize the different instruments and communicate important decisions, such as the creation of the South Orkney Islands Southern Shelf marine protected area in 2009: countries requested "the Commission to communicate details of the MPA to the ATCM. [and to] seeks advice from the ATCM on other measures that may be needed to ensure any other activities that may have an impact on the MPA are properly regulated" (CCAMLR, 2009a: 23). In turn, the Antarctic Treaty can also inform and advise the CCAMLR. The decisions of the Antarctic Treaty might even help in the adoption of marine protected areas. In the last few years, Belgium has put a focus on this link between the ocean and continental part of the Antarctic, to link both institutions (B-P-1). It has for example initiated a process to get the ATCM to support in the creation of the East Antarctic and Ross Sea proposals (B-P-1). This has not been possible though: the consensus has been blocked by the same countries than those blocking the adoption of marine protected areas by the CCAMLR. But this shows at least the continuity between the instruments.

However, there are still distinctions noticed between the two instruments. Regarding their Convention area for example, if most of the area covered is overlapping, there are some differences. This brings variations in the case of antarctic marine protected areas. Indeed, the proposal of a marine protected area outside the Convention area of the Antarctic Treaty but inside the Convention area of the CAMLR Convention is more likely to raise conflict because it does not fall under the territorial rules of the Antarctic Treaty. The South

Georgia Islands is an example of an area under the CAMLR Convention but outside the Antarctic Treaty. This makes it comparatively more difficult to propose as a marine protected area than the South Orkney Islands, which are protected by the freeze of territorial claims of the Antarctic Treaty.

A harmonization with the Environmental Protocol is also important. The Committee for Environmental Protection is especially important as it is responsible for the Antarctic Specially Protected Area (ASPA) and Antarctic Specially Managed Area (ASMA), the continental protected areas. It is evident that there is not always a clear distinction between the continental and ocean species and that continuity is necessary in the protected areas. Moreover, some ASPA and ASMA encompass a marine or coastal zone, and this requires a coordinated management with the CCAMLR, in charge of the marine living resources. The "administrative arrangements between the ATCM and CCAMLR now appeared to be working well to allow such management plans to be processed in a timely manner" (CCAMLR Review Panel, 2008: 12). The CCAMLR can also propose areas for Antarctic Specially Protected Area and Antarctic Specially Managed Area but the Review Panel estimates that its role regarding those proposals can be more proactive (CCAMLR Review Panel, 2008). There are also differences in the concepts used, such as the concept of conservation. The Convention for the Conservation of Antarctic Marine Living Resources targets the protection of the ecosystem for the rational use of its resources, while the Environmental Protocol pursues broader objectives including the protection of the environment for its intrinsic value (Guyomard, 2010).

In conclusion, there is certainly a common vision for the Antarctic Treaty System and a beginning of harmonization between its instruments. However, it can be improved to facilitate the coherence in the protection of the continent. The attendance of policy-makers and scientists in the meetings of the different instruments can surely help in this harmonization. It should be mentioned that another logic is also considered in France and Belgium, where some members of the delegation participate in international and environmental negotiations for marine protected areas in other contexts such as the Convention for Biological Diversity (CBD), the OSPAR Convention for the North-East Atlantic or Regional Fisheries Management Organizations (F-P-1). This is actually an interesting input that can be a good complement within a delegation. Those are anyway two relevant logics, bringing a better overview on the Antarctic context in general and on the marine protected areas in a global context. Of course, those logics are not exclusive and the attendance to the meetings can be shared between the members of the delegations. In the two cases, it makes sense that actors from both science and policy in the delegation are associated to harmonize the different instruments.

8.3.4. Monitoring and management plans

When writing the proposal for the South Orkney Islands, there was no precedent and the British delegation wanted to keep the process really easy, to serve as a model for future marine protected areas (UK-S-3). They did so with the idea that the other areas could be proposed later. They discussed that they wanted to make the process as straightforward as possible (UK-S-3) to have it as a first case and example for next MPAs. Therefore, they went for one of the less difficult options with the idea to come back to other zones afterwards (UK-S-4; UK-S-3). Because they wanted to keep the proposal simple, they thought to introduce the conservation measure to create the MPA first and to come with management and monitoring plans after. Also, they expected that other areas would be quickly protected so that they could also see what others would do. However, there has been no other MPA since then, and there is still no management and monitoring plan. In between, the CCAMLR has instead voted the Conservation Measure 91-04 to define the General framework for the establishment of antarctic MPAs. Discussions turned out to be complicated about the General Framework and what the plans should look like (UK-S-3). As there was no agreement, they decided to wait for a clear rule. There is currently no plan yet. However, there is monitoring activity in the area. The United Knigdom indeed leads operations in the area to assess the objectives. They "have been tracking penguins to see that they still use this habitat during post-breeding period, and they do. [They] work with Norwegian colleagues. They have a survey that covers the whole of the South Orkney shelf and just runs into the protected area, so that is a good monitoring effort. The BAS established an oceanographic mooring to the north of the protected area last year, and we are hoping that will give us good monitoring data as well" (House of Commons, 2013). In 2013, the delegation came for the first time with a proposal for those plans, developed in collaboration with Norway. It will be reviewed in 2014.

However, the new proposals suffer from that. Despite that it has been endorsed that it is based on the Conservation Measure 91-04, and respects the requirements regarding those plans, the opponents raised the precedent from the South Orkney Islands that does not have monitoring and management plans. In that sense, the South Orkney Islands did not provide an example for the East Antarctic Representative System of Marine Protected Areas (F-P-1; F-S-1). The interviewees have been keen to mention that if it hampers the new proposal, the South Orkney MPA has at least the merit of having done an MPA. It has well been an impetus (F-P-1) because the South Orkney Islands MPA showed that it was possible to create an MPA within the CAMLR Convention and paved the way for new projects. However, it is important that a management and monitoring plan can be added as soon as possible to the Conservation Measure for the South Orkney Islands. It would delete an easy argument for opponent countries and bring a fresh boost to the process of creating marine protected areas in the Southern Ocean.

Conclusion

The Southern Ocean is home of a unique and high biodiversity, but the knowledge of its ecosystems remains largely determined by the relative incaccessibility of the continent. What is known, however, is that it is facing serious threats with the increase of human activities, climate change and invasive species for instance. The Antarctic Treaty System recognizes those threats and set objectives to protect the continent henceforth *devoted to peace and science*. The different instruments target a better management of the area and its resources, on an ecosystem-based approach. The Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) which targets specifically the management of marine resources made a major commitment when adopting the objective of the creation of a representative system of antarctic marine protected areas by 2012. The goal has not been achieved though. Only one protected area exists around the South Orkney Shelf and the Convention faces difficulties to adopt the new proposals for the East Antarctic and the Ross Sea. Others areas are expected to be proposed in the coming years as well.

The present study recognizes the importance of political disputes in the current status quo, but it proposed to address another aspect: the interactions between science and policy. The research statement suggested that the science-policy interface requires strategic attention as it may also provide a way forward in the process. The establishment of marine protected areas has been studied as a policy arrangement that takes on multi-levels. The national level was studied through three national delegations from the United Kingdom, France and Belgium and the international level was studied through the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR). The analysis targeted the roles and expectations of scientists, policy makers and environmental NGOs acting in or around the science-policy interface and has eventually recommended how interactions could become more effective. The process of creation of marine protected areas has been studied by relating the practices and views of actors to two models of knowledge production: the linear model of expertise and the joint knowledge production. In the social science literature on environmental governance, a debate takes place on the character and effectiveness of the interaction between the realms of science and policy. Models differ from a linear transfer of knowledge from science to policy, to knowledge brokering and joint knowledge production where science and policy actors actively cross the boundaries of their realm. The study demonstrates that the linear model, with knowledge flowing from science to policy as two separate entities and science being value-free, is perceived by many actors as the way the science-policy interface should ideally function. Nevertheless, the emergence of post-normal science recognizes the importance of the human factor and interviewees also reported that boundary crossing occurs already. Allowing a common interface, in which boundary organizations and objects play an important role, is likely to facilitate the interactions and prevent the cristalization of the relationships in the current blockage of the CCAMLR. The conclusion of the study is that good practices in blurring

boundaries do exist and can lead to higher effectiveness to establish marine protected areas in the Southern Ocean.

This conclusion falls in line with the international literature on science-policy interface. In natural science fields, the linear model remains often perceived as the way science should procede and this is also what usually stands out of educational programs. Yet, social science claims that the blurring of boundaries between science and policy can lead to more effective policy making (Guston, 2001; Pielke, 2007; van den Hove 2007; Beck, 2011; Hegger et al., 2012). A noticeable evolution happened in social science literature with a change in paradigm towards post-normal science and the joint knowledge production model. The present research on marine protected areas offers an interesting case for literature by studying a concrete context in depth. Most studies rely on theoretical perspectives sometimes enlighted by brief case studies, whereas this study focused specifically on one context and conducted face-to-face interviews with key actors involved in and around the process of creation of marine protected areas. It gave the opportunity to the actors to express their needs and expectations regarding their roles in the science-policy interface. Hence, it can bring an interesting practical contribution to the current literature on science-policy interfaces as well as on the general understanding of the Antarctic context. Another contribution is believed to arise from the testing of the success conditions for joint knowledge production enounciated Hegger et al. (2012) in the article *Conceptualising joint knowledge production in regional climate change adaptation projects: success conditions and levers for action*. The authors propose a framework for assessing joint knowledge production via seven success conditions. Those conditions appeared to be helpful for drawing an analytical grid as a base for the comparative analysis. They have not been used directly as conditions because some are difficult to evaluate but the core items of the seven propositions formulated in the article have provided the key aspects for the data analysis. Besides, other models have also provided important basis for the theoretical framework, such as the two models of knowledge production and the Pielke's categories of scientists. However, the reality does not always match with ideal-types categories and the difficulty lied in rendering the nuances. Similarly, the end recommendations needed also tones and gradations: the study's outcome could not consist in adopting one view and miss the opportunity to combine the different interests raised in the interviews. It is not black or white, precisely because it needs to include different expectations besides the theory; and the expectations of several kinds of actors. Along the study, special attention was given to question constantly the conclusions, regularly asking if this was realistic and more importantly, if this could be beneficial to the actors. It is challenging to keep it realistic enough while trying to think "out of the box". This is surely more challenging without attending the CCAMLR negotiations. Working within a team could have been an interesting approach to facilitate a balanced view. Much of the research process required a deep reflection on how improving the current situation and it is sometimes difficult to assess it alone. The interviews proved an essential and effective resource to understand

what was realistic and desirable, and the supervision has been a crucial support in some phases of the research.

At the end of the process, some key recommendations came up and are believed to be worth to investigate for implementation. In a nutshell, it would be to settle possibilities for trainings for scientists and to improve coherent funding schemes and rewards when attending political meetings. Those rewards should go beyond the usual quantitative indicators of scientific publications. Also, the scientists' roles in the political negotiations need to be clarified. For policy-makers, recommendations include targeting a better continuity among team members, possibly by limiting the turn-over. This aims at improving the accessibility and the mutual understanding with scientists. Regarding environmental NGOs, they can be a serious support in the science-policy interface with a stronger role as boundary organizations. For instance, they can organize workshops or trainings to facilitate the connection between actors. The notion of boundary object requires more attention: it can be a central tool for the dialogue. The concept of marine protected area is a great example of a common terminology between science and policy, which provides a good basis for both scientific research and political negotiation. Indeed, a consensus exists on the creation of marine protected areas in the Antarctic. The difficulties lie in the modalities to implement them and the level of protection but the actors agree on their relevance. This is actually a crucial aspect for the Convention for the Conservation of Antarctic Marine Living Resources. The adoption of such an objective was an important success and in spite of the failure to establish a network of Antarctic marine protected areas by 2012, many agree that the Convention has been so far an appropriate tool for the management of marine resources in the Antarctic (CCAMLR Review Panel, 2008; Constable, 2006). In the last two years, important decisions for the management of marine resources have been made, regarding the quotas for example (UK-S-2). Also, it is to say that refusing a MPA proposal is not dishonest in itself; on the contrary it can be based on good arguments. In 2010, the Commission refused to adopt two different proposals for the Ross Sea and this led to the common and more coherent proposal presented by the United States and New Zealand together. However, after three meetings stalling the two proposals, the credibility of the Convention starts to erode and there is a risk for the trust between the actors being affected. The study discussed how improving the science-policy could make the creation process of marine protected areas more effective and provided some concrete directions for a way forward in the process.

The science-policy interface taking place in the Antarctic is, however, a really specific context. The introduction insisted on the specific status of science on the continent for three main reasons. Firstly, scientists are the only human inhabitants in the area, which makes their influence on policy very direct and dominant. Secondly, the continent is "devoted to peace and *science*" (Environmental Protocol: art. II), so that a military presence is forbidden. The only national representation in the area happens through science. Scientists and research stations are the only visible presence of their countries and

hence scientists represent a sort of political soft power. Thirdly, as Antarctica does not count inhabitants, there is no so-called local or traditional knowledge. It results in a monopoly of science on knowledge. Those three aspects clearly demonstrate the dominance of science in the Antarctic. The science-policy interface studied in this report is therefore a sort of simplified case in comparison with many other situations. In other cases, additional actors such as industries and local organizations interfere much more in and around the science-policy interface. In the Artic for example, inhabitants have an essential role and as such are represented by several influential organizations. Their long-time knowledge of their environment and the protection of their culture are key aspects in the discussions. Industrial companies looking at workable resources are other actors influencing the interactions between science and policy. In the Antarctic, there is much less interests trying to speak out as the continent is devoted to peace and science. It allows for a very limited number of human activities. This said it does not make the case less interesting; on the contrary it isolates the two actors in a sort of ideal-typic context and the study proofs that even in such a context, the roles are not straightforward. Such a direct relationship probably makes the limit between science and policy even more difficult to perceive. Despite this specific status, the study process used for this research could be interesting to transpose in other contexts, and it is believed that most of the recommendations given here can also apply in other situations. A similar study has been conducted by Beck (2011) on the International Panel on Climate Change (IPCC). The conclusion of the study also claims to overcome the linear model: "As long as the IPCC remains reluctant to address the political implications of scientific findings, it does not meet the information needs of decision-makers. […] Many argue that this sterile approach may have made the IPCC less useful than it might otherwise have been" (Beck, 2011: 304). This shows that our study finds echos in other contexts as well and that the linear modeal of knowledge and the joint knowledge production model are indeed relevant. It is believed to be an interesting basis for assessing most of situations where science and policy come to collaborate or should work together. In the context of the Antarctic itself, the other instruments of the Antractic Treaty System would also be interesting cases to look at. To give a quick insight, the Scientific Committee for Antarctic Research (SCAR), an non-governmental organization that provides and coordinates the scientific research in Antarctica, aims at providing objective, independent and high quality scientific advice on issues of science and conservation affecting the management of Antarctica and the Southern Ocean[15]. As an independent body, it can be an observer and provide high quality science but it keeps a strong independence vis-à-vis the policy-makers. The Scientific Committee of the CCAMLR is not an independent body, in a way that the distinction of SCAR is even stronger in the science-policy interface. This would be an interesting beginning for an analysis.

[15] See : http://www.scar.org/

All in all, it illustrates that social sciences also find their relevance when joined with natural science. This study proves that even in the case of the Antarctic, where the priority has been given for so long to natural sciences, there are interesting developments emerging from interdisciplinarity. A commitment between social science and natural sciences opens the door to numerous possibilities for an enhanced understanding of environmental governance, and for the implementation of the soundest decisions. In 2010, the Scientific Committee on Antarctic Research set up the Social Sciences Action Group to catalogue the range of values human beings place on Antarctica[16]. It illustrates the recent recognition of the added value of interdisciplinarity. This study, which claims that blurring the boundaries between science and policy can lead to more effective decision making, stands as another illustration.

[16] See: http://www.scar.org/researchgroups/via/

Bibliography

1. Scientific works

Ainley D., Ballard G., Weller J. (2010). Ross Sea Bioregionalization, Part I. CCAMLR WG EMM-10/11, Hobart, CCAMLR, 2010. Available from: http://www.penguinscience.com/CCAMLR4.pdf

Aktinson R. (1999), Project management: cost, time and quality, two best guesses and a phenomenon, its time to accept other success criteria. International Journal of Project Management 17(6): 337-342.

AOA (2012). Antarctic Ocean Legacy: A vision for circumpolar protection. Antarctic Ocean Alliance: 1-59.

Arts B., Leroy P., Van Tatenhove J. (2006). Political modernization and policy arrangements: a framework for understanding environmental policy change. Public Organization Review 6: 93-106.

Arts B., Van Tatenhove J. (2002). Policy and power: a conceptual framework between the 'old' and 'new' paradigm. Policy Sciences 37: 339-356.

BAS (2013). Business Plan 2013, British Antarctic Survey.

Beck, S. (2011). Moving beyond the linear model of expertise? IPCC and the test of adaptation. Regional Environmental Change 11(2): 297-306.

CCAMLR (2005). Report of the CCAMLR workshop on Marine Protected Areas. Silver Spring, USA: 589-623.

CCAMLR Review Panel (2008). Report of the CCAMLR Performance Review Panel, September 1, 2008.

Constable A. J. (2006). International implementation of the ecosystem approach to achieve the conservation of Antarctic marine living resources, Presentation to UNICPOLOS 7, June 2006. Available from: http://www.un.org/Depts/los/consultative_process/documents/7_constable.pdf

de Lichtervelde A., Demoitié C., Du Brulle X. et al. (2008). Belgium and Antarctica. Exploration, Science and Environment. Collaboration between the Federal science policy, Health, Food chain safety and Environment and Foreign Affairs and Foreign Trade and Development Cooperation, December 2008. Available from : http://www.belspo.be/belspo/bepoles/publ/psf_en.pdf

Dictionary.com (2014). Policy-maker.

Edelenbos J., Van Buuren A., Van Schie N. (2011). Co-producing knowledge: joint knowledge production between experts, bureaucrats and stakeholders in Dutch water management projects. Environmental Sciences and Policy 14: 675-684.

Floor, J., van Koppen, C.S.A. & Lindeboom, H.J. (2013). A review of science-policy interactions in the Dutch Wadden Sea – The cockle fishery and gas exploitation controversies. Journal of Sea Research 82, 165-175.

Grant S., Constable A., Raymond B., Doust S. (2006). Bioregionalisation of the Southern Ocean, Report of experts workshop. WWF-Australia and ACE CRC, Hobart, September 2006.

Guston, D. H. (2001). Boundary Organizations in Environmental Policy and Science: An Introduction. Science, Technology, & Human Values 26(4): 399-408.

Guyomard A.-I. (2010). La protection de l'environnement en Antarctique – Droit international et droit comparé, Tomes I et II, Centre de Droit Maritime et Océanique (CDMO), Thèse de Docteur en Droit, Dir. Beurier J-P.

Halpern B., Walbridge S., Selkoe K., et al. (2008). A global map of human impact on marine ecosystems. Science 319: 948-951

Hegger D. M. Lamers, A. Van Zeijl-Rozema and C. Dieperink (2012). Conceptualising joint knowledge production in regional climate change adaptation projects: success conditions and levers for action. Environmental Science & Policy 18(0): 52-65.

Hoppe R. (1999) Policy analysis, science, and politics: from "speaking truth to power" to "making sense together". Science and Public Policy 26(3): 201–210.

IUCN (2006). Marine Protected Areas in the Southern Ocean: A focus on CCAMLR, International Union for Conservation of Nature. IP 59.

Kuhn T. (1962). The Structure of Scientific Revolutions. University of Chicago Press, Chicago.

Kunseler E. (2007). Towards a new paradigm of Science in scientific policy advising, Essay. Available from http://www.nusap.net/downloads/KunselerEssay2007.pdf

Miller C. (2001). Hybrid management: boundary organisations, science policy, and environmental governance in the climate regime. Science, Technology and Human Values 26 (4): 1087-1096.

Molenaar E., Efferink A., Rothwell D. (2013). The law of the Sea and the Polar Regions: Interactions between Global and Regional Regimes, Brill.

Mostert E., Raadgever G.T. (2008). Seven rules for researchers to increase their impact on the policy process. Hydrology and Earth System Science 12 (4): 1087-1096.

Olsen E. M., Johnson D., Weaver P., Goñi R., Ribeiro M.C., Rabaut M., Macpherson E., Pelletier D, Fonseca L., Katsanevakis S., Zaharia T. (2013). Achieving Ecologically Coherent MPA Networks in Europe: Science Needs and Priorities. Marine Board Position Paper 18. European Marine Board, Ostend, Belgium.

Pielke R. (2007). The Honest Broker: Making Sense of Science in Policy and Politics. Cambridge, Cambridge University Press.

Pohl, C., S. Rist, A. Zimmermann, P. Fry, G. S. Gurung, F. Schneider, C. I. Speranza, B. Kiteme, S. Boillat, E. Serrano, G. H. Hadorn and U. Wiesmann (2010). Researchers' roles in knowledge co-production: experience from sustainability research in Kenya, Switzerland, Bolivia and Nepal. Science and Public Policy 37(4): 267-281.

Ravetz, J. R. (1999). What is post-normal science? Futures 31: 647-654.

Ravetz, J.R. (2001). Science advice in the knowledge economy. Science and Public Policy 28(5): 389-393.

Roberts N. (2012). Antarctica and New Zealand - Voyages of discovery. Te Ara - the Encyclopedia of New Zealand. Available from: http://www.TeAra.govt.nz/en/map/37136/the-antarctic

Turnhout E., Hisschemöller M., Eijsackers H. (2005). Ecological indicators: between the two fires of science and policy. Ecological indicators 7 (2): 215-228.

van den Hove, S. (2007). A rationale for science–policy interfaces. Futures 39(7): 807-826.

World Population Statistics (2013). Antarctica Population 2013. Available from: http://www.worldpopulationstatistics.com/antarctica-population-2013/ (last update on 20 June 2013).

WWF-UK (2012). Written evidence submitted by WWF-UK, HC846 Sustainability in the Overseas Territories. House of Commons, United Kingdom, December 2012. Available from: http://www.publications.parliament.uk/pa/cm201213/cmselect/cmenvaud/writev/846/m17.htm

2. Official documents

Antarctic Treaty (1959). Washington, United States, December 1, 1959.

AWI (2012). AWI to coordinate the scientific preparations for establishing marine protected areas in the Weddel Sea. Bremerhaven, October 2012. Available from: http://www.awi.de/index.php?id=6383&type=123&L=0&filename=awi.pdf

CCAMLR (1980). Convention on the Conservation of Antarctic Marine Living Resources, Conference on the Conservation of Antarctic Marine Living Resources, Canberra, 7–20 May 1980. Available from : http://www.ccamlr.org/en/system/files/e-pt1.pdf

CCAMLR (1982). Rules of Procedures of the Commission. CCAMLR-I, Hobart, Australia, May/June 1982.

CCAMLR (1983). Rules of Procedure of the Scientific Committee. CCAMLR-II, Hobart, Australia, August/September 1983.

CCAMLR (2009a). Report of the XXVIII meeting of the Commission, Hobart, Australia, October/November 2009.

CCAMLR (2009b). Conservation Measure 91-03: Protection of the South Orkney Islands southern shelf. CCAMLR-XXVIII. Available from: http://www.ccamlr.org/sites/drupal.ccamlr.org/files//91-03.pdf

CCAMLR (2011a). Report of the XXX meeting of the Commission, Hobart, Australia, October 2011.

CCAMLR (2011b), Conservation Measure 91-04: General framework for the establishment of CCAMLR Marine Protected Areas. CCAMLR-XXX. Available from: http://archive.ccamlr.org/pu/E/e_pubs/cm/11-12/91-04.pdf

CCAMLR (2012). Report of the XXXI meeting of the Commission, Hobart, Australia, October 2012.

Delegations of New Zealand and the United States to CCAMLR (2013). A proposal for the establishment of a Ross sea region marine protected area. CCAMLR XXX-II. Available from: http://www.mfat.govt.nz/ross-sea-mpa/docs/Revised-Ross-Sea-region-MPA-proposal-full.pdf

Environmental Protocol (1991). Protocol on Environmental Protection. Madrid, Spain, October 4, 1991.

House of Commons (2013). Marine Protected Areas in the Southern Ocean. Oral Evidence taken by the Science and Technology Committee, HC 103-i, May 2013.

SC-CAMLR (2005). Report of the XXIV meeting of the Scientific Committee, Table 1, Hobart, Australia, October 2005.

SC-CAMLR (2009). Report of the XXVIII meeting of the Scientific Committee, Hobart, Australia, October 2009.

SC-CCAMLR (2011). Report of the XXX meeting of the Scientific Committee, Hobart, Australia, October 2011.

SC-CCAMLR (2013). Report of the XXXII meeting of the Scientific Committee, Hobart, Australia, 2013.

WSSD (2002). Plan of Implementation of the World Summit on Sustainable Development: 18, South Africa. Available from: http://www.gdrc.org/uem/eco-tour/WSSD_PlanImpl.pdf

3. Press releases

Miliban D. (2009). UK proposal turns south of South Orkney Islands a Marine Protected Area. MercoPress [online], 11.11.2009. Available from: http://en.mercopress.com/2009/11/10/uk-proposal-turns-south-of-south-orkney-islands-a-marine-protected-area (last consulted on March 21, 2014).

Rajgopal K. (2013). Antarctica needs MPAs. The Hindu [online], 20.02.2013. Available from: http://www.thehindu.com/sci-tech/science/antarctica-needs-marine-protected-areas/article4436120.ece (last consulted on April 2, 2014).

4. Websites

AAD (2013). A proposal for a representative system of Marine Protected Areas in the East Antarctic planning domain. Australian Antarctic Division. Available from: http://www.antarctica.gov.au/law-and-treaty/ccamlr/marine-protected-areas (last consulted on May 12, 2014).

Arctic Frontiers (2014). Conference 2014: keynote speakers. Available from http://www.arcticfrontiers.com/2014-conference/policy-section/keynote-speakers/198-jane-rumble-head-of-polar-region-department-foreign-and-commonwealth-office-uk (last consulted on May 11, 2014).

ASOC (2013). About ASOC. Available from: http://www.asoc.org/about (consulted on May 12, 2014).

ATS (2011). Related agreement. Available from: http://www.ats.aq/e/ats_related.htm (last consulted on May 11, 2014).

BAS (2014). British Research Stations and Refugees – History. Available from: http://www.antarctica.ac.uk/about_bas/our_history/stations_and_refuges/index.php (last consulted on May 11, 2014).

BELSPO (2014). Belgian Polar Platform. Available from: http://www.belspo.be/belspo/bepoles/index_en.stm (last consulted on May 15, 2014).

CCAMLR (2012). Convention Area. Available from: http://www.ccamlr.org/en/organisation/convention-area (last consulted on March 12, 2014).

CBD (2014). Ecosystem Approach. Available from: http://www.cbd.int/ecosystem/ (last consulted on May 19, 2014).

EU (2014). Environment and Research, Science Policy Interface. European Union. 08.05.2014). Available from: http://ec.europa.eu/environment/integration/research/interface_en.htm (last consulted on May 12, 2014).

European Commission (2013). Questions and Answers, East Antarctic Representative System of Marine Protected Areas (EARSMPA). 12/07/2013. Available from : http://ec.europa.eu/information_society/newsroom/cf/mare/itemdetail.cfm?item_id=11370 (last consulted on May 12, 2014).

CCAMR (2014a). About CCAMLR. Available from : https://www.ccamlr.org/en/organisation/about-ccamlr (last consulted on May 14, 2014).

CCAMLR (2014b). CAMLR Convention. Available from : https://www.ccamlr.org/en/organisation/camlr-convention (last consulted on May 14, 2014).

France Diplomatie (2014). La France et les régions antarctiques et subantarctiques. Available from : http://www.diplomatie.gouv.fr/fr/dossiers-pays/antarctique-22653/la-france-et-l-antarctique/article/la-france-et-les-regions (last consulted on May 12, 2014).

FCO (2013). Supporting the Overseas Territories, Antarctica and the Polar Regions. Available from : https://www.gov.uk/government/policies/protecting-and-developing-the-overseas-territories/supporting-pages/antarctica-and-the-polar-regions (last consulted on May 12, 2014).

Geological Survey (2012), Antarctic Convergence. Available from: http://www.eoearth.org/view/article/150096/ (last consulted on June 15, 2014).

IPEV (2014). L'Institut polaire français Paul-Emile Victor. Available from: http://www.institut-polaire.fr/ipev/l_institut (last consulted on May 12, 2014).

IPCC (2014). Organization. Available from http://www.ipcc.ch/organization/organization.shtml (last consulted on May 14, 2014).

IUCN (2014). Environmental governance. Available from: http://www.iucn.org/about/work/programmes/environmental_law/elp_work/elp_work_issues/elp_work_governance/ (last consulted on May 14, 2014).

NERC (2014). About us. Available from: http://www.nerc.ac.uk/about/ (last consulted on May 1, 2014).

NERC-BAS (2013). The Antarctic Treaty Explained. Available from http://www.antarctica.ac.uk/about_antarctica/geopolitical/treaty/explained.php (last consulted on May 12, 2014).

NERP (2009). First High Sea MPA designated in Antarctica, National Environmental Research Program. Available from: http://www.nerpmarine.edu.au/news/first-high-seas-mpa-designated-antarctica (last consulted on May 14, 2014).

SCAR (2014). Welcome to SCAR. Scientific Committee on Antarctic Research. Available from: http://www.scar.org/ (last consulted on May 19, 2014).

SPF Affaires étrangères, Commerce extérieur et Coopération au développement (2012). "Direction Générale des Affaires multilatérales et de la Mondialisation (DGM). Available from: http://diplomatie.belgium.be/fr/sur_lorganisation/organigramme_et_structure/m/ (last consulted on May 14, 2014).

Transpol'Air (2014). Robert Falcon Scott. Available from: http://transpolair.free.fr/explorateurs/scott/sud_2eme_exp.htm (last consulted on March 15, 2014).

5. Interviews

To respect the anonymity of the interviewees, it has been decided to quote them by a code. This code is established by the first letter of the country, the first letter of their working area and a number to distinguish them when some have the same work in the same country. All interviews have been led between November 2013 and March 2014.

Code	Function of the interviewee
I-O-1	International NGO representative
I-O-2	International Scientific NGO representative
UK-S-1	United Kingdom - Scientists representative
UK-S-2	United Kingdom - Scientists representative
UK-S-3	United Kingdom - Scientists representative
UK-S-4	United Kingdom - Scientists representative
UK-P-1	United Kingdom - Policy-maker representative
UK-O-1	United Kingdom - NGO representative
UK-O-2	United Kingdom - NGO representative
F-S-1	France - Scientist representative
F-P-1	France - Policy-maker representative
F-P-2	France - Policy-maker representative
B-S-1	Belgium - Scientist representative
B-P-1	Belgium - Policy-maker representative

Appendixes

1. *Members at the CAMLR Convention*

Here below are listed the member states and acceding states at the Convention for the Conservation of Antarctic Marine Living Resources. It is further indicated if they are also parties at the Antarctic Treaty and at the Environmental Protocol.

A. Members

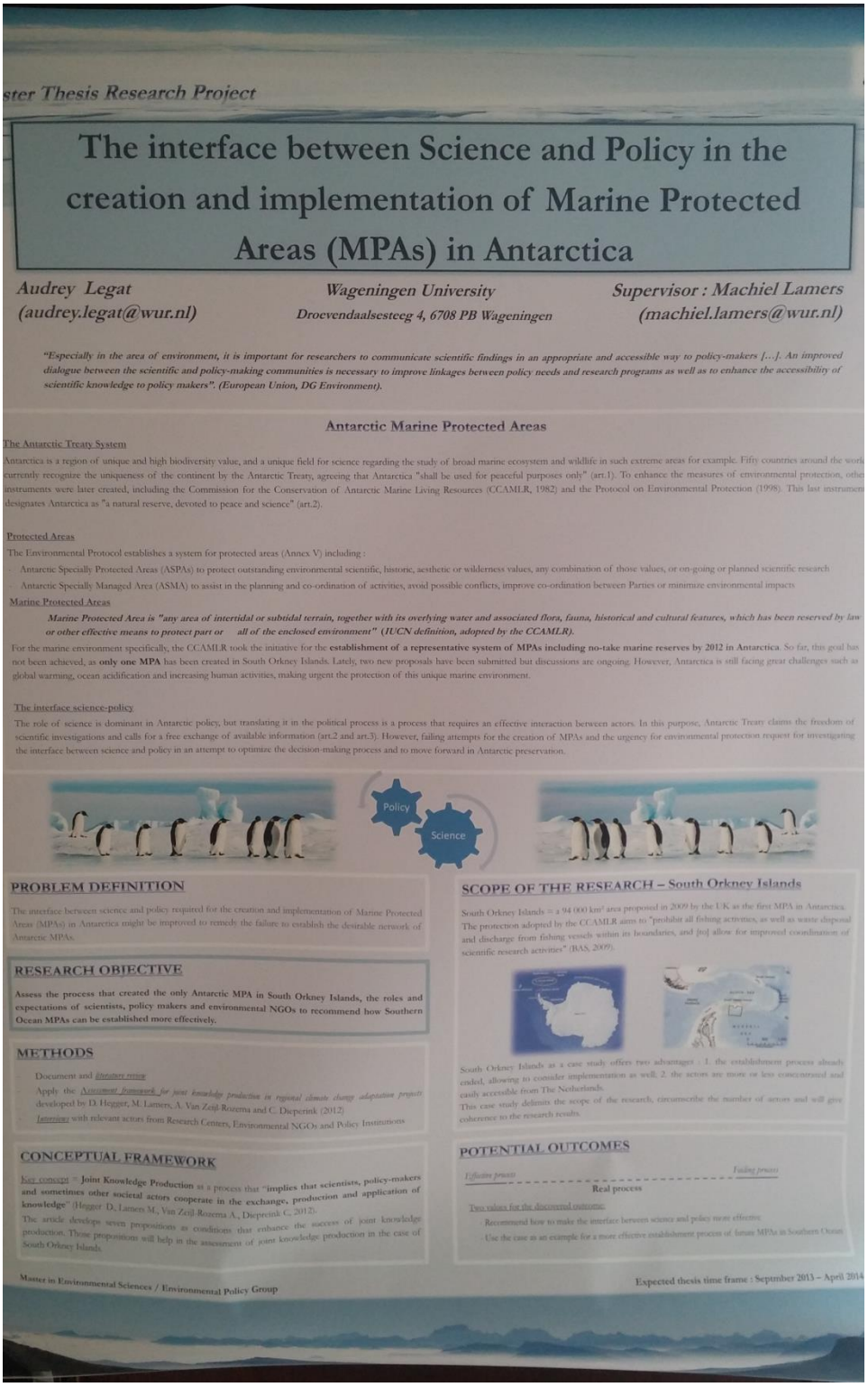
Member states at the CAMLR Convention	Party at the Antarctic Treaty	Party at the Environmental Protocol
Argentina	✓	✓
Australia	✓	✓
Belgium	✓	✓
Brazil	✓	✓
Chile	✓	✓
China	✓	✓
European Union		
France	✓	✓
Germany	✓	✓
India	✓	✓
Italy	✓	✓
Japan	✓	✓
Korea (ROK)	✓	✓
New Zealand	✓	✓
Norway	✓	✓
Poland	✓	✓
Russian Federation	✓	✓
South Africa	✓	✓
Spain	✓	✓
Sweden	✓	✓
Ukraine	✓	✓
United Kingdom	✓	✓
United States	✓	✓
Uruguay	✓	✓

B. Acceding states

Acceding states at the CAMLR Convention	Party at the Antarctic Treaty	Party at the Environmental Protocol
Bulgaria	✓	✓
Canada	✓ (non-consultative)	✓
Cook Islands		
Finland	✓	✓
Greece	✓ (non-consultative)	✓
Mauritius		
Netherlands	✓	✓
Pakistan	✓ (non-consultative)	✓
Panama, Republic of		
Peru	✓	✓
Vanuatu		

2. *Poster presentation at the NWO Symposium*

Poster presented at the Netherlands Polar Committee Symposium of the Netherlands Organisation for Scientific Research (NOW) on "Polar science and policy: a happy marriage?" (November 1, 2013, The Hague).



ster Thesis Research Project

The interface between Science and Policy in the creation and implementation of Marine Protected Areas (MPAs) in Antarctica

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"Especially in the area of environment, it is important for researchers to communicate scientific findings in an appropriate and accessible way to policy-makers […]. An improved dialogue between the scientific and policy-making communities is necessary to improve linkages between policy needs and research programs as well as to enhance the accessibility of scientific knowledge to policy makers". (European Union, DG Environment).

Antarctic Marine Protected Areas

The Antarctic Treaty System

Antarctica is a region of unique and high biodiversity value, and a unique field for science regarding the study of broad marine ecosystem and wildlife in such extreme areas for example. Fifty countries around the world currently recognize the uniqueness of the continent by the Antarctic Treaty, agreeing that Antarctica "shall be used for peaceful purposes only" (art.1). To enhance the measures of environmental protection, other instruments were later created, including the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR, 1982) and the Protocol on Environmental Protection (1998). This last instrument designates Antarctica as "a natural reserve, devoted to peace and science" (art.2).

Protected Areas

The Environmental Protocol establishes a system for protected areas (Annex V) including :

- Antarctic Specially Protected Areas (ASPAs) to protect outstanding environmental scientific, historic, aesthetic or wilderness values, any combination of those values, or on-going or planned scientific research
- Antarctic Specially Managed Area (ASMA) to assist in the planning and co-ordination of activities, avoid possible conflicts, improve co-ordination between Parties or minimize environmental impacts

Marine Protected Areas

Marine Protected Area is "any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment" (IUCN definition, adopted by the CCAMLR).

For the marine environment specifically, the CCAMLR took the initiative for the **establishment of a representative system of MPAs including no-take marine reserves by 2012 in Antarctica**. So far, this goal has not been achieved, as **only one MPA** has been created in South Orkney Islands. Lately, two new proposals have been submitted but discussions are ongoing. However, Antarctica is still facing great challenges such as global warming, ocean acidification and increasing human activities, making urgent the protection of this unique marine environment.

The interface science-policy

The role of science is dominant in Antarctic policy, but translating it in the political process is a process that requires an effective interaction between actors. In this purpose, Antarctic Treaty claims the freedom of scientific investigations and calls for a free exchange of available information (art.2 and art.3). However, failing attempts for the creation of MPAs and the urgency for environmental protection request for investigating the interface between science and policy in an attempt to optimize the decision-making process and to move forward in Antarctic preservation.

PROBLEM DEFINITION

The interface between science and policy required for the creation and implementation of Marine Protected Areas (MPAs) in Antarctica might be improved to remedy the failure to establish the desirable network of Antarctic MPAs.

RESEARCH OBJECTIVE

Assess the process that created the only Antarctic MPA in South Orkney Islands, the roles and expectations of scientists, policy makers and environmental NGOs to recommend how Southern Ocean MPAs can be established more effectively.

METHODS

- Document and *literature review*
- Apply the *Assessment framework for joint knowledge production in regional climate change adaptation projects* developed by D. Hegger, M. Lamers, A. Van Zeijl-Rozema and C. Dieperink (2012)
- *Interviews* with relevant actors from Research Centers, Environmental NGOs and Policy Institutions

CONCEPTUAL FRAMEWORK

Key concept = **Joint Knowledge Production** as a process that "**implies that scientists, policy-makers and sometimes other societal actors cooperate in the exchange, production and application of knowledge**" (Hegger D, Lamers M., Van Zeijl-Rozema A., Dieperink C. 2012).

The article develops seven propositions as conditions that enhance the success of joint knowledge production. Those propositions will help in the assessment of joint knowledge production in the case of South Orkney Islands.

SCOPE OF THE RESEARCH – South Orkney Islands

South Orkney Islands = a 94 000 km² area proposed in 2009 by the UK as the first MPA in Antarctica. The protection adopted by the CCAMLR aims to "prohibit all fishing activities, as well as waste disposal and discharge from fishing vessels within its boundaries, and [to] allow for improved coordination of scientific research activities" (BAS, 2009).

South Orkney Islands as a case study offers two advantages : 1. the establishment process already ended, allowing to consider implementation as well. 2. the actors are more or less concentrated and easily accessible from The Netherlands.
This case study delimits the scope of the research, circumscribe the number of actors and will give coherence to the research results.

POTENTIAL OUTCOMES

Effective process — **Real process** — *Failing process*

Two values for the discovered outcome:

- Recommend how to make the interface between science and policy more effective
- Use the case as an example for a more effective establishment process of future MPAs in Southern Ocean

Master in Environmental Sciences / Environmental Policy Group

Expected thesis time frame : September 2013 – April 2014

3. Abstract submitted for presentation at the SCAR Open Science Conference

The present thesis has been presented by Dr. Machiel Lamers at the SCAR Open Science Conference hold during the XXXIII biennal meetings of the Scientific Committee on Antarctic Research between August 23 and August 25, 2014 in Auckland, New-Zealand. Here below is the abstract submitted together with Dr. Machiel Lamers.

The Science - Policy Interface of Marine Protected Areas (MPAs) in the Southern Ocean

The Southern Ocean is the home of unique and high biodiversity, but the conservation of its ecosystems are faced with serious challenges. The Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR), the ecosystem-based governance system of the Southern Ocean, has agreed to create a representative system of Southern Ocean Marine Protected Areas (MPA) by 2012, including no-take zones. So far, this ambitious goal has not been achieved as only one MPA has been established around the South Orkney Islands and several proposals have been stalled due to international political disputes. Understanding and improving the interactions between science and policy actors could provide a way forward in this process.

In the social science literature on environmental governance, a debate takes place on the character and effectiveness of the interaction between the domains of science and policy. Models differ from a linear transfer of knowledge from science to policy, to knowledge brokering and joint knowledge production where science and policy actors actively cross the boundaries of their domain. The science-policy interface of Antarctic environmental governance is not properly understood and is of special interest because of the dominant role of science in this part of the world.

This paper explores the establishment of the South Orkney Islands MPA by relating the practices and views of science and policy actors to several models of science-policy interactions. Next to reviewing relevant documentation, semi-structured interviews have been conducted with key actors involved in and around this process from the United Kingdom, Belgium, France and the Netherlands. We analyze the roles and expectations of scientists, policy makers and environmental NGOs in the Antarctic science-policy interface and recommend how interactions can become more effective. Our study demonstrates that the linear model, with knowledge flowing from science to policy, is perceived by many actors as the way the science-policy interface should ideally function. Nevertheless, interviewees also report that boundary crossing and knowledge brokering is occurring regularly and also needed. This paradox may be explained by the dominance of natural sciences in Antarctic science and policy. Following the international literature, we argue that good practices in crossing boundaries do exist, which can lead to higher appreciation of those involved and effectiveness of MPA decision-making.