

The role of epistemic communities in Science diplomacy: An analysis of U.S. and German foreign policy towards Colombia.

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Abstract

This thesis aims to identify how scientists who belong to epistemic communities promote the development of scientific diplomacy activities within the framework of US and German foreign policy towards Colombia. Its main objective is to identify the conditions that allow the members of these communities to develop processes of scientific cooperation through different international governmental agencies.

This research project seeks to contribute to the discipline of International Relations, identifying new actors and cooperative actions that contribute to foreign policy. This study uses a Constructivist theoretical approach, employing qualitative methods to highlight the importance of members of epistemic communities to scientific diplomacy.

To this end, this study analyzes some historical and current examples within different areas of knowledge within the context of bilateral relations with Colombia, in order to illustrate the development of scientific cooperation processes between the United States, Germany and Colombia.

List of Acronyms

| | |
|-------------|--------------------------------------------------------------------------------------------------------|
| AA | German Foreign Office - Auswärtiges Amt |
| AAAS | American Association for the Advancement of Science |
| AID | Agency for International Development |
| AvH | Alexander von Humboldt Foundation - Alexander von Humboldt-Stiftung. |
| BMBF | Federal Ministry of Education and Research - Bundesministerium für Bildung und Forschung |
| BMZ | Federal Ministry for Economic Cooperation and Development |
| CDC | Center for Disease Control |
| CELCI | Latin American Center for Interdisciplinary Formation |
| CERN | Conseil Européen pour la Recherche Nucléaire |
| CGH | Center for Global Health |
| COLCIENCIAS | Administrative Department of Science, Technology, and Innovation |
| DAAD | German Exchange Academic Service - Deutscher Akademischer Austauschdienst |
| DFG | German Research Foundation - Deutsche Forschungsgemeinschaft |
| DoD | Department of Defense |
| DOE | Department of Energy |
| DoS | Department of State |
| ECLA | Economic Commission for Latin America - Comisión Económica para América Latina y el Caribe |
| EPA | U.S. Environmental Protection Agency |
| ESA | European Space Agency |
| EU | European Union |
| FTA | Free Trade Agreement |
| FETP | Field Epidemiology Training Program |
| GDP | Gross Domestic Product |
| GIZ | German Society for International Cooperation - Deutsche Gesellschaft für Internationale Zusammenarbeit |
| GMO's | Genetically Modified Organisms |
| GTZ | German Agency for Technical Cooperation - Gesellschaft für Technische Zusammenarbeit |
| HRK | German Rectors' Conference |
| HTS | High-Tech Strategy |
| I4 | International Institutes for Interdisciplinary Innovation |
| IANPHI | International Association of National Public Health Institutes |
| IR | International Relations |

| | |
|--------|------------------------------------------------------------------|
| ISI | Import Substitution Industrialization |
| ISS | International Space Station |
| IT | Information Technologies |
| MPG | Max-Planck Society - Max-Planck-Gesellschaft |
| MPI | Max Planck Institutes |
| MPTRG | Max Planck Tandem Research Groups |
| NAS | National Academies of Sciences |
| NASA | National Aeronautics and Space Administration |
| NGO's | Non-Governmental Organizations |
| NIH | National Institutions of Health |
| NOOA | National Oceanic and Atmospheric Administration |
| NPHI | National Institutions of Public Health |
| NPT | Non-Proliferation Treaty |
| PHO | Pan-American Health Organization |
| QDDR | Quadrennial Diplomacy and Development Review |
| R&D | Research & Development |
| S&T | Science & Technology |
| SCADTA | Sociedad Colombo Alemana de Transportes Aéreos |
| OECD | Organization for Economic Cooperation and Development |
| UN | United Nations |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| UIS | UNESCO Institute for Statistics |
| USAID | United States Agency for International Development |
| USDA | U.S. Department of Agriculture |
| WHO | World Health Organization |
| WR | German Council of Science and Humanities - Wissenschaftsrat |

List of Figures

| | |
|-------------------------------------------------------------------------|-----------|
| Figure 1: Who does Science Diplomacy in the United States? | 40 |
| Figure 2: Structure of the German System of S&T | 68 |

Table of Contents

| | |
|-------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Acknowledgements..... | 3 |
| Abstract..... | 4 |
| List of Acronyms | 5 |
| List of Figures..... | 7 |
| Table of Contents | 8 |
| CHAPTER I..... | 10 |
| 1. Introduction | 10 |
| 1.1 The ability of scientists to work with peers abroad..... | 12 |
| 1.2 Research Design..... | 13 |
| 1.2.1 Theoretical framework and analytical concepts..... | 13 |
| 1.3.1 Science Diplomacy..... | 17 |
| 1.3.2 Epistemic Communities | 19 |
| 1.4 Case selection and Temporality | 20 |
| 1.5 Research Question, Hypotheses, and Objectives..... | 24 |
| 1.5 Methodology..... | 25 |
| 1.6 Data and Fieldwork Methods | 26 |
| 1.7 Thesis Structure..... | 27 |
| CHAPTER II | 29 |
| Scientists in Foreign Policy: The Role of Epistemic Communities in Science Diplomacy | 29 |
| 2.1 The role of scientists in foreign policy | 29 |
| 2.2 Using science as a tool of foreign policy | 33 |
| 2.3 The effects of epistemic communities on foreign policy..... | 35 |
| CHAPTER III..... | 40 |
| Analysis of Science Diplomacy in the Bilateral Relations of the United States of America with Colombia..... | 40 |
| 3.1 The Importance of Science in the Government Agencies of the American Society | 40 |
| 3.2 Science Diplomacy in U.S. Society: The Role of Government Agencies and the Private Sector | 42 |
| 3.3 The Role of the Department of State: Examining the Relationships between Epistemic Communities and Science Diplomacy in the U.S..... | 44 |

| | |
|--------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 3.4 The role of Centers for Disease Control and Prevention: Public Health Issues and the Relevance of Science Diplomacy | 48 |
| 3.5 The Role of the National Science Foundation in Science Diplomacy Activities..... | 51 |
| 3.6 Background of the Bilateral Agenda of the United States of America and Colombia | 53 |
| 3.6.1 Historical Context | 54 |
| 3.7 Analysis of Epistemic Communities Work with Colombia | 58 |
| 3.8 Summary of the work of U.S. epistemic communities to generate science diplomacy outcomes towards Colombia | 66 |
| CHAPTER IV..... | 67 |
| Analysis of Science Diplomacy in the Bilateral Relations of Germany with Colombia | 67 |
| 4.1 The Relevance of the German System of Science and Technology in Foreign Policy..... | 68 |
| 4.2 Scientists on board: Analysis of the Importance of Scientists in the German S&T System..... | 69 |
| 4.3 Science Diplomacy in the German Federal Foreign Office | 72 |
| 4.3.1 The role of the German Academic Exchange Service in the Foreign Office..... | 73 |
| 4.3.2 The relevance of the Alexander von Humboldt Foundation | 75 |
| 4.4 The Promotion of Science Diplomacy by the Federal Ministry of Research and Education | 77 |
| 4.4.1 The role of the German Research Foundation in the promotion of science diplomacy... .. | 79 |
| 4.5 The Max Planck Society International Work..... | 81 |
| 4.6. Background of German Foreign Policy towards Latin America | 83 |
| 4.7 Analysis of the effects of German Epistemic Communities in Colombia..... | 84 |
| 4.8 Summary of the work of German epistemic communities and their science diplomacy activities towards Colombia | 90 |
| CHAPTER V | 91 |
| 5.1 Findings and Conclusions..... | 91 |
| 5.2 Further research..... | 96 |
| Annexes | 98 |
| Annex 1: List of Interviewees | 98 |

CHAPTER I

1. Introduction

March 2, 2004 was an extraordinary day for space research endeavors, the kind of day that happens only once in a lifetime. On that day, the European Space Agency (ESA) launched the Rosetta spacecraft. This mission involved detailed expertise in the creation and startup of the Rosetta orbiter and the Philae lander. These two special artifacts brought back specific data to help us understand the secrets of our solar system, as reflected in the composition of comets. The achievements of this space mission were the result of ten years of joint work by high-level scientists on equipment such as software and satellites, which were created with international intergovernmental support to achieve the long-term research goal of unveiling the mysteries of space.

This story aims to exemplify how scientific activities are embedded in the international arena, and how scientific initiative can accomplish governmental objectives. This research looks at the development of scientific cooperation as a foreign policy tool.

It examines Germany's and the United States' use of research activities abroad, which involves the diplomatic role of scientists gathered in epistemic communities acting as intermediaries between academia, laboratories, and government organizations. Additionally, this research seeks to understand the impact of the work that German and U.S. scientists do on the development of scientific cooperation in Colombia, from a different perspective.

The unique aspect of this thesis, and one of its main contributions to the existing literature, is that it identifies how, and to what extent, epistemic communities have promoted scientific work through foreign policy mechanisms in Colombia. This includes the establishment of scientific initiatives at the international level, the identification of new opportunities, the training of scientists regarding local conditions, and the creation of scientific outcomes.

This thesis analyzes the role of knowledge-based experts in the development of foreign policy mechanisms that promotes research cooperation. Subsequently, this project provides an empirical examination to identify the participation of scientists and their home country governments in the promotion of science activities at the international level, and finds that, due to some enabling factors, such as a lack of clarity on the part of policy makers regarding certain issues, expertise in a certain field of knowledge, and privileged access to policy makers, these experts can forge research cooperation in different knowledge topics and geographical areas.

This project uses information gathered from in-depth interviews conducted in Bogotá, Colombia, the German cities of Bonn, Köln, and Berlin; and the cities of Atlanta and Washington D.C. in the United States. Also, this study includes documental analyses of official statements by government agencies, and from scientific lectures, publications and other relevant documents.

Finally, this study provides a better understanding of how Colombia has participated in scientific cooperation, by looking at what lessons can be learned from these experiences, and by examining how these activities can help the development of new initiatives linked to science and innovation in the country. Furthermore, it contributes to the fields of academia and policy since, to my knowledge; there are no studies with these characteristics on South American countries. Also, the conclusions can be used to promote a new agenda for further research in the field of International Relations (IR) from an interdisciplinary approach.

In this study, I argue that some states, such as Germany and the United States of America, produce exceptional results in many fields of knowledge, due to their leadership in science, which makes them a point of reference in the global arena. Both of these countries prioritize their research in basic and applied sciences, in order to compete at an international level. Their academic and scientific contributions are well-known for the quality of their research institutions and publications, including the close connection between academic endeavors and their application in industries that support the progress of science with technical or financial resources.

The concept of science has been defined by many authors (Ferris, 2011; Greene, 2004; Kuhn, 1996). In this case, I use the definition provided by Siepmann (1999). He defines science as *“the field of study which attempts to describe and understand the nature of the universe in whole or part”*. Thus, here science is understood to be the search for knowledge, in which individuals try to understand how the world works on a large or small scale through the implementation of the scientific method in order to reach a specific outcome, or to understand a certain topic. It includes the development of knowledge at the local, national, and international level.

I argue that investing in science is a crucial factor for any country that wishes to compete, cooperate, and succeed in different social, economic, and political aspects at the national and international level. For instance, it is valuable to examine the impact of science from an economic and political point of view.

Usually, the results generated by scientists are connected with the production of research, and benefits such as vaccines, debating ideas at events, research networks, publications, scholarships, fellowship programs, patents, consulting processes, and the establishment of companies, among other outcomes.

1.1 The ability of scientists to work with peers abroad

Scientists try to work abroad for different reasons which include, but are not limited to, the following:

- 1) The development of science does not have borders. Scientists have a strong tradition of collaboration with peers at local, national, and international levels. They share resources and thoughts to increase the understanding of their subject of study through networks and collaborative work.
- 2) Once a scientist becomes well-known in a particular field, he or she can take advantage of the Matthew Effect (Merton, 1968). This concept proposes that exaltation and recognition will be given to scientists who are already recognized in their field, increasing their ability to network with peers and create new research opportunities.
- 3) Scientific work at the international level can be used as an incentive to obtain funding to improve research. Other reasons to work abroad are access to infrastructure and subjects of research, including the opportunity to work with friends and colleagues, even with the most renowned scientists in a specific field.
- 4) Scientists can influence policy decisions in the international arena using their expertise in a related field, including international issues such as nuclear arms control or health issues. In this regard, Peter Haas (1992) proposed the concept of epistemic communities. It refers to: *“a network of professionals with recognized expertise and competence in a particular domain and an authoritative claim to policy-relevant knowledge within that domain or issue-area”*.

In this thesis, I argue that scientists have strong motivations to develop scientific work abroad with the support of governmental agencies and institutions. However, it is relevant to question how scientists can accomplish this goal. What are the main motivations for working with the government and generating further research? To analyze these issues, I provide a summary of analytical concepts to explain the relationships between scientific and governmental actors, in order to understand how scientists articulate their interests and ideas within the framework of foreign policy.

1.2 Research Design

The study is organized as follows. First, it introduces the main features and the analytical concepts of the theoretical framework, building on constructivist approaches within IR. Second, it presents a literature review of the main concepts it addresses: *science diplomacy* and *epistemic communities*. The third part introduces the case selection and the time frame for the study, and includes a brief description of the methodology used for this study, which takes a qualitative approach to collecting and analyzing data.

1.2.1 Theoretical framework and analytical concepts

The theoretical framework and the analytical concepts in this study rely on constructivist approaches to the study of IR for the following reasons:

First, there are relevant studies that analyze the importance of science, technology, and innovation from many theoretical perspectives, even interdisciplinary approaches.¹ In the field of International Relations there are studies that conform to the realist theory in which scholars address the relevance of science and technology for the state and how topics related to this field can affect the power balance in the international system (Aron, 1964; Kissinger, 1984, 2014, p. 341; Spykman, 1938).

Additionally, the liberal theory, in terms of foreign policy, has focused on three main features, which are: 1) the relevance of the representative or republican government; 2) a principled respect for nondiscriminatory rights; 3) the existence of social and economic interdependence (Doyle, 2008, p. 61). This last feature includes studies that seek to understand global integration through technology within the international system, and suggest the predominance of a complex interdependence by different actors, including state and non-state actors. These relationships are expressed through the establishment and development of transnational connections, international organizations, and international regimes (Keohane, 2001, p. 2; Keohane & Nye Jr, 1998).

However, for the development of this study, the liberal framework does not apply for the following reasons: 1) this study focuses on the perspective of scientists involved in research cooperation processes within the framework of the foreign policies of the U.S and Germany, respectively. 2) There is no complex interdependent relationship between the host countries of scientists with Colombia, especially because the latter has limited capabilities in terms of science and technology

¹ These studies include techno politics and other theoretical approaches that could explain the impact of technology within the international system. See Fritsch (2011); Mayer et al (2014); Weiss (2005).

(S&T). In summary, the liberalist and neo-liberalist theoretical frameworks emphasize analysis of cooperation processes from the perspective of the state, rather than that of the individuals involved.

For these reasons, I employ a constructivist approach, because this acknowledges the importance of ideas which define the identities and interests of actors in world politics. This approach suggests that the social dimensions of international relations serve as the basis for analyzing the behavior and beliefs of these actors in a particular situation. Additionally, the subjects of analysis include topics related to the mutual constitution of structures and agents (Fierke, 2013; Ian Hurd, 2009, p. 303; Wendt, 1992). Therefore, for this thesis, a constructivist approach takes into account the scientists' interest in working within the framework of foreign policy, and the ways in which their involvement in governmental agencies generates scientific outcomes at the international level.

Moreover, it is important to emphasize that social construction within the constructivist framework is the result of social processes of interaction linked to the production of shared knowledge about the world, which is crucial for recognizing the reality that is usually given as a fact (Flockhart, 2012, p. 82).

Another relevant explanation regarding the constructivists' perception that the world is socially constructed is given by Jeffrey Checkel, who suggests that:

Socially simply means that constructivists give greater weight to the social in world politics...Constructed means that constructivists understand the world as coming into being -constructed- through a process of interaction between agents and the structures of their broader environment (Checkel, 2008, p. 72).

Some examples of this social construction can be found in societal facts and contexts such as the value of the money (Adler, 1997, p. 328), the denomination of refugees at the international level (Barnet, 2011, p. 156), the probability of some rogue states to use of nuclear weapons (Checkel, 1998, p. 326), among other societal perceptions about international affairs.

In this sense, the construction of ideas and interests linked to the generation and development of scientific activities is socially created by the interactions between members of civil society, governmental institutions, and international organizations. These relations are expressed in a constructivist approach by a social context that explains the process of institutionalization of norms, rules, and certain outcomes, and thus confirms the relation between agent and structure.

For this study, the social construction between the actors involved in this thesis relies on the ways in which social interactions between scientific members of epistemic communities and governmental agencies create or generate scientific outcomes in the German and the U.S. governments. This is because science is perceived as a progressive tool that will improve the well-being and development of society at local, national and international levels.

For this reason, the analytical concepts employed here serve to help us understand the social content between scientists and governmental agencies expressed in the framework of foreign policy to generate research cooperation towards Colombia.

A constructivist approach permits the analysis of ideas and interests among members of epistemic communities, and the relationships between these communities and governmental institutions. In this case, the relationships are those of the United States of America and Germany with Colombia, regarding the creation and development of scientific activities in the framework of science diplomacy as a tool for research cooperation.

Additionally, this theoretical framework serves to describe relations between actors, states and the international structure (Adler, 2013; Finnemore, 1992; Omelicheva, 2011; Wendt, 1992). For this study, scientists gathered in different epistemic communities are relevant players in the international system, with the support of policymakers, states, governmental institutions, international organizations, among other actors, working to promote the generation and development of scientific outcomes.

The concept of *epistemic communities* refers to how a community of experts has the ability to influence state behavior due to their expertise in a specific subject of knowledge, helping states to identify their interests, flagging issues up for collective debate, suggesting new policies, and creating new outcomes or rules to negotiate at the international level. One clear example is the work of epistemic communities in terms of international regimes regarding environmental governance (P. Haas, 2016c). Moreover, this concept has been used by many constructivists to understand the complex and interconnected global agenda (Adler, 2005; Adler & Haas, 1992; Antoniadis, 2003; Barnett, 2011; Cross, 2013; P. Haas, 1992; Lynch & Klotz, 2007).

According to Andreas Antoniadis (2003), the members of epistemic communities play two roles. The first one is direct involvement by representing scientific initiatives in the political arena. The second role is an indirect one, in which members seek to obtain the desired result through the generation of knowledge (or its application) in a specific field. Members also aim to endorse new

topics for the national agenda and the nation's decision-making process in the framework of foreign policy.

For this thesis, it is relevant to understand how members of epistemic communities are involved in the creation and development of research cooperation in the framework of the foreign policy of Germany, and the U.S.

The promotion of scientific cooperation is carried out by scientists who are experts in a certain knowledge area; these scientists are connected with members of epistemic communities which work with scientific governmental agencies. Additionally, the promotion of international cooperation is expressed through the scientific outcomes obtained about topics agreed upon in the bilateral agenda, including the development of events, the establishment of joint research groups, and the development of research activities, among other endeavors that have the economic or technical support of different government agencies.

I also suggest that members of epistemic communities can be involved in different institutions or advocacy groups to promote and create new forms of international cooperation through the development of scientific activities as a social construction. Due to their expertise in specific knowledge areas, easy access to policymakers, and the possibility to create and develop activities on matters of policy and tangible results, they can help to create and identify new scientific outcomes for the social and economic development of their home countries.

This thesis focuses on the importance of *science diplomacy* in foreign policy. Science diplomacy enables the development of scientific activities at the international level with the support of government agencies that provide resources on many fronts. Scientists and diplomats developed this term to promote collaboration among peers abroad to provide responses to relevant issues such as climate change, alternative sources of energy, and health hazards, among others, facilitating the construction of partnerships at the international level.

This concept includes the following ideas: First, science in diplomacy suggests that science can offer precise information to support foreign policy objectives. Second, diplomacy for science implies that diplomacy can facilitate international scientific cooperation. Third, science for diplomacy suggests scientific cooperation can improve international relations among actors in the international system (The Royal Society, 2010).

Scientific activities are usually used as foreign policy tools for states to improve their leadership in topics related to science and technology. Such leadership can be motivated by interactions among scientists in order to generate knowledge and build capacity at the international level. One clear example is the work conducted by scientific diasporas around the world, which allows for the exchange of knowledge in order to generate new outcomes among scientific members in their home countries (Flink & Schreiterer, 2010; Meyer & Brown, 2003).

1.3 Literature Review

The existing literature drawn upon in this research thesis can be organized into two areas: science diplomacy and epistemic communities. Additionally, for each concept I include information related to the United States of America and Germany as reasonable cases.

1.3.1 Science Diplomacy

Many scholars have studied the relationship between science and diplomatic affairs (Flink & Schreiterer, 2010; Malik, 2010; Mayer, Carpes, & Knoblich, 2014). Their approaches have focused on how science can build bridges between nations and how some countries have established productive relationships through the development of scientific endeavors at the international level between the actors in S&T systems (Fedoroff, 2009; Flink & Schreiterer, 2010; Weiss, 2005).

Usually, the activities related to science diplomacy have been used by developed countries as a means of technical cooperation. Nevertheless, the concept of science diplomacy goes beyond that. For this reason, it is imperative to analyze the relationship between both concepts. Science implies the development of scientific activities to search for and produce knowledge. Moreover, as Turekian et al. (2015, p. 4) note, *“science is neither inherently political [n]or ideological but represents a type of universal language, a vector of transnational communication that poses fundamental questions about the nature of things.”* Science also carries certain principles, such as knowledge, expertise, and application of the scientific method that allow policy makers to seek scientific advice to solve or analyze a specific issue.

On the other hand, diplomacy is a tool of foreign policy applied by nations to represent objectives, goals, attitudes, and positions of the internal actors of any state in their interaction with the international system (Cooper, Heine, & Thakur, 2013; Jacobs & Page, 2005). Diplomacy is also concerned with power. It is connected with the daily activities of negotiations, conflict resolution, and building and maintaining relationships in many fields established by national interests.

Therefore, I argue that science diplomacy is a mechanism for creating a dialogue between scientists and politicians to promote national interests in certain topics of knowledge. Thus, science diplomacy gives new relevance to scientific and technological issues in the international context. This concept incorporates political activities in the following three major dimensions.

First, *diplomacy for science* refers to how diplomatic relations can facilitate scientific cooperation among countries by promoting the involvement of resources and infrastructure. Examples of diplomacy in the service of science include CERN's (The European Organization for Nuclear Research) Large Hadron Collider, the largest particle accelerator in the world, and the International Space Station (ISS).² Additionally, diplomacy for science seeks to "*facilitate international cooperation, whether in pursuit of top-down strategic priorities or bottom-up collaboration between individual scientists and researchers*". (The Royal Society, 2010). These different approaches are relevant to the development of this thesis.

Science in diplomacy refers to the scientific advice that supports the design and implementation of policies linked to foreign policy objectives, such as how to manage global resources like the air, the oceans, biodiversity, or space. In other words, it helps to get the best information related to scientific knowledge to policy makers to enable them to give a better response to the complexity of international affairs in our interconnected world.

Science for diplomacy serves to improve international relations and calm political tensions between countries. It has been demonstrated by many examples of joint work between the scientific institutions of Israel and Palestine, or the reestablishment of diplomatic relations between the governments of the U.S. and Cuba, where science has a relevant role to accomplish.³

Additionally, the activities of science diplomacy can be explained by the analysis of Vaughan C. Turekian in the forum Science Diplomacy in Action: Bridging Cultures and Supporting Development (Policy Studies Organization, 2013). In this contribution, he suggested that the activities of science diplomacy can be reduced to three E's: 1) Expression: scientific support to allow any country to express its national power or influence in a certain field, 2) equipment: by equipping a nation's foreign ministry to deal with technical issues that science can provide relevant solutions to; such issues may be related to energy, health, and biodiversity, among other topics. And

² Derived from the name "*Conseil Européen pour la Recherche Nucléaire*". See Pestre & Krige (1992)

³ The Israeli-Palestinian Science Organization (IPSO) is a nonprofit organization, which operates under the formal endorsement of the Israeli Academy of Sciences and Humanities and the Palestinian Academy for Science and Technology. This organization has worked in many fields, such as physical anthropology, water, environment, and agriculture, genetics, desertification of dunes, pharmacology. See IPSO - Israeli-Palestinian Science Organization (n.d.)

3) enhancement: enhancing bilateral and multilateral relations between countries; a good example is the relationship developed between China and the U.S. in the science and technology fields.

These approaches have been addressed by the Royal Society (2010) in London. The people involved in these activities recognize that the tremendous value of science diplomacy lies in its potential to design and implement solutions to international challenges that have scientific and technological approaches, because some issues go beyond national boundaries, and no country can solve them on their own.

Moreover, science diplomacy can shape the behavior of state agencies using the generation of research endeavors as a relevant tool of foreign policy. Furthermore, most of the recent literature related to science diplomacy has been promoted by the Center for Science Diplomacy of the American Association for the Advancement of Science–AAAS (American Association for the Advancement of Science, 2014). However, the contribution of studies of science diplomacy in Latin America remains minimal. In fact, just a few articles have been found about science diplomacy in this region.

The most relevant articles related to this thesis are research publications of intergovernmental scientific networks in Latin America. The first one is the Ibero-American Programme for Science, Technology and Development (CYTED) and the Inter-American Institute for Global Change Research (IAI). Both institutions have contributed to the promotion of science for diplomacy in the region in order to improve capacity building, including a continuous process of transformation from North-South networks to South-South cooperation models (Soler, 2014).

Another relevant case is a publication that included many case studies of scientific cooperation in different parts of the world, including Antarctica (Davis & Patman, 2015). Nevertheless, very little work has been undertaken to evaluate how networks of experts can promote or work within the framework of science diplomacy in Latin America at the country level. Consequently, I argue that scholarly efforts in this area are incomplete, and this thesis aims to make a contribution to the literature on this topic.

1.3.2 Epistemic Communities

This concept was proposed by Peter Hass (1992b). He argues that members of epistemic communities come from a number of different knowledge disciplines, and share the following elements that influence policy. These are: 1) a shared set of normative and principled beliefs, 2) shared causal beliefs, 3) shared notions of validity, and 4) a common policy enterprise. It is

suggested that due to their expertise and generation of knowledge, these communities can influence and promote scientific work through the establishment of new ideas that lead to new patterns of behavior in international policy coordination.

Additionally, it is important to stress that epistemic communities exhibit factors that allow them to influence a government, due to the following: 1) the ability to understand and manage the uncertainty variable that directly affects the activities of policy makers. 2) The knowledge and expertise of these communities can bring new ideas for solving complex problems, even at the transnational level. 3) Their advice on learning processes can provide support to achieve outcomes pertaining to global issues. Proof of this is the existence of international regimes in a variety of areas, which include technical information and procedures for facing challenges with high levels of uncertainty such as environmental issues, governance of the Internet, and responses to health threats, among other topics.

The role of epistemic communities has been studied by many scholars (Adler, 2005; Adler & Haas, 1992; Antoniadou, 2003; Finnemore, 1992). There have been studies that identify how epistemic communities have influenced scientific development initiatives at the domestic level and at the international level, specifically issues related to environmental problems and nuclear arms control (Adler, 2005; P. Haas, 2016a). However, there is a gap in the existing literature regarding how epistemic communities have worked on foreign policy to develop scientific activities through bilateral relations.

1.4 Case selection and Temporality

Through the case studies for this thesis, I find that the work of scientists who belong to epistemic communities can shape foreign policy outcomes through the creation and development of science diplomacy activities. For instance, I choose some cases of members of epistemic communities that work with governmental agencies due to their field of action in terms of international cooperation, previous work with beneficiaries, and close ties with governmental institutions.

However, one important point to bear in mind is the differentiation that Peter Haas made between epistemic communities and bureaucratic bodies that rely on their beliefs, goals, missions and budget (1992, p. 19). For this reason, the cases analyzed in this thesis depend on the work done by some members of research institutions and advocacy groups which can be analyzed using the concept of epistemic communities. This claim is made because their members use the administrative

empowerment of governmental institutions to achieve material interests, and also seek to generate and apply ideas or knowledge in the public sphere.

In addition, I argue that members of epistemic communities should be involved in the bureaucracy of the national and international agencies for the following reasons. 1) Their expertise can reduce uncertainty and complexity when dealing with a certain issue in order to reduce unanticipated effects that stem from a political decision. 2) Their advice can persuade decision makers and encourage new policy outcomes such as policy alternatives and coalitions to support certain decisions. 3) Their work depends on the diffusion of ideas that generate assertive results on the basis of social construction among scientific and political actors, in order to create and promote scientific outcomes at the international level.

One remarkable case that supports the involvement of members of epistemic communities in bureaucratic agencies can be found in the Economic Commission for Latin America (ECLA)⁴ under the leadership of Raul Prebisch, who was the executive director in 1950 (Villamizar, 2012). With the support of Hans Singer, he established the foundations for the Latin American structuralism school. As a result of this academic movement, they proposed an economic development theory that aimed to understand the asymmetrical trade relations between the countries of the center (developed countries) and the countries of the periphery (developing countries); this concept was named Dependency theory (Cardoso & Faletto, 1979, p. 3).

As a possible technical solution to solve the dependency of the developed countries, Raul Prebisch became firmly associated with the idea of Import Substitution Industrialization (ISI), in which a developing country improves its internal production, substituting its own goods for the goods that it imports from abroad, focusing on industrialization processes within the country (Love, 1980). This development approach was adopted by some Latin American countries such as Brazil and Chile, but academic and political criticisms towards this development model caused other economic models to be adopted (Baer, 1972).

It is important to stress that the leadership and political involvement of Raul Prebisch were key factors for understanding the work of epistemic communities at the international level. His expertise in economic development and his access to high level policymakers within bureaucratic agencies allowed him to propose and implement innovative solutions to development problems of Latin American countries.

⁴ The Spanish acronym is CEPAL - Comisión Económica para América Latina.

The cases from the U.S. chosen for this thesis are the National Academies of Sciences (NAS), and the American Association for the Advancement of Science (AAAS), which work with the Department of State (DoS), The International Association of National Public Health Institutes (IANPHI), which works with the Center for Disease Control and Prevention (CDC), and some universities and research groups that work with the National Science Foundation (NSF) in the United States.

In Germany, I choose the example of the Max Planck Institute for Experimental Medicine, which works with the Max Planck Society (MPG) to create some joint research groups.⁵ I also include some illustrations of the work of the Alexander von Humboldt Foundation (AvH)⁶ and the German Academic Exchange Service (DAAD) with the German Foreign Office (AA)⁷ to generate scientific outcomes in Colombia. Finally, I explain the relevance of the work done by the Council of Sciences (WR) for the German Federal Ministry of Education and Research in Germany (BMBF), and the German Research Foundation (DFG).⁸

These cases are relevant to the development of this thesis due to the following factors: 1) Their relative knowledge areas of expertise include the longstanding tradition within each governmental institution of sponsoring projects at the international level, especially with Colombia, in areas such as health, international aid, law and biodiversity, among other knowledge fields. 2) The development of projects with the support of these governmental agencies created new funding and technical assistance opportunities. 3) There are various long-standing connections between U.S. and German scientists and Colombian counterparts.

I have also included some relevant historical context for both cases (the German and American governments). Both established important initiatives that enabled interaction and facilitated the development processes of science abroad, specifically in Latin America and Colombia. Also, it is important to emphasize that I limit the temporal scope of the study to the period between 2009 and 2016, because many initiatives from Germany and the U.S. Government related to science and technology were achieved in Colombia during this time frame.

Moreover, this study focuses on Colombia as a case study for comparisons due to the following factors: Firstly, Colombia has a perceived value to German and U.S governments because they were

⁵ In German: Max-Planck-Gesellschaft zur Förderung der Wissenschaften - MPG.

⁶ In German: Alexander von Humboldt-Stiftung – AvH.

⁷ In German: Auswärtiges Amt – AA.

⁸ In German: Bundesministerium für Bildung und Forschung – BMBF.

able to find the necessary human and natural resources to carry out science activities (German Federal Foreign Office, 2016; Mason, 2014; Müller, 2014; U.S. Department of State, 2015).

Additionally, Colombia has an interesting geographical setting that allows the advancement of research in areas such as marine sciences, agricultural sciences, tropical medicine, biotechnology, engineering, and other knowledge areas. As De Greiff (1994) explains, *“Colombia is an equatorial country, with access to two oceans and complete range of topographic diversity levels. These features can create supply factors to motivate an approach with researchers from multiple disciplines.”*⁹; Due to its geography, the country is rich in biodiversity, especially plant and animal species, making it a point of reference for science creation in Latin America (Fulbright Colombia, 1997; Weberience, 2014; Whitney, 1994; Wildlife Extra News, 2008).

Colombia has a long tradition of cooperation with both countries in many areas of research. In the case of the United States of America, this collaboration started with the establishment of the Fulbright Commission in 1957 and continued with the Alliance for Progress program created by President John F. Kennedy in 1961 (Fajardo, 2003; Fulbright Colombia, 2007; Sterns, 1987). The Fulbright Commission in Colombia has facilitated higher education programs such as visiting scholars, scholarships, and research fellowships to promote the development of science and knowledge.

In the case of Germany, cooperation has taken place since the participation of Alexander Von Humboldt in the Botanical Excursion to Colombia in 1801, and this relationship has continued to this day.¹⁰ Another example was the influence of Baron Wilhelm von Humboldt on General Francisco de Paula Santander in 1832. The result of this relationship was the establishment of the Universidad Nacional de Colombia (Universidad Nacional de Colombia., 2014). Another relevant German case is found in the support, and advice to build capacity in some research areas such as basic sciences, education, philosophy, and physics (Constain, 2012; GIZ, 2015; Rodríguez-Lara & Caro Greiffenstein, 2012).

Moreover, the impact of German academic immigrants after 1945 provided some opportunities to study and carry out research in Germany. Examples of this scientific work can be found in areas such as the activities carried out by Ernesto Guhl Nimtz in geography, Leopold Rother in

⁹ In Spanish: *“Colombia es un país ecuatorial, con salida a dos océanos y una diversidad total a nivel topográfico. Estas características pueden constituir factores de oferta para la aproximación con investigadores de múltiples disciplinas.”*

¹⁰ Cases of this cooperation can be traced to the work done by different research centers in Germany. See Internationales Büro des BMBF (2012).

architecture, and Juan Herkrath Muller in physics, among other examples in different knowledge areas (Cubillos Alonso, 2006; Mahecha, 2011; Montaña, 2011; Murcia, 2004).

Furthermore, Colombia has received official development assistance from the German Society for International Cooperation (GIZ) since 1967 in areas related to peace building, environmental policy, protection and sustainable management of natural resources, and sustainable economic promotion.¹¹ Meanwhile, another type of strategic cooperation has been developed by German political foundations. They promote their values through support for, and establishment of international cooperation programs, joint events, and funding to build capacity in areas of interest to political parties. Other institutions, such as the Alexander von Humboldt Foundation, the Helmholtz Institutes, and the German Academic Exchange Service have supported bilateral relations through scholarships and providing funding programs.

1.5 Research Question, Hypotheses, and Objectives

The project is guided by the following question:

How do epistemic communities in the United States and Germany promote diplomacy for science in Colombia?

The project proposes the following hypothesis inspired by the existing literature on epistemic communities:

H1: Scientific cooperation in the U.S. and Germany is the result of interactions between epistemic communities and governmental organizations within foreign policy, which in many cases contributes to the promotion of science diplomacy towards Colombia.

Moreover, the general and specific objectives of this study are described below:

General objective

- To identify whether the interactions between epistemic communities and governmental organizations in the U.S. and Germany promote actions linked to diplomacy for science through the development of bilateral cooperation with Colombia.

Specific objectives

¹¹ In German: Deutsche Gesellschaft für Internationale Zusammenarbeit-GIZ.

- Identify the enabling or limiting factors that have affected scientific cooperation between epistemic communities' members around the world.
- Analyze scientific cooperation processes in three governmental institutions of the United States of America towards Colombia during the period defined in this study. These are the Department of State (DoS), the Centers for Disease Control and Prevention (CDC), and the National Science Foundation (NSF).
- Analyze scientific cooperation processes in three institutions in Germany towards Colombia during the period defined in this study. These are the German Foreign Office (AA), the Federal Ministry of Education and Research (BMBF), the German Research Foundation (DFG), and the Max Planck Society (MPG).
- Explore the promotion and development of German and American scientific cooperation with Colombia.

1.5 Methodology

The methodological base of this project follows a three-level analysis and uses a qualitative approach. In this section, I describe the methods employed for data collection and analysis.

The study assumes that, due to certain factors, members of epistemic communities can promote the creation and development of science diplomacy activities. Thus, it seeks to evaluate the hypotheses proposed in order to understand how scientists are involved in foreign policy mechanisms of their home governments, especially Germany and the United States. As a result of the interaction of both concepts, I propose that the relations between members of epistemic communities and policy makers and governmental agencies have facilitated the generation of new scientific outcomes in Colombia.

The research question is answered using a qualitative research model. This thesis includes an analysis of scientific communities from the United States of America and Germany that have worked with Colombia from 2009 until 2016. However, in some cases this study includes some historical context that reflects the relevance of the development of scientific cooperation through time. Thus, I identify some detailed cases using documentary analysis and internet-based research to determine the results of those interactions. These include legislative acts, reports, information available in databases, research in libraries, and other documents that bring to light binational research cooperation initiatives.

Furthermore, for the purpose of triangulation, I conducted semi-structured interviews with major actors from U.S. and German organizations in the cities where these research institutions are located. The template of the interview included five general questions and was sent by email before the proposed meeting. Some questions were added during the conversation. The participants in the semi-structured interviews included high-level officials in the government and scientific organizations in both countries, advisory staff from the different embassies, and scholars in charge of cooperation with Latin American partners, especially Colombia.

Moreover, each chapter will include a classification of the different types of work generated by epistemic communities in relation to the foreign policy of each country. According to the criteria of the author, the work of scientists in the framework of foreign policy will be measured by the scientific outcomes obtained and generated in Colombia. These include factors such as funding or institutional capacities that affect the outcomes obtained so far. Finally, the information collected will be used to present a comprehensive analysis of both countries.

1.6 Data and Fieldwork Methods

The first stage of the research project presents a theoretical analysis linked to the main hypothesis, which is:

Scientific cooperation in the U.S. and Germany is the result of interactions between epistemic communities and governmental organizations within foreign policy, which in many cases contributes to the promotion of science diplomacy towards Colombia.

Using the selected theoretical framework, I analyzed the work carried out by members of epistemic communities in the United States of America and Germany, to identify how they have conducted science diplomacy initiatives such as joint projects and agreements, among other activities.

Thus, this thesis examines scholarly publications and official documents from Germany and the United States of America, in order to analyze their positions regarding the subject of this study. Moreover, I chose three case studies related to initiatives, projects, and official programs for each country in order to obtain detailed information about the process of establishing research cooperation in Colombia.

The second stage includes an empirical analysis to determine the existence of relationships between the concepts. This part of the project was developed using documentary analysis, internet-based research, and interviews with government officials and high-level scientists who are experts in

different knowledge areas and are familiar with mechanisms of cooperation in S&T. Thus, this stage of the project builds on the information collected during fieldwork and in-depth interviews with representatives of epistemic communities and foreign policy-makers.

In the case of the United States of America, I interviewed high-level scholars from scientific academies and advocacy groups, officers in charge of the international cooperation activities of the CDC and NSF for Latin America, and staff from the U.S. Department of State, among other actors. The interviews were conducted in Bogotá and Washington D.C., with some of them were conducted by Skype in 2015.

In the case of Germany, the interviews included representatives of the German Foreign Office and the Ministry of Education and Research, scientific leaders and officers from the Max Planck Society, some research cooperation officers from the German Research Foundation for the Latin American region, and some head officers in the Alexander von Humboldt Foundation, to obtain their points of view about the ability of German scientists to work within the framework of their foreign policy. The interviews were conducted in Bogotá, Berlín, Bonn, and Köln, and some of them were conducted by Skype in the year 2016.

The third stage of the analysis discusses the theoretical and empirical findings of the case studies, relating them to the research question and the proposed hypotheses. Thus, it evaluates how the findings match, contradict, and further previous studies on epistemic communities.

Moreover, it is relevant to mention some limitations encountered in the development of this thesis. These are related to the limited access to high-level officials, due to some factors such as restrictions on expressing their opinion about certain cases, lack of time and willingness to schedule a meeting, among other issues. Therefore, some of the statements by these officials were obtained from internet databases. Another limitation was my lack of German language skills, which is reflected in the absence of information published by political and scientific leaders in the German case. Nevertheless, I found papers and governmental reports in English that could serve to further this study. Also, various interviews were conducted in English with the German interviewees.

1.7 Thesis Structure

This thesis is divided into four sections; the first chapter is related to the understanding of how scientific activities are involved in foreign policy agenda. Then, it explores the factors that affect epistemic communities' participation in the generation of research cooperation abroad.

The second and third chapters are related to the parts of the case-study that analyze the relevance of S&T in the U.S. and Germany. Also, both chapters explain the motivations of members of epistemic communities to foster research cooperation at the international level. In addition, each chapter includes a comprehensive analysis of the bilateral relations with Colombia, showing how some joint scientific endeavors in different knowledge areas have historically been included in the foreign policy agenda.

Finally, the fourth chapter summarizes the findings of each case through of a scheme that shows examples the work of members of epistemic communities on their governments to promote science diplomacy towards Colombia. On the other hand, it suggests further research topics concerning specific aspects of the concepts used in this study.

CHAPTER II

Scientists in Foreign Policy: The Role of Epistemic Communities in Science Diplomacy

Foreign policy can be described as a tool for nations to use to analyze all the political, social, cultural, and economic issues of a country, in which every action is taken into account in order to succeed at an international level (Hill, 2003). Usually topics related to security, foreign aid, trade and diplomacy have dominated this policy agenda. However, new aspects have been included, such as culture, sports, education, social engagement, and science topics, which are used by governments as a long term strategy of foreign policy in order to achieve international success.

For this reason, it is pertinent to question how scientists can cooperate in international affairs. What is the relevance of science in the development of foreign policy? What are the conditions that allow scientists to align their work with the decisions related to foreign policy, particularly concerning scientific cooperation?

In this chapter, I analyze what foreign policy means, and the role that scientists play within it. Then I examine the interests and the main factors that are involved in the process of agenda-setting, adoption, and implementation of foreign policy, and the ways in which the members of epistemic communities are involved. To conclude, I will provide some examples of how scientists can succeed or fail in their attempts to obtain political support to shape scientific outcomes at the international level.

2.1 The role of scientists in foreign policy

There are many definitions of foreign policy. One of the most comprehensive is provided by Ernest Petrič (2013) who suggested that: *“The foreign policy of any state depends on its geopolitical position, its power, its internal organization and stability, on public opinion, on pressure groups and their interests; it depends also on its internal political situation”*. At the same time, Adnan (2014) stated that, *“[Foreign Policy] is a link between what goes on inside a state and the world outside of that state.”*. Both definitions take into account the relevance of the internal context of any given country, to the expression of their national interests at the international level.

From a constructivist perspective, it could be argued that this approach evaluates foreign policy in three main ways. 1) It enables us to understand the relevance of bureaucracies and interests. 2) It considers the decision-making process. 3) It takes into account the interaction between international and domestic levels (Lim, 2009).

Likewise, this approach emphasizes the role of identities as a basis for defining the interests and ideas of the foreign policy of a state in an intersubjective way according to social practices. As Goldstein and Keohane (1993) argued, interests and ideas have causal weight in explanations of human actions. To be more precise, it can be stated that foreign policy is the sum of the interests of many actors, such as political parties, social movements, experts, and enterprises, among others players, which create national identities which are socially constructed by the different actors involved and expressed in the international system (Kubáľková, 2001).

Additionally, this theoretical approach has been used to understand social aspects involved in international relations and foreign policy analysis (Ian Hurd, 2009, p. 302). Especially, in terms of practice-based foreign policy activities such as diplomatic practices and conventions, and action-based foreign policy in which decisions are intended to solve a problem or include a new way of thinking. The latter approach will be used in this thesis.

For these reasons, this thesis is designed to open the “black-box” of the state and understand how the work of scientists serves to develop and generate research cooperation activities. It is an attempt to understand the relevance of social construction by scientists and policymakers, expressed in the generation and development of scientific outcomes, as an element of the foreign policies of the U.S. and Germany.

On the other hand, foreign policy interests are expressed through objectives and goals that are presented by national governments through their Ministry of Foreign Affairs or other agencies. In addition, governments take into account the perception of different actors in civil society, such as NGOs and companies, among others, whose contributions represent the national interests of the nation.

Some examples of the topics included in the foreign policy agenda include the actions related to trade, security, and health, among other relevant topics, which are coordinated by each agency or ministry, and institutions that work separately or jointly. The relevance of the work of each ministry depends on the strategic goal that the government, as the main player, establishes in a particular area.

Notably, not all political decisions follow a defined hierarchy. Usually, some issues need expertise and previous knowledge to be handled properly. In this context, the detailed work of non-state actors is crucial for solving issues that have a high level of uncertainty and risk. Examples of these are found in environmental threats, health hazards, security topics, and other highly complex issues.

It is in dealing with these complex issues that members of the epistemic communities play a core function, because they can apply their expertise in certain areas, using their arguments and points of view to orient or change the behavior of a certain institution or policy.

Furthermore, this study aims to analyze the capabilities of members of epistemic communities in terms of the creation and development of scientific outcomes that are supported by a government. These outcomes are fruits of factors such as expertise, lack of knowledge by officials when dealing with a certain knowledge area, and access to policymakers and institutions. This claim relies on the relevance of ideas and social interactions between members of epistemic communities and policymakers, which allow the definition of interests and activities in bilateral relations between states.

The social construction made by scientists and perceived by policymakers and governmental institutions permit analysis of new ways of cooperation that demonstrate the relevance of scientific expertise, and this shapes how foreign policy makers construct and make sense of the world, especially regarding certain outcomes achieved by government agencies and multilateral organizations.

In addition, the role of scientists in the foreign policy framework can be asserted in many ways because the boundaries of the responsibilities of each governmental actor are quite flexible. Usually, the development of science at an international level involves a plethora of actors from more than one organization.

One clear example is the development of health sciences abroad, which involves not only the Ministry of Health, but also other institutions, such as universities, science academies, research institutions, health companies, research groups, and other players that provide useful suggestions for dealing with complex issues.

The social relations between scientific and political actors can generate and develop scientific outcomes such as vaccines, treatment for infectious diseases like HIV/AIDS, research on chronic diseases such as Alzheimer's and Cancer, sanitation treatments, or regulations linked to public health, among other outcomes.

Another example is the inclusion of health concerns as a relevant point in the foreign policy of the countries that belong to the United Nations (UN). These health concerns can be traced to different scenarios at the international level, due to a lack of response at the state level to solve health challenges that cross national borders. One illustration of this claim is the impact of infectious

diseases. The effects of diseases can damage the immune system of a country's population, affecting other areas such as national security and the economy, and leading to humanitarian problems.

A possible response to this concern is the founding of the World Health Organization (WHO), an important entity in the international public policy agenda. One milestone in the development of its activities was the creation of resolution 63/33 of the UN General Assembly in 2008 and its implementation the following year. It was a success for the scientific and political community around the globe because it addresses the relevance of global health for the international system (Hein, 2013, p. 65).

Nevertheless, there are differences between developed and developing countries when it comes to facing and analyzing health hazards. As Henry Feldbaum (2013) says, "*state interests play a powerful role in prioritizing and shaping engagement on global health issues*". This happens because each country has a unique understanding of its national interests, and sometimes actors can facilitate the generation of foreign policy activities to promote science abroad, even if it is related to sensitive topics like serious health threats.

One illustration of the work of epistemic communities to solve health issues at the international level is the case of H1N1 influenza A. The roots of this virus come from its continuous mutation, starting with pigs in 1918, then jumping species to birds, and finally to human beings.

In 2009, the WHO declared H1N1 influenza a pandemic, focusing on this threat at a global level. Nevertheless, not all state actors responded in the same way. The case of Indonesia is a relevant one because this country refused to share and release tissue from avian flu victims to WHO scientists, since the representatives of this country argued that the generation of vaccines would only be available to people in developed countries (Crisp, 2010).

This refusal to share samples with the WHO has been put forward by other developing countries, arguing similar positions (Sedyaningsih, Isfandari, Soendoro, & Supari, 2008). These governments shared the vision concerning the creation of a vaccine that could be given directly to people, and not the vision of the pharmaceutical companies that work with the WHO. In the end, the Government of Indonesia shared their samples, due to the pressure of the scientific community that continued its efforts to create a common mechanism to share samples of infectious diseases that could benefit everyone.

To conclude, I argue that foreign policy refers to actions that any government takes on behalf of its national interests abroad. Sometimes scientific activities are relevant, yet they are not borne in mind by heads of state and ministries of foreign affairs. However, issues with a high level of uncertainty need special treatment. Scientists can use their expertise and their ability to transfer knowledge to solve issues and shape the agenda of foreign policy in any government, making the development of scientific outcomes relevant in the framework of foreign policy.

2.2 Using science as a tool of foreign policy

Usually, the socially biased perspective regarding scientists has been linked to the creation and application of knowledge for understanding a certain issue, and to the continuous discussion of achievements. On the other hand, scientists feel that their voices are not heard by different members of society, which limits their participation in actual debates, in which they can share their meaningful expertise and innovative solutions in fields linked to political and foreign policy issues. This situation is caused by the perception that some academics live in so-called ivory towers, which limits their ability to engage with the political world.

Nonetheless, many other scientists try to bridge the gap and get involved in the political process. They try to create useful networks to work or study in a certain field. For example, Ernest Haas (1990, p. 11) puts forth:

Science becomes a component of politics because the scientific way of grasping reality is used to define the interests that political actors articulate and defend. The doings of actors can then be described by observers as an exercise of defining and realizing interests informed by changing scientific knowledge about man and nature.

The scientific results obtained with the support of the state in a relevant field shape the political world in the international context. These results include the creation of devices, events, norms, projects, laws, materials, compounds, and vaccines, among others. The generation of these outcomes allows a significant advancement in matters related to science and technology.

Additionally, some of the factors which involve the engagement of scientists within the public sphere are the crafting of science to answer relevant questions related to their research interest in order to expand their knowledge and satisfy their curiosity. Usually, scientists look for funding to obtain access to high-end equipment or travel abroad to continue their studies. Sometimes, this search for answers to understand the complexity of our world can also provide support for the international agendas of governments.

Moreover, I argue that a facilitating factor for collaboration among scientists and other members of society is the acceptance and advancement of the universal principles and values science promotes. The latter claim is based on the search for truth, driven by their curiosity, their impartiality in reaching this goal, and the rational choice to accept changes and new ways to find this knowledge.

In other words, science is a common language that is linked to the development of their activities. Because scientists around the world accept some general values in terms of utilitarian, cultural, disciplinary, and vocational perspectives, they achieve results to challenges on a local, national, and global scale, creating and offering new solutions with an enormous impact on society, and this impact can be further improved with the proper support of governments.

Another factor that promotes the development of science is the beneficial effect of the involvement of scientists in the process of the globalization and information technologies (IT) revolution (Friedman & Mandelbaum, 2011, p. 61). The process of globalization is a major milestone in promoting interactions among academics, allowing the establishment of networks, and even accelerating the outcomes of basic and applied sciences.

At the state level, I argue that the international system can be seen as a complex system with many actors including governments, individuals, Non-Governmental Organizations (NGOs), international organizations, and private companies, among others. Sometimes, these actors have a particular interest in the scientific enterprise because they believe that science and innovation are fundamental to the development of a country, making this topic relevant for domestic and foreign policy.

Furthermore, the work of epistemic communities is pertinent in some cases of foreign policy. The main way for these communities to prove their points of view is when they lead or become part of a governmental agency to solve an issue. The key factors that prove their efficiency are linked to expertise, uncertainty, and close relationships with policy makers.

The sum of these factors will lead to changes in policy and allow scientific actors to become involved in different stages of the policy process by policy makers. One of the main tools used by scientists to work, with the support of governmental agencies, is the learning process which is the basis of policy evolution as described by Peter Haas (1992).

This process allows members of epistemic communities to contribute to the international relations of a state through the diffusion, selection, and maintenance of political innovations, because policy makers can learn and understand new paradigms of reality, and consider new ways to solve a specific issue. Other factors to take into account in policy-making processes according to Haas

(2016b, pp. 81–86) are interpretation and institutionalization. Both factors are shaped by shared policy beliefs, which establish objectives and goals under certain conditions of complexity, taking into account that “*Complexity tests the limits of human understanding*”.

At the international level, members of epistemic communities must translate their technical language into policy advice, bearing in mind the historical, political, economic, and social context in order to interact with and learn from different points of view to solve significant problems. The relevance of this process is not just making the right arguments but also making them public and appropriate for all the actors involved.

Moreover, as Jacobs and Page (2005, p. 108) argued, the relevance of the members of epistemic communities relies on the need for any government to have experts that can provide independent decisions without suffering pressure from groups or citizens. Thus, another reason for the involvement of scientists in the political sphere is the support that they can provide to a government to identify and reach the interests of the state that are settled in the structure of the international system.

To conclude, members of epistemic communities have specific advantages that make them relevant in the international system. Specifically, their expertise in their fields, plus their personal abilities, their capacity to gain institutional access, and ability to spread ideas in different ways, make it possible to cross the bridge between uncertainty and policy decisions, including the generation and development of activities in the framework of foreign policy and at an international level.

2.3 The effects of epistemic communities on foreign policy

Examples of scientists’ work at the international level can be found in our daily life. For example, in the benefits provided by the Human Genome Project in public health (Palotie, Widén, & Ripatti, 2013), or in the understanding of difficult diseases such as Cancer (Naidoo, Pawitan, Soong, Cooper, & Ku, 2011). Similarly, we see the use of satellites to collect data and predict or react to situations of natural hazards like earthquakes, volcanic eruptions, tsunamis, floods, and landslides has been proved in different scenarios (Alexander, 1991; Stefanov & Evans, 2015).

Another example is the establishment of an international organization that promotes issues of education, science, and cultural affairs around the globe, embodied in the United Nations Educational, Scientific, and Cultural Organization (UNESCO). This organization was created due to the need to establish joint educational and scientific work internationally (Finnemore, 1993), I argue

that these examples supports the constructive work of academics in the international relations sphere, expressed through scientific work that modifies the policy process to promote or reach a desired outcome.

Nevertheless, despite the key factors of efficacy demonstrated by scientists in regard to foreign policy, sometimes the development of activities related to these issues does not have the desired result. This can happen due to the following reasons: 1) in certain matters there are clear conflicts of interests that cause serious differences and arguments between scientists, policymakers, and other actors. 2) Lack of a will by policy makers to solve complex issues without taking into account the support of the scientific community, because they have the confidence (or the political position) to solve a certain problem. 3) Structural issues within a State related to the institutional support for engaging in scientific activities. Examples of these kinds of issues are lack of funding, high level of staff turnover, short term policies, among other institutional factors.

In this thesis, I will provide various illustrations of how scientists can succeed or fail in their work regarding foreign policy. These examples include the Non-Proliferation Treaty (NPT), a significant success in terms of expertise in a knowledge area, uncertainty on the part of policymakers when dealing with a specific technical issue, and close relations to policymakers.

On the other hand, I will explain the failure of epistemic communities in the debate regarding genetically modified organisms (GMOs) at the international level, which exemplifies how these experts have failed to be influential in the political sphere.

In order to understand the relevance of epistemic communities in the development of science diplomacy, I will refer to the Non-Proliferation Treaty (NPT) as a relevant example of the work of scientists, especially of physicists, in the development of the foreign policy of two main superpowers: the U.S. and the Soviet Union. The relevance of this example is well known because only experts in energy and physics are able to understand the complexity of the case, and have the expertise needed to create and promote this knowledge. Their suggestions concerning the regulation and implementation of control processes for nuclear weapons, and most importantly their relationship with policymakers, allowed them to work with them, providing arguments that were materialized in the development of policies which focused on nuclear arms control.

Scientists, such as Joseph Rotblat, and the members of the Pugwash Conference explained and shared their views of the threats linked to nuclear weapons starting in 1957. Their expertise was crucial to developing this institutional regime that directly affects international security around the globe. Also, their work in the framework of science in diplomacy was recognized in many places. They were even awarded the Nobel Peace Prize in 1995 *"For their efforts to diminish the part played by nuclear arms in international politics and, in the longer run, to eliminate such arms"* (Nobelprize.org, 2014).

Furthermore, it is important to remark that other scientists played a key role in the development of this Treaty, including Evgeny Velikhov, and other physicists such as Mikhail Gorbachev's unofficial advisors who made the epistemic community relevant in the transmission of arms control ideas (von Hippel, 2013), proving the importance of their work regarding this issue (Adler, 2005; Dunlop, 2012).

On the other hand, the debate regarding the generation, treatment, and different uses of GMOs is a valid case to analyze due to the failure of the members of epistemic communities to achieve consensus at the international level, mainly caused by the different perception of the use and impacts of GMOs in the European Union (EU) and U.S. context. The lack of understanding about the use of GMOs by actors such as NGOs, advocacy groups, policymakers, companies and members of civil society, plus uncertainty about dealing with future issues makes it a sensitive topic.

The terms "*genetically modified*" or "*transgenic organism*" refer to an organism whose genetic structure has been altered at the cellular level by procedures of genetic engineering. The international controversy stems from topics regarding policies for agriculture and biotechnology in different countries. It is proven that genetically modified crops have a strong resistance to pests, harsh environmental conditions, or chemical reactions such as the use of herbicides and other substances. In addition, scientists can improve the nutrient profile of GMOs, assuring a strong impact on harvest production.

The debate started with a concern regarding consumer health and the direct impact of GMOs on biodiversity. In the United States, the National Academy of Sciences indicated that *"It is the final product of a given modification, rather than the modification method or process, that is more likely to result in an unintended adverse effect"* (National Academies of Sciences, 2004, p. 5). However,

the academies also stressed that there are limited studies that determine ill effects on human health (2004, p. 5).

In consequence, in the United States, these products do not need any special form of health regulation because they have been modified specifically for the desired outcome. For that reason, the governmental agency that evaluates them does not make a distinction between marketed GMOs and non-GMO foods.

Conversely, the European Union as a multilateral organization has received many complaints about the use of transgenic crops. In this case, civil organizations and advocacy groups such as Greenpeace, the Organic Consumer Association, and the Union of Concerned Scientists developed a strong campaign to show the potential impact on health from this kind of food, proposing some actions such as mandatory labeling of each product, the suspension of these modified products, and a debate about the catastrophic effects they might have on biodiversity, among other issues (Greenpeace International, 2008; Organic Consumers Association, 2016; Union of Concerned Scientists, n.d.; World Health Organization, 2016b).

From the European Commission's point of view, the main problem was linked to agricultural policy and consumer preferences (Drezner, 2008, p. 154). Due to the efforts of civil organizations to reduce the use and purchase of these products, the European Commission established regulatory conditions, including the labeling of products with GM additives or compounds. Currently, there is a proposal being considered by the European Commission to change the regulation to restrict or prohibit the use of authorized GMOs in their member states (European Commission, 2015).

In this instance, the failure of the members of epistemic communities relies on the lack of a global consensus about the benefits and the risks of GMOs. Their expertise and close relations with political leaders and companies in the United States demonstrate with research outcomes the benefits of its use. However, in the case of the European Union, the work done to bring this topic to debate by scientists was minimal, and scientists in this area allowed for the polarization of this issue by other actors (Pielke, 2002).

Members of epistemic communities have certain advantages that make them relevant in the international system. Their expertise in a knowledge field makes it possible to cross the bridge between uncertainty and foreign policy process. However, sometimes their arguments, knowledge

and work are insufficient to achieve political objectives due to other societal factors such as: 1) struggles among actors that can change the general perception of how to act in a certain field. 2) Denial or rejection by policymakers. 3) Lack of engagement for proposing new solutions to a certain issue.

To conclude, all the factors explained above can be found in the following table:

Table 1: Key factors for the development of science diplomacy in terms of epistemic communities

| | | | |
|-------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Enabling Factors | Uncertainty of policy makers when dealing with certain issues. | Expertise and skills in certain knowledge topics expressed in scientific outcomes. | Close relationship with policymakers and governmental agencies |
| Limiting Factors | Conflict of interests between the different actors involved in the policy process. | Lack of political will to deal with certain issues | State structural issues related to institutional support for engaging in scientific activities. |

Source: Compiled by the author based on literature review related to Epistemic Communities in international affairs.

Taking into account these examples, it is crucial to question the relevance of epistemic communities in a bilateral relation among states. Is it possible to extrapolate research cooperation to other areas of knowledge? Are there other relevant cases of science diplomacy, especially in Colombia? If so, who are these scientists that support bilateral relations? How do bilateral relations materialize into scientific outcomes? All of these questions will be tackled in the following chapters.

CHAPTER III

Analysis of Science Diplomacy in the Bilateral Relations of the United States of America with Colombia

According to the purpose of the study, this chapter examines the following topics. 1) The importance of science in the government agencies of U.S. society, as a basis for enhancing the performance of foreign policy; 2) The relationship between epistemic communities and science diplomacy in the U.S. and; 3) The links between the bilateral agenda of the U.S. and Colombia in terms of international cooperation, emphasizing the outcomes obtained in themes related to science and technology.

People who were consulted in the development of this chapter included high level scientists from the National Academies of Sciences (NAS), and the American Association for the Advancement of Science (AAA'S), officials who are involved with governmental agencies such as the DoS, NSF, CDC, as well as their Colombian counterparts. This information was obtained through skype interviews and in-person interviews. The data collection and field work was carried out in Washington D.C., Bogotá, and Atlanta.

I conclude with an analysis of the work of epistemic communities in the United States of America towards the development of science diplomacy outcomes in Colombia. My aim is to show that science diplomacy activities have been developed in this bilateral relationship thanks to contact between members of epistemic communities and governmental agencies, and that this has produced positive results, such as the establishment of government agencies, and other scientific results achieved through “Diplomacy for Science” as a mechanism of the U.S. foreign policy.

3.1 The Importance of Science in the Government Agencies of the American Society

Science has played a key role in the history of the U.S. Its influence can be observed from the historical period of the Founding Fathers, through the rise in importance of the applied sciences, which promoted the industrial innovation that directly impacted the nation's leadership in the 19th-century, and has continued until today (Ferris, 2011, Chapter 4; Moreno, 2011, Chapter 1).¹²

¹² This advance served to create devices such as the steamboat, the cotton gin, the first flying airplane, and other gadgets. See Ferris (2011)

In the 20th century, the pertinence of science in the U.S. contributed to internationally enriching the scientific environment in many different ways. These can be categorized as 1) immigration of distinguished scientists supported by the U.S. government who promoted a scientific ecosystem which allowed creative and free thinking in support of governmental purposes.¹³ 2) The importance of basic sciences that changed the course of world history in the Second World War. This example is related to the studies of nuclear fission (splitting of an atom), which evolved into the first nuclear bomb created in the context of the Manhattan Project (Neal, Smith, & McCormick, 2008). Furthermore, this discovery allowed for the use of nuclear technology to generate new energy and disease-treating technologies. 3) The space race between the U.S. and the Soviet Union that allowed the conquest of space by the human race. The main goal was succeeding in sending the first man to the moon, which also included the development of outstanding outcomes from applied sciences.¹⁴ 4) The significance of enhancing research in biomedical sciences led by the National Institutions of Health (NIH) to prevent and promote the well-being of U.S. society.¹⁵ 5) The complex relationship between scientists and the agencies of government due to the conflict of interest between all those actors belonging to the science and technology system who were struggling to defend their positions and their assigned budget in Congress.

The relevance of the scientific work of the American Society began when the U.S. was established, with the essential participation of important scientists among the Founding Fathers, the men who designed the U.S. Constitution. Thus, examples of the progressive influence of science in the U.S. can be found in the cases of Thomas Jefferson, who was the only president who could comprehend Newton's Principia, and who also studied agricultural patterns in the new world. Benjamin Franklin is recognized for his contributions to the study of electricity. James Madison, the main architect of the Constitution of the USA, included references to life sciences, chemistry, and physics in his Federalist Papers (Cohen, 1995).

They were mainly influenced by the major ideas of the Enlightenment (Shermer, 2015). The ideas born during this period support the application of critical thinking and scientific argument to other non-scientific disciplines of the “*époque*”. Such themes related to politics, economics, and moral

¹³ Among the notable scientists that immigrated to the U.S. were the German theoretical physicist Albert Einstein, who arrived in 1933 and discovered some years later the equation of the theory of relativity, the British chemist Joseph Priestley, who is recognized for his work on the discovery of the Oxygen molecule; among other relevant scholars. See Neal et al (2008, p. 100).

¹⁴ Other discoveries that were created in the space race are satellites to predict and measure forecast information, and transfer data such as the internet to connect and bring relevant information such as the broadcasting of radio, television, among others.

¹⁵ The NIH includes 27 separate institutes that cover different knowledge areas of medicine, such as infectious diseases, mental health, and cancer, among others.

philosophy, which did not have a scientific approach at that time. These scientists adopted this new “enlightened” vision to create a scientific environment where ideas and knowledge were exchanged without risks and with the aim of creating a better society. This rational point of view of science was the basis of liberalism (Ferris, 2011, p. 96), which has been one main driver of the foreign policy of the United States of America until the present time.

As a result of this liberal thinking, I suggest that the main driver for generating outcomes at the international level in American scientific society is motivation. This can be expressed as self-interest in knowing and expanding knowledge in each area where scientists are involved. As a renowned scientist expressed (E. Colglazier, interview, Washington D.C., 3 July, 2015):

You stay with the best, you are applying with the best wherever they are, you are going to collaborate on secondary issues using science as a tool to strengthen relations with people and countries, helping every country to have more of a knowledge based society.

In sum, science activities work perfectly within democratic and liberal systems. The development of these activities shares many values of the U.S. society, such as freedom, innovation, and social advancement, among others. These values also provide the perfect framework to create and foment scientific collaborations at the international level.

3.2 Science Diplomacy in U.S. Society: The Role of Government Agencies and the Private Sector

The United States has a strong innovation system involving public and private actors, which enables it to succeed at the international level. It could be argued that this S&T system is “uncoordinated”, but it supports the work of scientists abroad in many areas of research in order to maintain its leadership in the international system (Lane, 2008).

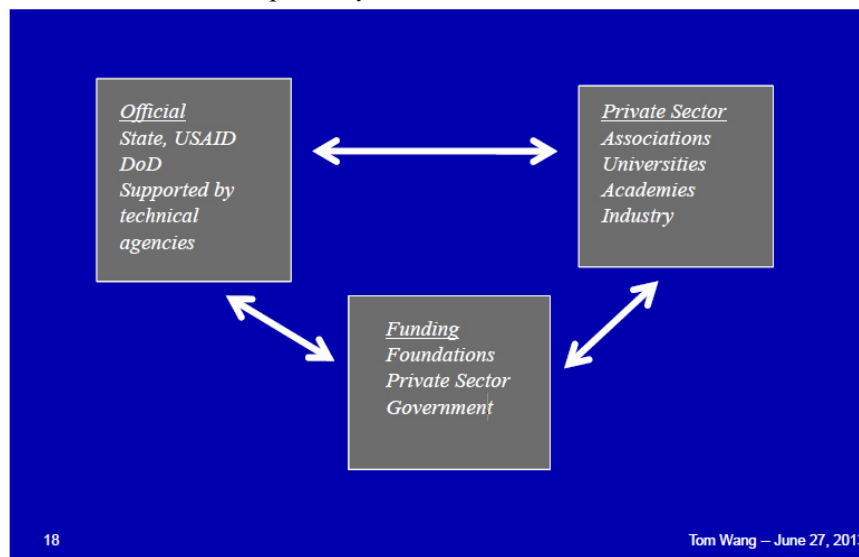
The importance of this system relies on the strong links between its members, in terms of investment in areas of basic sciences and applied sciences, which can generate scientific outcomes such as goods and services with high added value to be traded. Another point to emphasize is the relevance of the high level of education of members, and the technical and economic support that is needed to generate and continue scientific endeavors within the S&T system, even if some actors come from abroad.

Additionally, from the perspective of U.S. scientists, it is important to emphasize the support for scientific endeavors in the development of projects and innovation processes within government agencies. This technical and economic support facilitates engagement with political actors to accomplish scientific objectives and aims in an effective way. As Neil Degrasse Tyson (2015) pointed out *“these centers of research, as well as other trusted sources of published science, can empower politicians in ways that lead to enlightened and informed governance.”*

It is important to highlight the financial support and the technical assistance provided by the U.S. government to generate and maintain science diplomacy activities. Proof of this is the investment made in some initiatives, such as the participation by the National Aeronautics and Space Administration (NASA) in the ISS. For the year 2016 it was around \$3.1 billion (NASA, 2016). This support is a key driver for improving and preserving scientific relations of the U.S. abroad. This encourages the leadership of the U.S. in science and technology, and establishes the perfect conditions for exploring and continuing other work, such as diplomatic, commercial and cultural activities.

Furthermore, in the U.S., there are other organizations apart from state agencies and scientific actors that are relevant to the development of science diplomacy. They include members of the private sector, such as foundations or advocacy groups that sustain, with resources, lobbying activities for scientific endeavors at the international level. To illustrate this in a better way, Figure 1 shows the relationships between the different actors that are involved.

Figure 1. Who does Science Diplomacy in the United States?



Source: Wang (2013).

To sum up, analyzing the work of the members of epistemic communities involves examining the activities of science diplomacy in the U.S. towards Colombia. I selected relevant case studies that provide empirical information regarding the work of these members in the following agencies: Department of State, the Centers for Disease Control, and the National Science Foundation, which illustrate how scientists are involved in the generation of research cooperation activities in these government agencies.

3.3 The Role of the Department of State: Examining the Relationships between Epistemic Communities and Science Diplomacy in the U.S.

The DoS is a government agency in charge of expressing the U.S. national interests in terms of security, commerce, diplomatic relations and official aid. It is the equivalent of the foreign affairs ministry in other countries. Some of its duties include the coordination of actions with other agencies to accomplish foreign policy objectives. Topics related to foreign aid, trade, Human Rights, consular affairs, and public affairs are addressed by these kinds of agencies.

However, science issues have not been included in U.S. foreign policy for many years, or were dealt with by the technical offices of the different agencies of the government. These topics implied a detailed understanding, and political support, to decrease the level of uncertainty in challenging issues such as nuclear deterrence, environmental hazards, and biological risks, among others

Since the end of the 1980s, the scientific community has expressed its worries to the Carnegie Commission on Science, Technology, and Government about the need for engagement with scientific activities by the U.S. public administration. This means government agencies must integrate science and technology issues into their objectives so that these objectives may be achieved in an effective way, including at the international level. This commission was composed of the president of the Carnegie Corporation, a philanthropic organization, prestigious scientists who belonged to many fields of knowledge, two former U.S. presidents, some congressmen, a former attorney general, science advisers from the private sector, and many more renowned personalities (Greenberg, 2001, p. 305).

This commission can be perceived as one former epistemic community because of the composition of its members and the recommendations given that involve scientific approaches. The relevance of the Carnegie Commission lies in the diversity of its members and the shared principle beliefs, together with a common policy enterprise related to increasing scientific activities and raising

profiles within the U.S. government (Carnegie Commission on Science and Technology, 1992). Nevertheless, the interest of the DoS in science was meaningless (Greenberg, 2001, p. 310).

Indeed, the relation between the Science Adviser of the White House and the staff of the DoS during the Bush Presidency was very contradictory (Greenberg, 2001, p. 318). With the election of President Bill Clinton, something began to change, step by step, due to the hard work of his vice-president Al Gore, who was deeply concerned with environmental challenges. Under the leadership of Madeleine Albright, more aspects changed in the DoS. She expressly requested a report from the National Academies of Sciences (NAS), in order to understand the state of scientific engagement at the DoS. This publication was issued in 1999 and includes interesting suggestions designed to increase the importance of science and technology activities in the foreign services (National Research Council, 1999).¹⁶

The main contributions of this report are regarding the relevance of the Science and Technology Advisor to the U.S Secretary of State (STAS), and the need to increase scientific capacity inside the DoS (Greenberg, 2001, p. 328; Neureiter, 2004). The most significant result was the establishment of the Office of Science and Technology in 2000, under the supervision of the Under Secretary for Economic, Energy and Innovation Affairs (U.S. Department of State, 2014b). This achievement was recognized by former S&T advisors such as Nina V. Fedoroff (2009), and Frances Colon, former Science Advisor to the U.S Secretary of State in the Distinctive Voices Lecture series at Beckman Center (2013). Additionally, in a review made by the NAS in 2015, the experts consulted recognized the achievements that the DoS applied to engage in a better way with all the activities of science diplomacy. However, it noted that the engagement should have been more comprehensive in order to succeed at the international level (National Research Council, 2015).

The advisory work of the NAS is recognized by many politicians in the USA. This research organization originated in the middle of the U.S. Civil War with President Abraham Lincoln's support. Later on, President Woodrow Wilson deeply believed in its advisory role. Thus, he demanded the establishment of the National Research Council as a way for scientists to work with the government. Moreover, President Eisenhower in 1956 and President Bush in 1993 confirmed the importance of the academies to the American government (National Academies of Sciences, 2015).

¹⁶ Other outcomes emerging from this report include: 1) a leadership role within the DoS to manage science and technology issues, 2) better engagement with topics related to science and technology among the staff of the U.S. Embassies, 3) improving interagency relations to face challenges related to science and technology, among others topics. See National Research Council (1999).

Currently, the National Academies include the National Academies of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council. Among its members are many leading scholars who are expected to provide their advice objectively and independently to get a better approach and solve issues that are on the mind of the board of trustees of each government agency. (J. Boright, Interview, Washington D.C., 24 June 2015; Interview with the interim advisor of S&T at the State Department, Washington D.C., July 2, 2015).

For this case study, the NAS play a key role because their members can be perceived as members of epistemic communities. Indeed, in both examples these institutions include high-level scientists from a plethora of backgrounds and disciplines that use their expertise and connections to improve the global engagement of the foreign service of the U.S. Government.

Additionally, their members share principled beliefs which are based on the relevance of the positive impact of science to mankind, shared causal beliefs about the lack of engagement of the U.S. government in embracing and supporting scientific activities; shared notions of validity, in order to give the best advice to the government in terms of science and technology; and a common policy enterprise, which is expressed in their own reports in which they argue for the direct involvement of high level scientists in foreign policy affairs.

Another remarkable case regarding the relevance of members of epistemic communities that have played a vital role in encouraging science diplomacy activities abroad is the American Association for the Advancement of Science (AAAS). This is an international non-profit organization dedicated to promoting the generation and support of science. Furthermore, it is well recognized as an advocacy group that leads the engagement of scientists and the public, even among different U.S. government agencies.

Right now, the AAAS publishes the journal *Science*. It also offers some programs focused on science policy, education, career development, and public engagement. At the international level, the AAAs has a program called the Center for Science Diplomacy. It promotes a better understanding of science diplomacy through the development of research activities and knowledge transfer (Wang & Turekian, 2012).

In this case, its members have obtained relevant positions in the U.S. government, including executive agencies and legislative bodies. Their academic profiles are required because of their expertise in different knowledge areas, the possibility to work on and solve issues regarding the framework of uncertainty, their access to policymakers in order to explain how to solve a certain issue, and the need to be involved in the creation and application of policy outcomes.

Also, it is important to have in mind that personal and contextual factors such as empathy, leadership, and expertise in a certain field of knowledge are necessary to be able to work in an effective way with policymakers.

For instance, the following findings suggest the relevance of the work of members of epistemic communities in the DoS: 1) most of the science and technology advisors for the Secretary of State were previously involved in the NAS or in the AAAS (Pincus, 2014). 2) The scientists involved in the public policy process claimed their expertise, and their will to serve the country, as a valuable asset to strengthen the capacity of science diplomacy in the international political agenda. 3) The U.S. government realizes that S&T can be a powerful tool to improve and enhance international relations. 4) The international scientific community recognizes the leadership and the know-how of scientific outcomes made by U.S. scientists (E. Colglazier, Interview, Washington D.C, July 3, 2015, Interview with the interim advisor of S&T at the State Department, Washington D.C., July 2, 2015).

The relevance of scientific activities at the State Department is evident in the establishment of programs that include the direct participation of scientists in foreign policy actions such as 1) The U.S. Science Envoy program, which seeks to identify opportunities for sustained international cooperation in a given country.¹⁷ 2) The opportunity to develop fellowships and internships within this government agency.¹⁸ 3) The Embassy Science Fellows Program, among other endeavors.¹⁹

The development of these programs is the result of the close relationship and previous work of members of epistemic communities with the DoS. This occurs because there are personal relations between scientists and policymakers that facilitate scientific activities in governmental institutions, such as the previously mentioned training programs.. This direct involvement can be relevant to enhancing statecraft actions within the framework of U.S. foreign policy. However, it is important to question whether this scientific work goes beyond topics of foreign aid and includes other areas of knowledge that can create bridges between scientists and policymakers at the international level.

¹⁷ Each science envoy is a renowned leader in specific knowledge areas such as health, chemistry, physics, agronomy, medicine, engineering, and evolutionary biology. Among their activities are the establishment of connections in research, and advice to the U.S. government agencies about programs that can be framed in the bilateral relationship. See U.S. Department of State (2003)

¹⁸ Governmental agencies such as the Jefferson Science Fellowship (JSF), the American Association for the Advancement of Science (AAAS) Science and Technology Policy Fellowships Program, and the Professional Science and Engineering (S&E) Society Fellows Program, among others (U.S. Department of State, 2014a). These training programs allow highly qualified students to take internships in these government agencies, which promote the application of high-level techniques and knowledge to understand and intercede in a relevant issue.

¹⁹ It enables scientists to work in a U.S. Embassy, Consulate or in a specific project that facilitates cooperation in institutions of the host country. Additionally, each Science Fellow must be approved by the Chief of Mission, and must report their work to the agency, the OES, and the State regional Bureau. See U.S. Department of State (2003).

To examine this new query, the study continues the analysis of another relevant U.S. agency, the Centers for Disease Control and Prevention (CDC).

3.4 The role of Centers for Disease Control and Prevention: Public Health Issues and the Relevance of Science Diplomacy

The CDC is a federal agency under the Department of Health and Human Services (DHHS). Its activities focus on public health issues which can be treated or prevented by disease control and prevention. The CDC conducts activities that include issues concerning infectious diseases, health promotion, environmental health, injury prevention, and educational activities, among other scientific endeavors.

The main goal of this agency is to improve the health of U.S. citizens. The CDC was officially created in 1946.²⁰ However, the name of this agency was changed by the U.S. Congress in 1992 to the Centers for Disease Control and Prevention (Kelley & Gantt, 2015).

Currently, the CDC addresses other health issues, such as obesity and diabetes, alongside its responsibilities in controlling infectious diseases. Its work focuses on five strategic areas: 1) supporting state and local health departments; 2) improving global health; 3) implementing measures to decrease leading causes of death; 4) strengthening surveillance and epidemiology; 5) reforming health policies (Centers for Disease Control, 2015d). In this case, the development of global health activities can be presented as a relevant case of generating science diplomacy actions because health threats can create important impacts in different geographic areas and in a short period of time.

In addition, the CDC plays a key role in U.S. foreign policy. Katz et al. (2011) recognize the relevance of this topic and acknowledge that: *“In the United States and abroad, global health has become part of foreign policy agendas and is included in discussions on national security, trade, and diplomacy.”* The global health agenda of the CDC includes actions that reflect their leadership in the treatment of infectious diseases that involve the engagement of international partners. At the same time, its work provides a clear response to the U.S. national interest to protect their population from hazards that could considerably interfere with the health and the economic well-being of

²⁰ Previous agencies that tried to find responses to the public health challenges that American society presented. For example, the Office of National Defense Malaria Control Activities (1942) which was in charge of the Communicable Disease Center committed to fighting malaria, typhus, and other infectious diseases. Then, there were the activities of the Office of Malaria Control in War Areas (1942–1946), and the Communicable Disease Center (1946–1967); this last agency evolved into the National Communicable Disease Center (1967–1970) that later became what is now known as the Center for Disease Control (1970–1980). See Centers for Diseases Control (2015d).

Americans. In this case, it relies on its expertise in the handling and analysis of different health issues, in particular, infectious diseases.

At the same time, the work of this agency has become a point of reference at the international level. Examples of the previous statements are the CDC's responses in the framework of prevention, detection, and reaction to health challenges with high complexity such as the Ebola Pandemic; the Influenza virus; the work carried out with refugees at border zones; and the training of epidemiologists in developing countries; among other actions. In this way, health issues are included in foreign policy so that government agencies can accomplish non-health objectives in the international system (Lee & Smith, 2011).

The CDC has successfully shaped its activities in the science diplomacy agenda as it pertains to health. Its reports on many issues have been a clear and solid basis for guidelines and strategies in most of the scientific institutions of developing countries and international organizations such as the World Health Organization (WHO) and the Pan-American Health Organization (PHO).

Furthermore, this federal agency can promote scientific collaboration through funding and technical assistance in many ways. One is the inter-agency work with partner organizations like the DoS, USAID, Department of Defense (DoD), and the NIH, among others. The other programs are related to the support process given by the CDC Center for Global Health (CGH) and especially by its different divisions.²¹ To sum up, the major role of this center is to work with international partners, on a bilateral, as well as multilateral basis, including the following actions: *“to prevent and control infectious and chronic diseases; [to] respond to international disasters; and [to] build sustainable global public health capacity by training epidemiologists, laboratory scientists, and public health managers”* (Centers for Diseases Control, 2015a).

Science diplomacy actions can be found in each division that emphasizes the joint work between agencies and the scientific communities in their host country. However, health scientists can frame the agenda of this federal agency at an international level. For this study, the members of the International Association of National Public Health Institutes (IANPHI) can be considered as members of an epistemic community for the following reasons. 1) These institutions guarantee the generation of knowledge and technical expertise in health research with the collaboration of peers around the world. 2) In the case of IANPHI, it is necessary to emphasize the fact that this international association includes representatives of the Emory University Global Health Institute,

²¹ Among these divisions are Division of Global HIV/AIDS (DGHA), Division of Parasitic Diseases and Malaria (DPDM), Division of Global Health Protection (DGHP), Global Immunization Division (GID). See Centers for Diseases Control (2015b) .

directors of National Institutions of Public Health (NPHI), ministries of health, and other relevant actors that can contribute advisory outcomes to deal with health issues. 3) The CDC works closely with many scientists who are involved in teaching, research, and extension processes in universities, different networks of research groups, and companies, among other international actors. 4) The members of epistemic communities provide the information needed for the generation of science-based policy, supported in the process of knowledge generation, knowledge exchange, and knowledge uptake (Choi, 2005).

The CDC can be seen as the American NPHI. Its leadership and expertise in the treatment of infectious diseases has brought scientific assistance, including technical and funding resources, to strengthen the capacities of similar agencies around the world. From the perspective of the scientists involved in the CDC, each NPHI in low and middle-income countries must highlight its investment in six relevant areas that impact on the public health of its population (Bloland, Simone, Burkholder, Slutsker, & Cock, 2012).²² These observations are supported by academics who suggest that the investment and support of the NPHI in terms of staff and resources can improve the health systems in developing countries (Frieden & Koplan, 2010).

At the same time, the technical assistance provided at the international level includes supporting other government agencies or health departments. If an issue needs clarification, the CDC can request support from state health agencies and the NIH. This reinforces the functions of the NPHIs in each territory, which allows for the development of science diplomacy activities.²³

The CDC can be perceived as a relevant actor in the global healthcare arena because the initiatives and actions conducted by scientists from this agency, together with other scientific and governmental actors at the international level have affected the understanding and treatment of diseases around the world. Illustrations of the activities conducted by the CDC can be found in countries such as Colombia, Ethiopia, Guatemala, Morocco, Mozambique, Rwanda, South Africa,

²² According to Bloland et al (2012) these functions are: 1) ensuring availability of critical strategic epidemiological information, 2) strengthening key public health institutions and infrastructure, 3) establishing strong public health laboratory networks, 4) building a skilled and capable workforce, 5) implementing key public health programs, 6) supporting critical operational/applied research.

²³ The 10 Essential Public Health Services according to the CDC are: 1) Monitor health status to identify and solve community health problems. 2) Diagnose and investigate health problems and health hazards in the community. 3) Inform, educate, and empower people about health issues. 4) Mobilize community partnerships and action to identify and solve health problems. 5) Develop policies and plans that support individual and community health efforts. 6) Enforce laws and regulations that protect health and ensure safety. 7) Link people to needed personal health services and assure the provision of health care when otherwise unavailable. 8) Assure competent public and personal health care workforce. 9) Evaluate effectiveness, accessibility, and quality of personal and population-based health services. 10) Research for new insights and innovative solutions to health problems. See Centers for Diseases Control, (2015a).

and Zambia. The case of scientific cooperation related to infectious diseases in Colombia will be analyzed in this chapter.

Although some may think that topics related to international cooperation to deal with health issues are only addressed in high-level discussions between international organizations and governmental agencies such as the NPHI, I argue that factors such as expertise, uncertainty in dealing with complex topics such as infectious diseases, and knowledge transfer can leverage the relevance of the scientific work and promotion of joint activities of expert physicians in medical specialties such as epidemiology, immunology, pathology, toxicology, and genetics, among other areas, to create a better impact on the activities carried out at the international level.

For now, it is important to analyze the relationship between academics and the National Science Foundation, and the role of the Foundation in science diplomacy activities abroad.

3.5 The Role of the National Science Foundation in Science Diplomacy Activities

The National Science Foundation (NSF) is an essential part of the development of the scientific and economic achievements by the U.S. during and after World War II. However, it is imperative to analyze the genesis of this governmental agency, and the role of scientists in its creation. The following facts are described below.

Before World War II, research in science and engineering was not considered a federal obligation. Government research into science and technology was largely uncoordinated, even with military research, where many agencies were working in the same area, without realizing it. Taking this lack of coordination into account, President Franklin D. Roosevelt supported the creation of governmental agencies to coordinate federal funding regarding science for war, including the National Defense Research Committee and the Office of Scientific Research and Development; both organizations were created from 1941-1947. At this point, it is important to emphasize the work done by Vannevar Bush, head of the Office of Scientific Research and Development. His research was based on the work and implementation of the Manhattan Project. Also, he wrote a report emphasizing the usefulness of science and technology in the postwar era, to foster the improvement of the U.S. government. This report is called *Science—The Endless Frontier* (1945).

In this report presented to President Harry Truman in July 1945, Vannevar Bush highlighted the urgency of federal support for basic research, which must include: 1) a good relation between the federal government and the institutions of higher education. 2) The need for the industry to turn its

discoveries into products. 3) The need for military research to remain under government supervision for security reasons. 4) The need to support the training of students in science, among other factors. (Bush, 1945) The application of these recommendations allowed the creation of the NSF after five years.²⁴ Its stated mission is: *"to promote the progress of science; to advance national health, prosperity, and welfare; and to secure national defense"* (National Science Foundation, 2016b). Moreover, the NSF is the only federal agency that promotes basic research and education in all the areas of science and technology (Neal et al., 2008, p. 32).

In sum, this report exposed the stakes that the federal government has in science and technology, and the benefits of the NSF, which have as their main goal enhancing the standard of living of American society. Furthermore, this agency has expanded its focus to many divisions related to all disciplines.²⁵ At the international level, this agency has its Office of International Science & Engineering (OISE), and it is in charge of the process of coordinating international research projects, and carrying out the NSF international strategy.

Also, this government agency has offices overseas in Paris, Tokyo, and Beijing. The main activities of these offices are: 1) the promotion of joint work with scientific communities in their respective country/region. 2) representing the NSF in its dealings with agencies, institutions and researchers in the host country/region, 3) the measurement of development and policies related to science and engineering (National Science Foundation, 2015).

Members of epistemic communities, such as research groups and universities, can develop research projects abroad with the support of this governmental agency. However, the relevance of these actions is minimal, because most of the activities related to science diplomacy inside the NSF have been established in the framework of goals that are set in a top-down approach.

This means that the policy agenda plays a key role here, because most of the international partnerships or actions that need international support are focused on the initiatives proposed by political leaders in charge of the public administration. In this case, it is the Office of Science and

²⁴ Although there was general agreement at this time over the principle of federal support for science, the implementation and the organization of this agency required five years to be integrated into the U.S. federal bureaucracy.

²⁵ The areas of discipline are comprised of the following: biological sciences, computers and information, science and engineering, education and human resources, engineering, geosciences, social, behavioral and economic sciences (National Science Foundation, 2015).

Technology Policy at the White House. However, interest in working in other knowledge areas or geographical zones can vary if scientists can find resources or incentives to work on a special topic.

The bilateral agenda between the U.S. and Colombia will be described in detail in the next chapter. To better understand the role of epistemic communities in the previous cases, it is important to analyze the bilateral relations between the U.S. and Colombia, in order to comprehend how the work of U.S. scientists has been crucial in the generation of research cooperation. Besides, it is relevant to examine the main features of the scientific actors involved that have allowed the development of science diplomacy activities towards Colombia.

3.6 Background of the Bilateral Agenda of the United States of America and Colombia

Bilateral relations between the US and Colombia have deep roots in different areas, such as economic relationships, security partnerships, support for social issues, including Human Rights and labor conditions, among other topics. Colombia has been perceived by the U.S Government as a devoted ally in terms of commerce, security, and other topics (Smith, 2008, pp. 208, 318). This close relationship has favored many U.S. interests in Latin America.

In the framework of this support, the U.S. Government has extended its work to other areas, but it has always maintained a pragmatic point of view on bilateral relations, and especially on topics linked to drug enforcement, security issues, trade, investment, and foreign aid. On the other hand, the Colombian government has benefited in many ways, and has supported initiatives in many areas of bilateral relations.²⁶

This long-lasting relationship illustrates a variety of examples of support by the U.S. Government for Colombia. From the perception of the author, aid programs such as: The Alliance for Progress (1962), 2) Plan Colombia (1999), 3) High-Level Partnership Dialogue (2010) enhance the bilateral agenda in education, health, science, and technology, which were included in the agenda in an indirect way.

For the purpose of this thesis, these themes will be analyzed within the science diplomacy framework, especially within the dimension of *diplomacy for science*, due to the fact that activities

²⁶ For the U.S. Government, Colombia is a key partner because: 1) Colombia is considered one of the oldest democracies in Latin America (U.S. Department of State, 2015). 2) The adoption of the Doctrine “*Respice Polum*” by the Colombian Government. This doctrine is based on attraction towards the polar star of the north, in this case is the U.S. Government. 3) The continuous support of the Colombia government in military conflicts and interventions led by the U.S., such as the Korean War, the Suez conflict, and recently in Afghanistan.

concerning technical assistance or capacity building require a direct engagement from members of the scientific community.

For a better understanding of the role of epistemic communities in the generation of science diplomacy actions towards Colombia, I address recent outcomes of the scientific work of networks of experts in the DoS, CDC, and NSF. Finally, I summarize the role that these scientists assumed in each of the previous cases, and provide relevant details for analysis.

3.6.1 Historical Context

Taking into account the history of the bilateral agenda between the U.S. and Colombia, I will describe some specific cases related to research cooperation. One clear example was the aid program called The Alliance for Progress, which was established in 1961 during the presidency of U.S. President John F. Kennedy. Its main goal was to establish international cooperation between the U.S. and Latin America. It sought to improve social conditions and political reform in Latin America, with the aim of mitigating the communist threat in the context of the Cold War (Taffet, 2012, p. 60).

This program included actions intended to increase capacity-building in terms of economic growth, especially as it related to loans and advisory processes for managing the economy, infrastructure, education, and health (Rojas, 2010). According to this specific agreement, the government recipients undertook to apply economic reforms to promote redistribution of land and extend liberal values (Taffet, 2012, p. 5).

One significant finding from this program was the influence of academics on the framework of modernization theory, especially W. Rostow, Lucian Pye, Daniel Lerner, Gabriel Almond, and James Coleman (Rojas, 2010), who proposed and defended this theory as a guideline necessary to achieve social change in Latin America and avoid communist threats (Latham, 2000, p. 4).²⁷

In 1961, the assistant to the national security advisor, Walt Whitman Rostow, sent a memorandum to U.S. President John F. Kennedy, where he proposed the creation of the Latin American Task Force (Latham, 2000, p. 69). This group was charged with the evaluation and development of

²⁷ The main academic outcomes that frame this theory were: Rostow, W.W.: *The Stages of Economic Growth: A Non-Communist Manifesto*. Cambridge: Cambridge University Press, 1960, Pye, Lucien W.: *Politics, Personality, and Nation Building: Burma's Search for Identity*. New Haven: Yale University Press, 1962, Lerner, Daniel. *The Passing of Traditional Society: Modernizing the Middle East*. New York: Free Press, 1958, Almond, Gabriel, and James S. Coleman, eds.: *The Politics of Developing Areas*. Princeton University Press, 1960.

activities in the Latin American region (U.S. Department of State, 1961).²⁸ According to the statements of this group of economics experts, the development process of Latin American countries was linked to certain conditions and topics, including social and economic issues that should be addressed through political reforms. Furthermore, this program included technical assistance towards capacity building to achieve the following goals pertaining to agrarian reform, industry, education, and health, among other topics (Latham, 2000, p. 83).

Colombia was presented as a poster child because, unlike other beneficiary countries, its leaders have always had the political will to follow the recommendations of the American experts. Also, the U.S government wanted to prove that its aid program could work under certain conditions. Among the major results of this program, research has reported the issue of the continuous tension between the short and long term goals of the National Front governments that were leading Colombia between 1958 and 1974.

Even though the program failed to accomplish the proposed goals in topics related to land reform and economic development (Rojas, 2010), I assert that the Alliance for Progress definitely aided the transformation of the institutional architecture of Colombia, in particular through the following: 1) The creation of an economic development plan under the framework of the Alliance, which enabled financial support for the strategies and projects. 2) The support of the Colombian government to create and transform specific government institutions in areas related to education, health, environment, energy, geography, urban planning, among others (1992, p. 232).

Another relevant case can be found in 1968, when the government of Colombia, with the support of the National Academy of Sciences (NAS), and the Agency for International Development (AID) held a seminar on science and technology for development in the city of Fusagasuga, Cundinamarca. This event constituted a milestone for the establishment of COLCIENCIAS (Administrative Department of Science, Technology, and Innovation) due to the political support and the experiences that these participants shared to create this institution (Nupia Martínez, 2013). The outcomes achieved in this program constitute a clear example of how epistemic communities can shape the agenda of foreign aid in U.S foreign policy.

²⁸ This group was led by former Assistant Secretary of State Adolf Berle and composed of Goodwin, Arturo Morales-Carrion, and Teodoro Moscoso of the Puerto Rican Government, economist and Latin Americanist Lincoln Gordon of Harvard, political scientist Robert Alexander, and historian Arthur P. Whittaker. See Rojas (2010).

In this case, the ability of Walter Whitman Rostow to advise policymakers, his expertise and work on uncertainty, allowed him to exert influence on the U.S Government (Latham, 2000, p. 46), particularly to propose new policy outcomes that were relevant to technical cooperation towards Latin America. Especially in the case of Colombia, this collaboration has been relevant to the development of key institutions that work to improve society.

Another aid program in the bilateral agenda was Plan Colombia, which was a response to the complex situation in Colombia related to drug trafficking, institutional weakness of the government and the loss of territorial control by the armed forces (McLean, 2002; Tokatlian, 2008). The perception by the U.S. government was the need to confront issues that could directly affect U.S. society; in this case, Colombia was a threat to regional and hemispheric security (Rojas, 2015, p. 15).

For this reason, in 1999 the U.S. government designed a program to support the Colombian government with strategies of carrots and sticks (Rojas, 2015, p. 41). First, it provided military and technical assistance related to anti-narcotics and capacity-building for the Colombian armed forces. The second part of the strategy provided support in certain areas related to the improvement of the economy, reform of the judicial system, promotion of civil rights, and support for social development.

In terms of non-military capacity-building and technical assistance, I argue that the main results of Plan Colombia are linked to areas such as alternative development, promotion of Human Rights, and reform of the judicial system, among others. These initiatives and projects were managed by the United States Agency for International Development (USAID), and some of these activities are relevant to this study, as they apply to research and knowledge transfer from the United States to Colombia.

One example is the Policy of Alternative Development, which provided alternatives to coca production for Colombian citizens who lived in conflict zones, such as 1) projects to generate income and employment, 2) food security projects, and 3) projects concerning alternative production, marketing, and technology (Rojas, 2015, p. 101). However, the clearest case that includes knowledge transfer was the technical assistance to improve Colombian capacity to solve criminal cases, especially in the form of forensic training and equipment. (Sorrell, 2010, p. 112).

The Colombian government has been one of the main partners of the U.S. in its interaction with its Latin American neighbors. But, I argue that in order to have better global engagement, not only security matters (such as drug trafficking) must be prioritized. Although issues related to science diplomacy were not highlighted in the agenda of Plan Colombia, the change of presidents in both countries allowed for the development of a new starting point in the bilateral agenda, in which a possible peacebuilding scenario could affect issues such as trade, health, education, research, and knowledge transfer. All of these are relevant to readjusting and improving this bilateral relationship.

The main result of this new approach was the ratification of the Free Trade Agreement (FTA) between the U.S government and the Colombian government in 2012. However, before that, both countries established the High-Level Partnership Dialogue to start a process of broadening of the bilateral agenda, focusing on other topics about which they could develop joint work initiatives (Ministerio de Relaciones Exteriores de la República de Colombia, 2010).

This High Level Dialogue was a new agreement that included the enhancement of the bilateral agenda in terms of economic and social opportunities, energy, science, technology, and innovation, biodiversity, environmental protection and climate change, education, culture, and sports (Embassy of Colombia in Washington D.C., 2015).

However, science and technology activities formed part of a previous framework that was signed in June 2010. This bilateral settlement emphasized science and technology as a way of improving trade and commerce activities. As a result of this agreement, new activities in different knowledge areas became pertinent to the bilateral agenda, especially topics related to health, the environment, agriculture, atmosphere, and space (Embassy of Colombia in Washington D.C., 2015). Different U.S. government agencies are involved in this work, such as the Department of Energy (DOE), NIH, CDC, NASA, the National Oceanic and Atmospheric Administration (NOOA), US Environmental Protection Agency (EPA) and the U.S. Department of Agriculture (USDA), among other agencies.

Up until now, there have been six dialogues (one per year) held in the cities of Bogotá and Washington D.C. In these meetings, both governments have worked to improve the bilateral agenda. The results included activities and advisory outcomes on topics such as education initiatives, and collaboration among technical agencies, among other topics. (Burns, 2012; Department of State, 2014, 2015; Ministerio de Relaciones Exteriores de Colombia, 2015; Steinberg, 2010; U.S. Secretary of State, 2011). However, academics of both parties have not been actively engaged in the development of these annual dialogues (Interview with Scientific Advisor of

the Colombian Embassy in the United States of America, July 1, 2015; Interview with Science and Technology officer of the U.S. Embassy in Colombia, July 16, 2015).

Although the development of activities in these new areas of the bilateral agenda could promote new frameworks for international cooperation, the U.S government continues to prioritize significant support for military assistance and economic relations (A. Mason, Interview, Bogotá, April 17, 2015). However, now that the Colombian government has reached an agreement with the leftist guerrillas in the peace talks, these trends in bilateral cooperation could motivate important changes in the generation of scientific outcomes, especially regarding the topics prioritized in the U.S.-Colombia High-Level Partnership Dialogue.

3.7 Analysis of Epistemic Communities' Work with Colombia

Among the main findings in the fieldwork for this thesis, we can find some trends that must be included to understand the relevance of S&T in U.S. Foreign Policy towards Colombia. 1) The U.S Government perception in terms of the effectiveness of science diplomacy activities is growing (Colglazier, 2013a; Dolan, 2012; Partnership for a Secure America, 2010). 2) There is a clear tendency to work abroad in terms of S&T with the sponsorship of many government agencies, but especially in some geographical regions that have had historical challenges in their relationships with the U.S., such as the Middle East, Cuba, and North Korea. 3) The participation of scientists in the generation and understanding of knowledge to reach political aims has played a key role in the development of the U.S. at the international level. However, the majority of the actions in this framework have taken a top-down approach, which means most of the activities in this context come from policymakers' initiatives. 4) In the context of bilateral relations, U.S. scientific cooperation has promoted the establishment of new research outcomes, which for this study have been linked to the dimension of diplomacy for science.

Regarding the different agencies selected for this thesis, this research finds that The DoS has played a key role in the bilateral agenda. Its support in the development of foreign aid programs towards Colombia has been studied several times (Fajardo, 2003; Rojas, 2015; Taffet, 2012). Nevertheless, it is important to bear in mind that the interests of the US government in foreign policy follow two main guidelines: 1) The National Security Strategy, and 2) the Quadrennial Diplomacy and Development Review (QDDR) (Kralev, 2012, p. 5).

Colombia has played a major role in the development of both strategies. The most consistent support comes from the strengthening of the military armed forces in the framework of Plan Colombia. But also, specific activities of the QDDR have been addressed by the bilateral agenda, especially in activities centered on economic growth, Human Rights, and climate change (A. Mason, Interview, Bogotá, April 17, 2015; Interview with the interim advisor of S&T at the State Department, Washington D.C., July 2, 2015).

The perception of Colombia among the scientists involved in the DoS is notably positive, especially in terms of innovation, biodiversity, and collaborations on the development of scientific endeavors, as many of the interviewees acknowledged (A. Mason, Interview, Bogotá, April 17, 2015; E. Colglazier, Interview, Washington D.C, July 3, 2015; DeVogd, Interview, Bogota, July 27, 2015, Interview with the interim advisor of S&T at the State Department, Washington D.C., July 2, 2015).

It is important to mention that the enabling factors in U.S. foreign policy that allow scientific work to be carried out, especially by members of epistemic communities, are related to their expertise to deal with complex issues in the framework of the foreign policy. In this case, the Obama Administration understood the potential power of science and scientific communities that could ease tensions among countries and promote a good image of the U.S. abroad (Colglazier, 2013b).

Members of epistemic communities gathered in different research institutions such as the NAS and the AAAs are important actors in supporting and achieving the foreign policy goals of the U.S. government through the DoS. These members must be identified by their counterparts in Colombia to promote fruitful cooperation within this government agency. Most of the U.S. scientists involved in epistemic communities have limited information about science diplomacy activities that can be done within the framework of U.S. foreign policy with Colombian counterparts.

Moreover, the work of members of epistemic communities can be traced to the structure of the DoS, but especially to the activities carried out by the STAS, which are the following: 1) coordinate interagency activities with the support of the US embassies around the globe, 2) promote public - private partnerships to enhance innovation process at the international level, 3) favor fellowship opportunities in order to present the most qualified candidates to serve the country, 4) allow the interaction of scientists with public diplomacy, 5) encourage foreign policy makers to have a better approach to solving an issue, 6) promote the relevance of decisions on science based policy, where the scientific community proposes ideas and generates knowledge to share, and exerts influence, even at the international level (Colglazier, 2013b).

Another relevant case is the work of epistemic communities that support the work of the CDC in Colombia. This can be seen in the support provided by the Division of Global Health in to public health through the CDC. Specifically, through its NPHI, Colombia received a shared grant from the CDC to develop capacity building and training processes in topics concerning laboratory safety and security, the construction of a national public health research agenda, access to national public health data, and strengthening of national surveillance of infectious diseases (Centers for Disease Control and Prevention, 2014).

The idea of obtaining this grant started with the participation of scientists from the Colombian NPHI, which was involved in the Field Epidemiology Training Program (FETP) of the CDC. The product of this technical program was the establishment of a training network in epidemiology based on an educational model called Epidemic Intelligence Service led by the CDC (Centers for Diseases Control, 2015c). After that, Colombian scientists continued working with other colleagues and members of the CDC, showing the potential to work with the Instituto Colombiano de Salud (Colombian NPHI) on topics related to infectious diseases (Centers for Disease Control and Prevention, 2016).

The CDC, with the advice of the IANPHI, chose two countries in Latin America, Colombia and Guatemala, to demonstrate the relevance of capacity building when dealing with infectious diseases in the region. The support of other colleagues that have a strong relationship with Colombian institutions in health issues, plus the commitment by the executive director of the Colombian NPHI reinforced the establishment of an agenda of cooperation between the parties, mainly with Colombia (Interview with Interim Director of the Direction of Research in Public Health, Bogota, March 2015, and interview with Country Director of the CDC in the Dominican Republic, Skype Interview, Santo Domingo, 2015).

In this case, Guatemala did not have the capacity to lead the project because of its limited technical resources. Thus, Colombia is a relevant example for the region because its NPHI has a long tradition to deal and study infectious disease threats. Furthermore, Colombia's NPHI can be used as a pivotal resource for other countries in the Latin American region that do not have the capacity to face threats concerning public health (Interview with Country Director of the CDC in Dominican Republic, Skype Interview, Santo Domingo, 2015; Senior Service Fellow CDC-CAR, Skype Interview, Managua, 2015).

At this point, the success of this case linked to health issues relied on the enabling factors of the scientific work by those scientists that have relevant knowledge of the CDC, strong relationships with decisions-makers, and previous knowledge about the scientific capacity to work with Colombian partners. A member of an epistemic community, and especially from IANPHI can obtain easy access to decision makers, and can demonstrate the relevance of the creation, assistance, and development of a scientific outcome that allows joint work abroad to solve an issue, such as in this case which is related to infectious diseases. It can be argued that the support requested can be obtained by arguments, but also important is previous experience of the bilateral relations that strengthen the research cooperation between governmental agencies, scientists, and receivers.²⁹

Indeed, the CDC has a clear role in studying and addressing any biological threat which might affect the USA. Its leadership in the detection, treatment, and prevention of diseases allows the development of science diplomacy activities. However, public health topics at the international level can also be used as a soft power strategy by the U.S. Government, in order to maintain and reinforce scientific activities in bilateral relations with any country (Fidler, 2013, p. 703).³⁰

In this case, I claim that the leadership of the CDC encourages the generation of scientific outcomes in the context of the bilateral agenda. Usually, both countries try to understand and solve health threats from a joint perspective (Centers for Diseases Control, 2015b). The main purpose of this joint work is to confront challenges concerning health issues, with the leadership of scientists, using their expertise to work with different levels of uncertainty in order to recognize and recommend some diagnoses and treatment to solve the particular issue.

Another relevant case included in this thesis is the role of the NSF in the generation of Science Diplomacy outcomes. This U.S. funding institution is the main supporter of research activities abroad. In this case, it is important to emphasize that the funding process allocates economic support mainly according to the following factors: 1) the trajectory of the investigator; 2) the peer review process; 3) resources assigned by priority score; 4) transparency in the process; 5) making their knowledge public, according to the specific requirements of this governmental agency (DeVoogd, 2011).

²⁹ The relevance of these Colombian science diplomats in terms of their support of bilateral relations and cooperative involvement in regards to scientific activities such as: sample sharing and analyses of diseases; the possibility of generating publications on the treatment processes of these illnesses, or the promotion of scientific outcomes such as vaccines, studies and policy recommendations, among others actions.

³⁰ Soft power is a concept which describes the ability to attract and co-opt rather than use coercion. See Nye (2004).

This robust evaluation process guarantees a proper distribution of economic resources, and assures the technical and economic support for U.S. Scientists. Moreover, collaboration at the international level can be good for promoting scientific activities abroad, as Mr Franklyn Carrero, Program Manager of the OISE acknowledges:

...The main factors that American scientists look for when developing international cooperation activities are related to the unique details of the region or country. The attraction allows joint work and the allocation of resources in order to reach a certain goal. (F. Carrero, interview, Washington D.C., 1 July. 2015).

To sum up, the international perspective allows for broader impact in terms of research, facilitating international collaborations among academics. However, in the specific case of Colombia, I argue that limited resources in terms of leveraged contributions affect the development of research cooperation activities proposed by members of epistemic communities in different research groups and universities.

According to the database of awards given by the NSF, the past and current research initiatives until 2016, concerning projects with Colombia have received sponsorship from this agency calculated at 86.226.054 Dollars, which served to sponsor 342 projects between U.S. scientists and Colombian counterparts until 2016. (National Science Foundation, 2016a).

Nevertheless, research projects with countries such as Argentina and Brazil have a distinct advantage in funding and number of past and current initiatives because these countries have a clear sponsorship in the investment of projects related to science and technology, making engagement with U.S scientists quite fruitful and easy to establish.³¹

The scientific work in the case of NSF could be enhanced by the scientists involved, such as faculty in universities and scholars who work in governmental research centers. However, the lack of engagement between Colombian and U.S. scientists and the lack of resources in terms of funding and institutional capacities make this effort quite complex.

Other results in the bilateral agenda can be observed, such as the establishment of an American studies research center at the Universidad Nacional de Colombia and in Universidad de Los Andes

³¹ In the database of awards given by the NSF, Argentina has 1187 projects supported by NSF worth a total of 837.015.615 Dollars. And Brazil has 1968 projects sponsored by this agency, worth a total of 641.733.650 Dollars. Other cases can be seen on the web page of the NSF.

(Borda Guzmán, 2013), donations of academic material to universities, and research scholarships provided by the Fulbright Commission as a good neighbor policy, among other programs.

Consequently, this thesis finds that efforts concerning science diplomacy regarding bilateral relations have served as a strategy of foreign policy to create and maintain scientific exchanges between both countries. However, the lack of resources and political will on the Colombian side to develop long-term policies in S&T to continue research activities have negatively affected the possibility of creating and developing more scientific projects with U.S. counterparts.

Also, the interest of U.S and Colombian scientists working with government agencies has served to maintain the U.S. dominion in the development of scientific endeavors by using science as a tool to achieve foreign policy aims, as Turekian et al. (2015, p. 5) claimed: *“science diplomacy can also be used to enhance one nation’s interests with respect to another.”*

Concerning this study, I argue that there has been a constant level of work between scientists and the US government agencies to generate cooperation processes in this bilateral agenda. Nevertheless, the top-down approach taken by policymakers is a strong limitation on how to generate new scientific outcomes, particularly because this line of endeavor prioritizes scientific activities based on policy assumptions.

For example, in the case of the DoS, there is a direct work towards Colombia by some members of the NAS and academics working on the framework of modernization theory, and the framework of the Alliance for Progress program created various governmental institutions that work on topics related to planning and development, education, regional environmental agencies, among other public institutions that aim to improve the lives of the Colombian people.

However, in the period of time selected for this thesis, the NAS and the AAAs have been key actors in leading and establishing science diplomacy activities abroad. Actually, I argue that their interests and expertise are aligned with the goals of U.S. foreign policy, which currently does not prioritize Colombia in the development of these kinds of activities, since the generation of scientific activities demands previous engagement by scientists of both countries, and funding compromises, that currently are not available to the Colombian counterparts.

On the other hand, I argue that another relevant case related to the promotion of scientific work is members of IANPHI and other scientific actors that shape the CDC agenda of research cooperation. This statement is based on the establishment of scientific training programs in infectious diseases by the CDC for the Colombian NHI. In this case, the relevance of enabling factors linked to previous

joint scientific activities, plus the close relationship between the scientists and policy makers reinforces the generation of new research cooperation programs in Colombia. This training could be materialized in the near future with the establishment of research groups or institutions that support new scientific endeavors.

Finally, in the case of the NSF, there is no empirical data that demonstrate the promotion of scientific endeavors in Colombia by this agency because the international relations of the NSF are based on the interests of U.S. Scholars, which most of the time are aligned with the priorities set by the federal government. In the case of Colombia, there is a lack of support from the government and private sector to generate science, making it very difficult to engage in international collaborations with U.S. partners. Moreover, most of the time U.S. scientists prefer to collaborate with partners with strong capacities in terms of equipment, economic resources, and human talent.

To conclude this chapter, I present the following remarks:

The technical assistance offered by the U.S. Government was a relevant factor in the improvement in international perceptions of Colombia. This change was possible, among other factors, due to the constant support in the form of foreign aid by the U.S. government that included the establishment of new technical institutions in 1968, security and military assistance through Plan Colombia, and the establishment of the High-Level Partnership Dialogue in the bilateral agenda.

The U.S. government has a strong role in the development of Science Diplomacy activities (U.S. Secretary of State, 2009), especially in the dimension of *science for diplomacy* with countries with complex international contexts.³² But in the case of Colombia, this is not relevant since members of epistemic communities in the U.S. have not established strong relations with Colombian scientists or scholars who can show their interest in developing science diplomacy activities in this country.

There is a clear top-down approach by the U.S. Government to generating Science Diplomacy activities abroad, particularly when policymakers and leaders in government agencies encourage or request scientific advice through the High-Level Partnership Dialogue with the support of members of epistemic communities.

³² In his speech at Cairo University the President of the U.S. supported centers of excellence in science and technology and the engagement of the US Science Envoys in order to achieve a better perspective on joint work with Muslim countries (Obama, 2009), proving that “*A country’s soft power is highly dependent on its ability to provide thinking and knowledge to its people and the rest of the world*” (Changhe, 2013, p. 549).

Thus, there would be a sustainable increase in S&T activities in the bilateral agenda if a bilateral dialogue could be implemented. However, on the one side there is no interest in Colombia by U.S. scholars, and on the other side, the lack of funding and the establishment of short-term goals by the Colombian government interfere with the creation and development of scientific activities.

These research findings suggest that the work of members of epistemic communities in the generation of science diplomacy outcomes towards Colombia relies mainly on personal, institutional and proficiency factors. It is precisely the enabling factors such as the ability of scientists to express their expertise in research outcomes, scientific skills to deal with uncertainty in certain knowledge areas, and previous work with policymakers in the U.S. that allow the social construction expressed through scientific outcomes within the framework of foreign policy.

Other cases of science diplomacy towards Colombia can be outlined in projects on knowledge areas such as biodiversity, climate change, peacebuilding, social issues, among other topics. These examples can be observed in government agencies such as NOAA (UNIMEDIOS, 2015), NIH (Collins, 2015). In these examples, Colombian academics work with the U.S. agencies to establish new scientific activities with partners in Colombia, building bridges between knowledge areas and nations, allowing the development of diplomacy for science activities.

3.8 Summary of the work of U.S. epistemic communities to generate science diplomacy outcomes towards Colombia

| <u>Field of International Cooperation area</u> | <u>Members of Epistemic Communities</u> | <u>Members of epistemic communities' interests</u> | <u>Main cooperation partner</u> | <u>Main scientific cooperation outcomes</u> |
|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| International cooperation in science and technology | National Academy of Sciences (NAS) The American Association for the Advancement of Science (AAAS) | <ul style="list-style-type: none"> • Maintain their presence, advisory and advocacy role for the DoS. • Promote the inclusion of scientists to enhance foreign policy services abroad. • Contribute their expertise in different knowledge areas expressed in foreign policy. | Department of State – DoS | The inclusion of new topics in the bilateral agenda, such as energy, science and technology, climate change and environmental protection, culture and education. |
| Infectious Diseases | International Association of National Public Health Institutes (IANPHI) | <ul style="list-style-type: none"> • Establish programs linked to the national public health research agenda. • Increase the participation of scientists from abroad in the promotion of new scientific outcomes from government agencies. | Centers for Disease Control and Prevention – CDC | <p>The development of activities such as access to public health data, strengthening national surveillance of infectious diseases, among other actions.</p> <p>The participation of Colombian scientists in a training program related to the detection and treatment of infectious diseases.</p> |
| International cooperation in science and technology | Academics enrolled in universities or research groups. | <ul style="list-style-type: none"> • Use policy alignment to work on specific research topics with support from the U.S. Government. • Promote international research activities to improve new scientific approaches. | National Science Foundation - NSF | <p>Until 2016, the previous research projects with Colombia received sponsorship from this agency calculated at 86.226.054 Dollars, which funded a total of 342 joint projects between U.S. and Colombian scientists.</p> <p>However, the numbers of projects remain small in comparison with other countries in the region, such as Argentina, Mexico, Chile or Brazil.</p> |

Source: The author.

CHAPTER IV

Analysis of Science Diplomacy in the Bilateral Relations of Germany with Colombia

The German perception of Colombia is quite positive in terms of bilateral relations. In popular thinking the football match between Germany and Colombia in the 1990's soccer World Cup is a clear example of this. Indeed, the footprint of Germany in Colombia has been strong, especially in terms of trade, economic development, education, and research.

The most remarkable examples of German work in Colombia can be traced back to the foundation of the first brewery in Colombia in 1889 (Alvarado, 2011, p. 8; Bavaria, 2016), and the creation of the first commercial aviation company in the country in 1919, Sociedad Colombo-Alemana de Transportes Aéreos (SCADTA), the precursor of the current company, Avianca (Restrepo, 1998, p. 93). Other cases of German work in terms of infrastructure can be found in the construction of bridges, roads, and railroad tracks, as well as in topics related to mining, and in the production and export of Colombian coffee in the eighteenth and nineteenth centuries (Weber, 2011).

Moreover, in terms of research and education, German influence over Colombia can be found in different stages of their historical relationship. Without a doubt, one of the milestones of the bilateral relationship was the historical visit of Alexander von Humboldt to the territories of New Granada (now Colombia). During this stay in the country, he discussed topics such as the flora, fauna and measurement of heights with eminent scientists such as Jose Celestino Mutis and Francisco José de Caldas (Wilhite, 1995, p. 5; Wulf, 2015, p. 77).

Other examples of German influence are found in the German mission on education (Serrano, 2012, p. 25; Villegas, 1966), in philosophical studies (Torregroza Lara & Cardenas Díaz, 2012, p. 91), and also in terms of capacity building through projects to improve Colombian public administration in areas concerning public services, accountability, and transnational justice, among other issues that have been managed by German political foundations and the German Society for International Cooperation, predecessor institution of the current German Society for International Cooperation (Roballo Lozano, 2012, pp. 18–21).³³

This chapter aims to identify the following topics. 1) The relevance of the S&T system to scientific work abroad, and how the activities of science diplomacy fit into a comprehensive strategy of

³³ In German: Deutsche Gesellschaft für Technische Zusammenarbeit- GTZ.

German foreign policy. 2) I analyze the work conducted by members of epistemic communities with regards to the generation of initiatives to promote science diplomacy actions by the German Foreign Office and the Ministry of Research and Education, especially the activities conducted by the DAAD, and the Alexander von Humboldt Foundation. 3) Other relevant cases are addressed in this study, such as the work of the German Research Foundation (DFG), as well as international activities driven by the Max Planck Society (MPG).

Finally, I will identify the interest of the German government in Latin America, and how the work of members of epistemic communities within German research organizations has generated scientific activities in Colombia.

This study includes the perceptions of high-level scientists from the Max Planck Society, managers of different projects in the AvH, and officers from the BMBF and the AA, as well as their Colombian counterparts. This information was obtained through Skype interviews and interviews that took place in the cities of Bonn, Köln, and Berlin in Germany.

4.1 The Relevance of the German System of Science and Technology in Foreign Policy

In the German System of S&T, there are a plethora of actors from the public and private sector that develop activities related to research and innovation. At the federal level, I highlight the investment and role of the Federal Ministries, as well as some research organizations that develop these kinds of endeavors. The total investment from the Federal German Government in 2012 was around 3% of Gross Domestic Product (GDP), which means that around 80.000 million Euros were invested in developing scientific activities, including the participation of the private sector (German Academic Exchange Service - DAAD, 2015).

It is important to emphasize that the states (*länder*) also provide support for activities concerning research and innovation. States such as Baden-Württemberg invested more than 5% of their total resources in R&D activities. Additionally, each state prioritizes its research programs according to the knowledge areas and capacities of universities and Länder Research Institutions, which have become relevant actors in the state system.

A significant result of the complex relationship between the federal and state institutions of research in Germany is the balanced participation by their actors in relevant fields such as 1) Governance. 2) Investment in basic and applied research. 3) Partnerships among public and private institutions. 4)

Development of strategic research and independent scientific research (German Academic Exchange Service - DAAD, 2015). In short, the relation between scientific institutions at federal and state level provides results due to coordination in the development of scientific activities. These include 1) the involvement of civil society in supporting the S&T System; 2) the willingness of actors to set priorities for the S&T policy. 3) A constant analysis and evaluation of current policies and programs for innovation.

Furthermore, the generation and constant support of scientific activities by the actors involved in the German S&T System has changed the perception of its role in the development of foreign policy. One clear example is linked to the perception that the German government must support global challenges such as infectious diseases, climate change, conservation of natural resources, ensure food security, confront the demographic shift, especially within the European Union population, and foster a better-informed society through the provision of suitable decision-making options for policy-makers, among other actions (Federal Ministry of Education and Research, 2014b).

Moreover, other outcomes of this relationship between the actors in the German S&T system involved in foreign policy are: 1) the promotion of an image of a modern country that is a reliable partner in terms of science, technology, and innovation. 2) The opportunity to face global challenges and prove the relevance of the expertise of German scientific actors in the international system. 3) To obtain resources that will serve in the near future of the nation, such as human talent and natural resources.

Both levels of actors, federal and state, have a clear relevance to new research activities in the framework of German foreign policy. These actors have the institutional capacity to instigate scientific activities that can include partners around the world according to their interests in different knowledge areas and geographical regions, and can create reliable partnerships and sponsorship of different organizations in the host country. In short, the German government perceives a clear complementary opportunity to reach scientific and foreign policy goals (Sigl & Witjes, 2015).

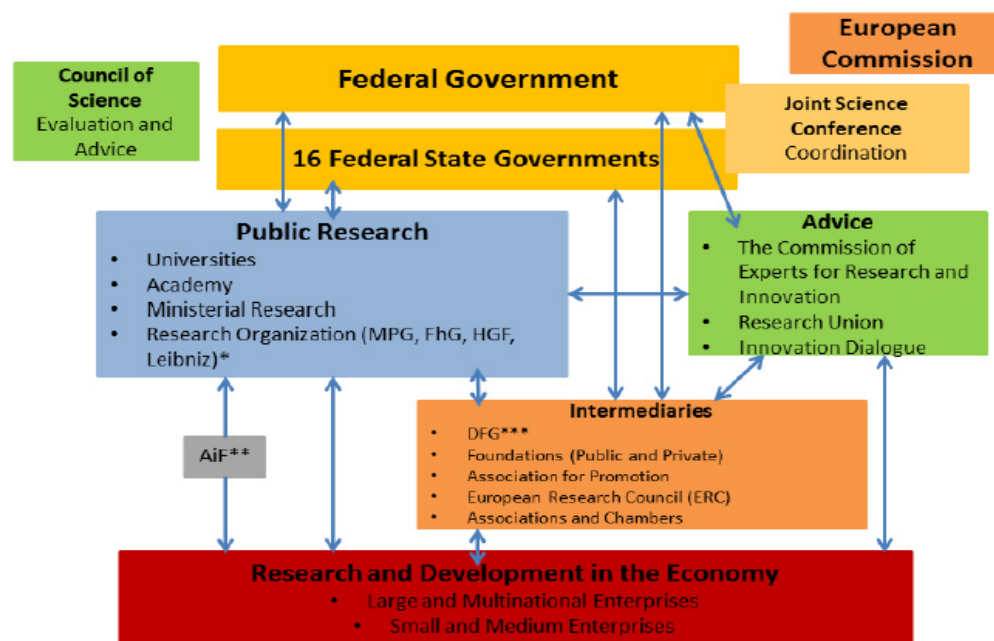
4.2 Scientists on board: Analysis of the Importance of Scientists in the German S&T System

The relevance of members of epistemic communities to the German system of S&T comes from many sources, such as universities, academies of science, enterprises, and distinguished scholars such as Nobel Prize winners and research organizations, among others. Among these, some

scientific groups can be considered epistemic communities and become relevant to the S&T system. These are the German Council of Science and Humanities (WR),³⁴ the Commission of Experts for Research and Innovation,³⁵ the Research Union, and the Innovation dialogue

The significance of the members of these groups relies on their scientific advice on many levels to coordinate, support, and evaluate the actions of the diverse actors of the S&T system. In order to understand this complex relationship between scientific actors in a better way, Figure 2 describes the structure of the German S&T System.³⁶

Figure 2. Structure of the German System of S&T



Source: Federal Ministry of Education and Research (2014a, p. 31).

The promotion of international joint work can be found mainly in the establishment and discussion of the Package of Pacts (Federal Ministry of Education and Research, 2014a, p. 21).³⁷ Each pact is the result of the design and adaptation of government reforms, including measures and incentives, to enhance the German scientific system. These actions are developed jointly by different actors within the Federal Government and the federal states.

³⁴ In German: Wissenschaftsrat (WR).

³⁵ In German: Expertenkommission Forschung und Innovation (EFI).

³⁶ *The Max Planck Society (MPG), Franhoufer Society (FhG), the Helmholtz Association of German Research Centers (HGF), the Leibniz Association (Leibniz), ** the German Federation of Industrial Research Associations, *** the German Research Foundation.

³⁷ In German: Paket der Pakte.

The main result of these activities is a considerable increase in funds for the scientific system. Examples of these pacts are the Higher Education Pact,³⁸ the Excellence Initiative,³⁹ the Joint Initiative for Research and Innovation, participation in the Seventh Framework Program–7FP, and also in the Horizon 2020 Program (Federal Ministry of Education and Research, 2014a, pp. 21–29).

⁴⁰The most relevant pacts will be analyzed further in the chapter concerning the role of members of epistemic communities in German government institutions, and in foreign policy.

Another issue to bear in mind is the application of two main approaches to the decision-making process regarding work at the international level by the German scientific system. According to the interviews conducted with various officers of different German research organizations, these approaches are the key element for generating scientific activities. These are top-down and bottom-up approaches.

In the first one, political leaders establish the main guidelines for generating scientific activities abroad. In the latter one, the initiatives or programs are proposed and developed by scientific members that at some point gain the interest or the attention of the political leaders and obtain political support expressed in funding, technical assistance, diplomatic assistance, among other activities (S. Werkmeister, Skype Interview, April 28, 2016; J. Kliesow, Interview, Köln, May 24, 2016).

As a finding of the field work for this chapter, I argue that members of epistemic communities in Germany are relevant for the German Government. Due to their expertise, ability to work with uncertainty contexts and their ability to transfer knowledge by learning processes, they can shape and promote the international cooperation agenda in topics related to education, research cooperation, and innovation. The main argument put forward by their members is the constant need for resources, and the relevance of their ability to adapt to institutional changes which bring clear success to the promotion of German leadership abroad.

Taking into account the relevance of scientists to the German S&T System, it is valuable to discuss the relevance of the work of the German Foreign Office and the impact of the members of epistemic communities that work within it. For this reason, I will explain how science diplomacy activities are involved in the German Federal foreign policy, and the relevance of the interests of the members of the DAAD and AvH foundation to the promotion of science diplomacy activities abroad.

³⁸ In German: Hochschulpakt 2020.

³⁹ In German: Pakt für Forschung und Innovation.

⁴⁰ In German: Exzellenzinitiative.

4.3 Science Diplomacy in the German Federal Foreign Office

The Federal Foreign Office is in charge of representing Germany's interests around the world. Its portfolio includes topics related to political, economic, and cultural affairs with multilateral organizations and different countries. In this ministry there are guidelines that define German foreign policy, such as: 1) Continuous leadership in, and support for international organizations, especially within the European Union. 2) Foreign trade promotion. 3) Advocacy in defense of Human Rights, democratic values, and international law. 4) Dealing with security issues, especially in disarmament and arms control. 5) Support for the promotion of foreign cultural and education policies (German Foreign Office, 2013).

Moreover, these foreign policy guidelines have a clear orientation towards “civilian power”, which means that the German government wants to engage its relations at the international level following three main principles. These are: “never again” which means the promotion of Germany's values-based foreign policy, “never alone”, linked to the promotion of multilateralism, and “politics before force”, which means that it is necessary to adopt a critical approach concerning the use of military force (Maull, 2014, p. 409). One clear example of these principles is the project led by the German foreign office called “Review 2014”. This project provided a critical view of German foreign policy from the perception of experts, civil society, and German diplomats, seeking suggestions that will improve the relevance of its foreign policy implemented by the German foreign office.⁴¹

The development of these guidelines brings up the question of how the activities of science diplomacy are included in German foreign policy. It can be stated that the activities related to science and technology come mainly from German foreign cultural policy. Activities such as the promotion of German language across the globe, the importance of intercultural processes in higher education, and the positioning of Germany as the “*Land of Ideas*” at the international level demonstrate this position (U. Albrecht, Interview, Bonn, May 23, 2016).

Furthermore, research suggests that the development of these scientific activities is a new tool in German foreign policy which is a “*foreign science policy*” (Sigl & Witjes, 2015, p. 264). In short, the German point of view about science diplomacy is a comprehensive strategy led by scientific activities that include political, economic, and cultural relations.

⁴¹ All the recommendations brought significant reforms within the German Foreign Office. They include 1) the impact of infectious diseases at the international level, such as Ebola; 2) The role of Germany in the recent armed conflicts in places like Syria, Iraq and Ukraine; 3) The establishment of a crisis prevention office. 4) New ways to connect with the general public like the use of digital media. See Federal Foreign Office (2014, pp. 43–46) .

Most scientific activities in Germany are conducted by universities, research institutions and members of the private sector, and it is very interesting to analyze how some of these members achieve scientific actions abroad. For this reason, we will examine the case of the DAAD and the AvH Foundation, which serve as examples of the ways in which members of epistemic communities promote international cooperative work within the framework of German Federal foreign policy.

4.3.1 The role of the German Academic Exchange Service in the Foreign Office

In the development of international scientific activities, one key player falls within the scope of analysis of this thesis. The Center of Information of the DAAD in Colombia serves as an interdisciplinary member of an epistemic community due to its structure, members and endeavors abroad to promote the creation and evaluation of new specific policies and seek state support to identify interests in S&T and higher education. In short, it expresses the different interests of its members, which are mainly institutes of higher education in Germany (S. Werkmeister, Skype Interview, April 28, 2016; (Interview with the Officer from the unit of universities, science, and research at the German Foreign Office, Berlin. 26 May, 2016).

Moreover, its work concerning the development of science diplomacy activities applies particularly in the dimension of *diplomacy for science*. To analyze this claim in detail, I present the way in which the DAAD works, and the relevance of high-level scientists within this organization in determining activities in the international arena. Then, I analyze the relevance of this institution to the generation of policy outcomes and research cooperation.

The DAAD is a German Government public association of universities and their student bodies⁴². It provides all the elements needed to advance an internationalization strategy for Germany, including scholarships, research grants, the promotion of German studies and German language abroad, and most importantly, it provides advice to decision-makers on topics related to culture, education, and development policy (German Academic Exchange Service, 2015b; Grothus, 2003).⁴³

This academic organization receives funds mainly from the German Federal Foreign Office, but it also has support from other ministries, such as the Federal Ministry for Economic Cooperation and

⁴² At the beginning of 2016, its members included 239 institutions of higher education (90 universities, 111 universities of applied sciences, other institutions (music, art, theology, among others) and 105 student bodies. The prerequisite for membership is the university's membership in the German Rectors' Conference (HRK). See: (German Academic Exchange Service, 2015a).

⁴³ Additionally, The DAAD has the role of National Agency for EU Higher Education Cooperation.

Development (BMZ)⁴⁴, international organizations like the United Nations Educational, Scientific, and Cultural Organization (UNESCO), the European Union, and German enterprises including Bayer, BMW, and Mercedes-Benz, and other civil society actors. In its decision-making bodies, there are delegates from the government, and permanent guests, including the President of the Alexander von Humboldt Foundation, the President of the Goethe-Institute, and the President of the German Rectors' Conference.

Its renewed international strategy focuses on three main areas of work: scholarships for the best students, structures for internationalization, and expertise for academic collaborations (German Academic Exchange Service, 2013). In addition, the actions of this framework are executed through the establishment of a global network that includes regional offices, information centers and DAAD Lektors at the international level.⁴⁵

The relevance of the work of the DAAD for the German government is expressed through two initiatives of federal foreign policy. These were participation in the strategy for internationalization in 2008,⁴⁶ and the role played by the DAAD in the Initiative for Academic Relations in 2009.⁴⁷ Both initiatives were instigated by the German Federal Foreign Office, together with other ministries. This country's strategies sought the establishment of science diplomacy activities with partners abroad, especially in the countries and regions that have current development dynamics and economic growth such as developing countries (Flink & Schreiterer, 2010, p. 672).

At the same time, the work of the DAAD can be identified in the other dimensions of Science Diplomacy. One clear example is the claim made by the Federal Minister of Foreign Relations at the celebration of the 90th anniversary of the DAAD. In his statement, he said that science can be a driver to strengthen the foreign policy ties with the Islamic Republic of Iran, underscoring the relevance of scientific collaboration in the framework of science for diplomacy (Steinmeier, 2015).

To sum up, I found that the role of members of the DAAD is vital for the generation of science diplomacy activities by the German Government since its members are involved in the development of scientific initiatives related to German foreign Policy, especially the actions related to international scientific strategy. Additionally, members of the DAAD work directly with decision-makers in the universities and other research organizations. Thus, they can offer solutions and

⁴⁴ In German: Bundesministerium für Zusammenarbeit und Entwicklung wirtschaftliche –BMZ.

⁴⁵ The DAAD lektors are a visiting professor program in the fields of teaching German as a foreign language. Usually, the role of the DAAD lektor is linked to the promotion of Germany as a place to study and do research.

⁴⁶ In German: Initiative Internationalisierungsstrategie.

⁴⁷ In German: Initiative Außenwissenschaftspolitik.

promote international research, as well as the promoting German culture within the framework of German foreign policy (Interview with the Officer from the unit of universities, science, and research at the German Foreign Office, Berlin.26 May, 2016).

4.3.2 The relevance of the Alexander von Humboldt Foundation

In 1799, Alexander von Humboldt sailed to South America (at that time *Spanish America*) in order to collect plants, seeds, rocks, and animals. But he also wanted to fulfill his curiosity about basic sciences, especially physics, geography, climatology, and astronomy. He wanted to know how all the forces of nature are interlaced and interwoven (Wulf, 2015, p. 45). However, he did not imagine the impact of his research publications would have, and nor did he realize how his example would influence the development of research cooperation with high-level scientists around the world.⁴⁸

The Alexander von Humboldt Foundation was created in 1953. This is one of the funding institutions that support the work of high-level scientists from all disciplines, in the framework of German Foreign Cultural Policy.⁴⁹ This research institution is attached to the German Foreign Office, and its activities are related to sponsoring German and international scientists through scholarships and research grants, as a way to promote joint work between scientists, and position Germany as a centre for high-level science.

Currently, the AvH international strategy includes the promotion of scientific endeavors and international exchange actions to reinforce Germany's position in the global knowledge society (AvH Foundation, 2016). This strategy is devised by the international advisory board, which is an independent consulting board that discusses strategic issues on topics concerning research cooperation and mobility of researchers. Its members include many leaders involved in different knowledge areas, and from various countries. These interdisciplinary perceptions and global approaches enable better understanding between the German perspectives on the development of scientific activities and the perspectives from other countries. Thus, the strategy can contribute to the continuous improvement of German science, and especially to the role of this governmental research organization in German foreign policy.

For the purposes of this study, the members of this institution can be considered as an epistemic community for the following reasons. 1) The support provided by this foundation is the basis for an international network of scientific cooperation and trust that comprises high-level scientists in

⁴⁸ Personal Narrative of Travels to the Equinoctial Regions of the New Continent, and Kosmos are the best known books internationally.

⁴⁹ Usually, post-doctoral researchers with a significant academic career.

different knowledge areas.⁵⁰ 2) Its members share features such as shared principles, beliefs, and a common policy enterprise, which are related to the relevance of conducting high-level science at the international level (U. Albrecht, Interview, Bonn, May 23, 2016; Interview with the Head of Division Central and South America at the AvH Foundation, Bonn, 23 May, 2016). 3) Its international fellows are recognized as the new German ambassadors, or better, *science envoys*, trust brokers, and bridge-builders who promote the image of Germany as a trustworthy partner in the generation of high-level science (Flink & Schreiterer, 2010, p. 673). 4) Its members are high-level scientists who have achieved relevant positions in different fields in the public sphere, such as government ministers, research directors, and advisors to policymakers (Interview with the President of the American Friends of the Alexander von Humboldt Foundation, Washington D.C., 2 July, 2015). 5) Its leaders acknowledge the relevance of science diplomacy in an empirical way. One statement regarding this issue was made by Professor Helmut Schwarz, head of the Alexander von Humboldt Foundation. He noted that “*Science has been used as a kind of diplomacy of trust*” (2013).

Additionally, this research organization holds the position of Secretary of the Committee for the Coordination of International Academic Relations.⁵¹ This group comprises the main research and funding institutions, academies, advisory groups and private foundations that develop and coordinate actions concerning the internationalization of German science abroad (AvH Foundation, 2009).⁵² The committee meets twice a year and presents valuable data about the actions of its members in terms of research cooperation. The relevance of this group is linked to the provision of information about research cooperation activities that can be used by government institutions to work on foreign policy issues.

To sum up, I argue that the scientists that belong to this institution are relevant scientific actors in German foreign policy because this organization promotes German science through funding schemes in order to encourage the perception of Germany as a champion of science at a high level.

Additionally, this institution promotes engagement with other research institutions in Germany. The president of this expert community is a member of different boards of directors in research

⁵⁰ Among its members are more than 26.000 high level scientists from all over the world. Around 50 scholars of the AvH foundation have won the Nobel Prize in different research fields. See: (AvH Foundation, 2015).

⁵¹ In German: Ausschuss zur Koordinierung der Auslandsbeziehungen (AKA).

⁵² Such as Alexander von Humboldt Foundation, Fraunhofer-Gesellschaft, the German Academic Exchange Service (DAAD), German Council of Science and Humanities (WR), German Rectors' Conference (HRK) German Research Foundation (DFG), Helmholtz Association of Germany Research Centres (HGF), Leibniz Association (WGL), Leopoldina-German Academy of Sciences, Max Planck Society (MPG) Max Weber Foundation, Volkswagen Foundation.

institutions, which stimulates scientific activities and long-term relationships between academics from different knowledge areas.

Usually, international scientific activities are sponsored by the German foreign Office. However, the support of other ministries and government agencies such as the BMBF, the BMZ, the GIZ, and other actors is essential to promoting German interests and leadership in the international system. For this reason, it is imperative to understand the role of the BMBF and the DFG in the development of German scientific activities abroad.

4.4 The Promotion of Science Diplomacy by the Federal Ministry of Research and Education

The German Federal Ministry of Education and Research is responsible for the promotion and regulation of educational and research matters.⁵³ The BMBF is divided into eight directorates, each of which is responsible for different tasks, such as central services; strategies and policy issues; European and international cooperation in education and research; vocational training and lifelong learning; science systems; key technologies, research for innovation; life sciences-research for health; provision for the future, research on culture, basic science and sustainability (Federal Ministry of Education and Research, 2015).

Among its head policymakers are the Federal Ministry, two Parliamentary State Secretaries who are responsible for maintaining a good relationship with the German parliament, and two permanent state secretaries. Most of them are appointed to different key positions, such as members of the board of trustees, members of the senate, and members of the supervisory boards of various German research institutions, assuring a supportive governmental position for scientific initiatives.

Additionally, I found that the role of scientists in the activities of the BMBF is greatly valued, especially the work done by The Commission of Experts for Research and Innovation and other scientific actors which provide advice for a comprehensive national strategy on innovation, research, and education. This strategy is called the High-Tech Strategy (HTS).⁵⁴

The purpose of the strategy included better coordination among the actors in the S&T system,⁵⁵ including the development of activities focused on increasing economic support for generating and continuing research activities in defined sectors such as climate energy, health nutrition, mobility,

⁵³ This Ministry shares its responsibilities with the ministries at the state level.

⁵⁴ Among the scientific actors included in the discussion of the High-Tech-Strategy the role of academics was highlighted, as was the Science Council, the Research Union, and discussion of the policy with citizens. See Beyer (2010, p. 10)

⁵⁵ The Strategy was developed by the Federal Ministry of Education and Research, in cooperation with the Federal Ministry for Economic Affairs and Energy and other Federal ministries. See Federal Ministry of Education and Research (2014a, p. 38).

security, and communications, which would improve German competitiveness at the international level. This strategy was launched in 2006 and subsequently updated in 2010 and in 2014 respectively (Federal Ministry of Education and Research, 2014a, p. 44).

Although the relevance of international activities is included in the HTS, there was a clear opportunity to improve the engagement of Germany abroad. For instance, the BMBF created in 2008 its internationalization strategy with the support of the German Foreign Office and other scientific actors. This public policy aims to accomplish the following goals. 1) Strengthen research cooperation with the top global scientists. 2) Develop international innovation potential. 3) Strengthen long-term cooperation with emerging countries in education, research and development. 4) Assume international responsibility and manage global challenges (Federal Ministry of Education and Research, 2014a).

Within this internationalization strategy, the ministry coordinates and tries to enhance research activities on different fronts, including different schemes for bilateral and multilateral cooperation, the fostering of international partnerships in selected knowledge areas, promotion of quality and excellence in scientific endeavors, and the need to promote mobility of researchers both to and from Germany (Federal Ministry of Education and Research, 2008, 2014b).

For this study, the work of the BMBF is relevant because its internationalization strategy includes the strengthening of bilateral relationships with developing and emerging countries. Its actions, conducted with the support of the German Government towards the Latin American region, including Colombia, cover the generation of scientific activities in knowledge areas such as global health, climate change and sustainable development, and it provides scholarships for higher education, as well as other educational and research topics.

This ministry is important due to the political and financial support provided to German researchers to develop their scientific activities in different knowledge areas. They include the work of various research institutions and political agencies at the international level, such as the research funding organizations in different countries, embassies, universities, and hybrid initiatives to promote German science, such as the German Houses of Innovation and Research, among other actions.

Furthermore, although there are few representatives of the BMBF abroad, some other branch offices from other agencies can promote its international strategy. Such is the case of the DFG offices abroad, which have served as a link to promote the international strategy of the German government. Due to this role, it is worth looking at its work at the international level.

4.4.1 The role of the German Research Foundation in the promotion of science diplomacy

The DFG is a research funding organization. This institution promotes research in all areas of knowledge through scholarships, grant programs, prizes, funding schemes for infrastructure, and support for networking activities, among other academic endeavors. It is self-governed by its statutory bodies, which include different representatives of the German research and academic communities.⁵⁶

Its budget is financed by the German states and the federal government. The relevance of this research organization is its funding for the generation and development of German science. This includes the participation of all the actors in the S&T system, emphasizing an interdisciplinary and international perspective. In addition, its international strategy is focused on the promotion of international cooperation following the premise that international scientific work can bring results that strengthen Germany as an international competitor (Deutsche Forschungsgemeinschaft, 2012).

This claim is based on the rationale regarding the contribution that research makes at the international level, because certain topics are better studied with international cooperation, such as space research, marine studies, biodiversity, and infectious diseases, among other knowledge areas.

Furthermore, this organization recognizes that excellent research must transcend boundaries. German science can improve its capacities through the exchange of arguments, ideas, and suggestions to promote excellence in the development of scientific endeavors. Moreover, the organization facilitates cooperation among scientists around the world and reinforces the image of Germany as an outstanding research location.

The DFG promotes the following international activities. 1) International programs to support research in some areas. 2) Agreements with partner organizations abroad such as the NSF in the United States, The Royal Society in the United Kingdom, and Colciencias in Colombia. 3) The establishment of DFG offices and liaison scientists around the world. 4) The participation of German scientists in international scientific events (D.Halm, Interview, Bonn, May 23, 2016).⁵⁷

For this study, the work of members of epistemic communities is exemplified in the establishment and management of the excellence initiative by the German Council of Science and Humanities (WR). This national political enterprise sought to guarantee strong financial support to improve the

⁵⁶ Members of different research institutions and political bodies of the federal and state level have been involved in the decision making bodies such as the Senate and the Joint Committee.

⁵⁷ These scientists serve as contact persons and representatives for the DFG in different countries.

capacities of Graduate Schools,⁵⁸ Clusters of Excellence,⁵⁹ and institutional strategies in German Universities⁶⁰

The main objectives of this initiative are related to enhancing the German S&T system, especially research in universities, creating opportunities for young researchers, and including an interdisciplinary perspective to motivate joint work across institutions and knowledge areas, and enhance internationalization opportunities, while taking gender into account to promote equality in opportunities for men and women (Wissenschaftsrat, 2010).

This program was created through mutual agreement between the German states and the federal government, with the representation of the BMBF, in the year 2005. The DFG and the WR were in charge of the implementation of the programs, and both actors decided to create a joint commission to organize and conduct the funding process for the program.⁶¹ In this case, the role of members of epistemic communities is the selection of research topics and the best proposals for enhancing scientific endeavors within this program's framework.

The startup and management process of the excellence initiative led by the WR is a clear example of the work of epistemic communities in this research foundation, although this program has not achieved the aim of improving the international visibility of German universities abroad (Vogel, 2016). This program attained moderate results in terms of developing capacities in leading research, helping to position some of the German universities as the best universities at the international level. If the German government continues its political and economic support for this initiative, in the near future, it can bring outstanding results (Vogel, 2016).

Finally, the relevance of the DFG relies on the permanent support of German science, including at the international level, through its international strategy. Additionally, this funding organization allows a bottom-up approach to the decision-making process, because scientists are the ones who initiate partnerships and DFG provides the funding framework through tenders and programs that can evolve into a major research project.

⁵⁸ This strategy aims to support the promotion of young scientists to enhance their research profile.

⁵⁹ This strategy seeks to engage scientific networking and joint work in different research fields, including universities, research institutions, and industrial partners, among other actors.

⁶⁰ This strategy seeks to enhance the university as a whole, identifying its strengths and needs to compete at the international level. It is relevant to mention that this strategy is complementary to the previous ones.

⁶¹ The DFG was in charge of creating an expert commission and the WR created the strategy commission to establish with the delegates of the Federal and State government the rules and the selection process in this initiative.

Another relevant actor that has a distinct advantage in the international system in terms of S&T is the Max Planck Society. Its structure and international activities are a clear example of how a member of an epistemic community can conduct science diplomacy. This case is analyzed next.

4.5 The Max Planck Society International Work

The Max Planck Society for the Advancement of Science (MPG) is an independent research association of research institutes founded in 1911. In 1948 the Kaiser Wilhelm Association was renamed to honor its former president, the theoretical physicist Max Planck (Max Planck Society, 2016). Its work focuses mainly on basic sciences. However, the work of the Max Planck institutes also includes research on topics such as social sciences, arts, and humanities. Notably, the federal and state governments of Germany provide 50% of the society's funding (Max Planck Society, 2015), while the rest of the budget comes from other sources, such as donations from companies, grants from the European Union, donations from individuals, and payments for services rendered.

Currently, this association consists of 83 research institutes and research facilities that cover all the knowledge areas.⁶² In addition, the MPG supports a number of Max Planck Research Groups (MPRG) and International Max Planck Research Schools (IMPRS) in Germany and abroad. The emphasis of the scientific work of the MPG includes the creation and development of scientific projects which are not funded through by universities. The MPG institutes and German universities complement one another's scientific endeavors.

Additionally, the members of this German research association can be considered as members of epistemic communities because its research community includes the leadership of German scientists, but with the participation of international scientists that share interests in conducting scientific projects abroad in order to obtain outstanding results in research and innovation (Max Planck Society, 2013, p. 2).

The senate of the MPG is the highest decision-making body. Its members are elected at the general meeting that comprises different types of members of the MPG. The Senate elects the President, Secretary General, and the other members of the Executive Committee. It also decides on the foundation and closure of institutes, the appointment of Scientific Members and the statutes of the institutes. There are three Committees within the Senate: the Committee for Research Planning, the Audit Committee and the Employment Committee (Max Planck Society, 2015). Within the

⁶² Five institutes and 15 centers of research facilities are located in different countries outside Germany. See Max Planck Society (2010).

organizational structure of the Max Planck Institutes (MPI) the director of each institute is equivalent to a dean in a university. Moreover, each institute is organized into research departments, headed by research directors; other members include research fellows that work on generating scientific activities.

The relevance of the MPI research association lies in its reputation as a leader among science and technology research organizations around the world. According to the Nature publication index, the MPG is the 4th most important institution generating research publications in different knowledge areas, surpassing many prestigious universities and research institutions from abroad (SpringerNature, 2016).

Its international strategy relies on three guidelines which are: 1) to encourage collaboration between Max Planck Institute and international scientists. 2) Improve the international profile of the MPG, especially in targeted countries such as Israel, India, China, and recently some Latin American countries. 3) Support the German scientific community in improving the engagement of German research organization at the international level (Max Planck Society, 2013, p. 1).

In addition, this investment in the development of basic and applied scientific activities can be perceived as a common policy enterprise due to the positive possible outcomes that it could generate, mainly new knowledge that could satisfy curiosity and improve human well-being (Gruss, 2013). Moreover, new scientific cooperation activities can be developed by the Directors of the Max Planck Institutes sharing notions of validity regarding the best partnerships for German science, in which one of their initiatives can bring other opportunities to other research organizations.

Examples of the scientific work done by the members of the MPG at the international level can be found in every corner of the world. The most prestigious are partnerships within the European Union, especially in the work of CERN in physics, and also the creation of the Minerva Foundation as a joint initiative between the MPG and the Weizmann Institute of Science in Israel, as well as in Latin America with the establishment of the APEX telescope in the Atacama Desert in Chile as an international joint venture headed by the Max Planck Institute for Radio Astronomy, among other examples that fit the description of science diplomacy, particularly in the dimension of *diplomacy for science* (Max Planck Society, 2010).

Undoubtedly, German research institutions and organizations have a clear role in foreign policy. However, it is necessary to understand the interests of scientists and how scientific activities are

involved in science diplomacy, especially in Latin America, and Colombia, in particular. These issues will be analyzed in the next part of the chapter.

4.6. Background of German Foreign Policy towards Latin America

German foreign policy has been recognized for its regional focus on work in other countries. The Latin American region has become particularly attractive to the German Government in recent years (Enver Schrömbgens, 2009). Evidence of this renewed interest can be found in the adaptation of the concept of *shaping powers*. This describes a new strategy of cooperation that goes beyond bilateral relations, including the development of new themes on the agenda such as cooperation on energy security and climate protection.

Usually, partnerships with Latin American countries have included common topics related especially to trade. However, among these countries, the German Government has found opportunities to instigate and support scientific activities in collaboration with its research institutions. At present, there is active participation in the region by members of German civil society, such as private companies, think tanks and political foundations that include in their portfolio the generation of scientific activities (Fernández Rocha, 2009).

The main interest in working with Latin American partners include 1) the historical presence of German-speaking immigrant communities, especially in countries such as Brazil and Argentina, but also in countries such as Uruguay, Chile, Mexico, Central America, the Caribbean, Venezuela, and Colombia in smaller numbers (Adam, 2005). 2) The long tradition of conducting joint scientific work in different knowledge areas. 3) Most Latin American countries are considered emerging economies, which means that these countries have reached levels of development that facilitate their engagement with German institutions while improving economic relations. 4) The region also has capacities in terms of natural resources, energy needs, and sustainable development, plus an innovative strength in its human capacity which reinforces the possibilities of undertaking joint work in scientific endeavors (German Federal Foreign Office, 2010; Pintor Pirzkall, 2012).

For instance, the main interest of the German government in generating scientific cooperation in the region relates to expressing its identity as an “industrial and technological leader” (Kern & Thomas, 2014, p. 108), and this status helps it obtain access to research, reinforce the image of Germany in science, and promote the research connections of German scientists with their peers abroad.

In order to understand the role of members of epistemic communities in German research cooperation with Colombia, the next section addresses the achievements resulting from relations between scientists and government agencies in the framework of German foreign policy.

4.7 Analysis of the effects of German Epistemic Communities in Colombia

The relevance of science and technology to the German Government is extremely important since these activities are part of its economic engine. The investment and international engagement of its research organizations have helped the country to achieve a better position within global society. In addition, research suggests that science diplomacy in Germany has focused on the dimension of diplomacy for science, especially to attract highly skilled people in order to foster economic, diplomatic, and scientific ties abroad (Fährnich, 2015, p. 3).

In this case, the work of the bilateral agenda between Germany and Colombia has focused on issues related to peace building, environmental policy protection, sustainable management of natural resources, and sustainable economic promotion (GIZ, 2015; Müller, 2014). In 1998 a new bilateral agreement was signed. It included technical cooperation to improve the economic development of both parties through the establishment of centers of education, research centers, and the support of education themes.⁶³

Additionally, this agreement includes the participation of German experts and the training of Colombian officials to achieve the objectives proposed in it. This general framework aims to promote scientific cooperation between the parties with a transversal approach to work with Colombian counterparts (Embajada de la República Federal de Alemania Bogotá, 2011).

Other relevant examples can be found in the different actions of the German research institutions such as the Leibniz Society, Fraunhofer Society, and the Helmholtz Association of German Research Centers, among other significant actors with Colombian counterparts (Internationales Büro des BMBF, 2012).

Among the topics established in the bilateral agenda, there are clear examples of how research cooperation activities have been created by members of epistemic communities through diplomacy for science towards Colombia. The relevance of the development of these activities depends on both

⁶³ In 1979 the Colombian Government signed an agreement with the Government of the Democratic Republic of Germany on cultural and scientific cooperation. Nevertheless, decree 121 of 1992 meant the agreement of both parties ceased to have effect from October 3, 1990 because German reunification changed the rules of the partnership.

top down and bottom up approaches (S. Werkmeister, Skype Interview, April 28, 2016; J. Kliesow, Interview, Köln, May 24, 2016).

Taking into account the fieldwork for this thesis conducted in Germany and Bogota, I found interesting research cooperation activities that highlight the role of members of epistemic communities in different German government institutions. These actions will be described below.

The most relevant case is the establishment of Max Planck Tandem Research Groups (MPTRG) in 2014, particularly those between the Max Planck Society, Universidad Nacional de Colombia, Universidad de Antioquia, and Colciencias to develop research on topics related to tropical diseases and therapeutic uses of biodiversity. These six research groups are located in the cities of Bogotá and Medellín.

This case is significant for the following reasons: 1) this process started with previous research experiences based on trust and high level capacities in research between the scientists of both countries, particularly with the work of the Max Planck Institute for Experimental Medicine with Colombian scientists, and the process continued with a visit of the former president of the Max Planck Society to Colombia in order to analyze research possibilities in Latin America, and the establishment of other MPTRG's (W. Stuehmer, Interview, Bogotá, August 29, 2015; Interview with the Head of Liaison office in Latin America of the Max Planck Society, Bogotá, March 15, 2016).⁶⁴ 2) The German scientists involved in this project have close relations with policymakers such as the Colombian ambassador and the High Presidential Adviser for Competitiveness and Strategic Projects (W. Stuehmer, Interview, Bogota, August 28, 2015). 3) Colombian scientists have the potential and the experience to develop research activities with a high level of expertise at the international level. 4) These joint research groups can obtain funds from Colombian entities, but also from German organizations that promote joint scientific endeavors.⁶⁵

Additionally, the establishment of these research groups motivated the interest of political and German research organizations (Interview with S&T officer of the Colombian Embassy in Germany, Berlin, May 27, 2016). This interest has been expressed in the high-level visits of those responsible for scientific activities in Germany, such as the visit of the Parliamentary State Secretary to the Federal Minister of Education and Research, and visits from the Fraunhofer Society and Leibniz Society, among others high level visits.

⁶⁴ The first visit by Professor Peter Gruss took place in 2013. See Gruss (2013).

⁶⁵ Another relevant case is the formation of a joint research group by The Max Planck Institute (MPI) for Comparative Public Law and International Law (Heidelberg) and Universidad de Los Andes in Colombia.

In short, this research outcome that has a bottom-up approach has served as a spearhead to strengthen German research cooperation with Colombia.

Another case to analyze is the work of the AvH Foundation in Colombia. This research institution works with Colombian partners including high-level scientists and political decision-makers; the work of the representative of this institution in Colombia has been related to motivating and establishing collaborative activities. However, the number of scholars who have participated remains low.⁶⁶ Furthermore, this research finds that there is insufficient evidence of the work of this institution and its scholars in the generation of science diplomacy activities in favour of Colombia.

In the cases of the BMBF and DFG, there is constant promotion of internationalization activities of German science. I argue that this effort in Colombia has recently come to the attention of German scientists; support for this statement comes from the recent visits of delegates from these institutions to foster engagement between Colombian and German Scientists. Though the number of projects is still low in comparison with other Latin American countries, there does not appear to be enough evidence in the findings to argue a fluent cooperation between both countries. Basically, by two main reasons: 1) there are limited initiatives in promoting joint work with Colombian counterparts by German scientists. 2) The lack of resources on the Colombian side is a current issue that impedes further actions within the bilateral relationship.

One particular case that illustrates the work of German epistemic community members towards Colombia, and how research cooperation can benefit from bottom up and top down approaches, is the case of the DAAD information center in Colombia. The representatives of the DAAD in Colombia collected the German interests in different knowledge areas, in order to create and maintain long-standing research collaborations, bearing in mind the tradition of joint work of German and Colombian Scientists.

Although its work is mainly related to the promotion of Germany as a place to study, the members of the DAAD play a role as negotiators on behalf of the academic and political interests of Germany, even with Colombian counterparts. Evidence of this convergence can be found in research endeavors in topics concerning marine sciences and transitional justice that evolved from the Colombian–German institutions, the Center of Excellence in Marine Sciences (CEMarin), and the German-Colombian Peace Institute (Birle, 2015; Colombia2020, 2017; Internationales Büro des BMBF, 2012, p. 25; Macana & Valdivieso, 2014; Steinmeier, 2016).

⁶⁶ Just 35 Colombian scientists have received the sponsorship from the AvH Foundation. In comparison with other countries in the region, the number of scholars is relatively small. See AvH Foundation (2016).

These initiatives seek the generation and development of academic and research outcomes in their knowledge areas, mainly expressed in terms of scientific events, such as specialized workshops and lectures, the creation of academic programs of postgraduate studies, and funds to support cutting-edge research projects, among other outcomes.

Other relevant activities that involve joint work between German and Colombian scientists from this special epistemic community are the different programs of funding for studies in Germany, such as scholarships and research grants. Currently, Colombia is the second country in Latin America in terms of student numbers in Germany, surpassed only by Brazil. In 2015, there were 1000 scholarships awarded to Colombian citizens (Babel, 2017). These sponsorships create common ground for human talent, and make available the resources to explore and continue research activities in the near future.⁶⁷

The interest of a member of epistemic communities in working abroad with the sponsorship of the government comes from the possibility of creating and maintaining research activities with the support from German research institutions. In this way, they will improve their reputation in Germany, and may stand out among their colleagues by obtaining achievements expressed in scientific outcomes and recognition.

This special interest is shared by the German government, which seeks success in topics related to S&T in order to achieve goals in terms of foreign policy, related to the promotion of Germany as the “*land of ideas*”, and a key ally for generating scientific activities of a high standard (U. Albrecht, Interview, Bonn, May 23, 2016;; Interview with the President of the American Friends of the Alexander von Humboldt Foundation, Washington D.C., July 2, 2015).

In this particular framework, Colombia is also important due to the areas of research that benefit from the bilateral relationship, as this country can serve as the main laboratory for understanding areas such as peace-building, biodiversity, and infectious diseases, among other topics.

Additionally, as a finding of this study, I would argue that some enabling factors, such as close relations between Colombian scientists and policy makers, high level expertise in a knowledge field, and previous experiences with Colombian counterparts in epistemic communities have served

⁶⁷ One example to bear in mind is the case of the Center for computer research in bioinformatics and applied mathematics in the Universidad Nacional de Colombia, which includes the postulation of Colombian scientists that studied in Germany to obtain a grant for this purpose. See: Unimedios (2014).

to support constant cooperation with Colombia by German foreign policy makers (W. Stuehmer, Interview, Bogota, 29 August 2015; J. Kliesow, Interview, Köln, May 24, 2016).

At this point, it is crucial to emphasize the social construction that generates scientific outcomes from the bilateral relation, especially the role of the Colombian Embassy in Germany. This diplomatic delegation established a comprehensive strategy for generating the best match between Colombian and German institutions, including universities, ministries, government agencies, even creating a science attaché position at the Colombian Embassy. This special attaché is in charge of the promotion of joint scientific activities and encouraging engagement by both sides (W. Stuehmer, Interview, Bogota, 29 August 2015; J. Kliesow, Interview, Köln, May 24, 2016).

However, this research found that unfortunately these actions have clashed with the unpleasant reality concerning the short-sightedness of policymakers, lack of resources, and the continuous change of staff on the Colombian side, especially in Colciencias and other government agencies. This situation has generated ambiguity that could affect the ongoing activities of the bilateral relation in the near future (J. Kliesow, Interview, Köln, May 24, 2016).

To conclude, it is important to point out the role of the members of epistemic communities in working with policymakers responsible for German foreign policy. These experts' work is supported by the German states and federal government for the creation and development of scientific activities in basic and applied sciences. As Peter Haas put it: *"epistemic communities are also more likely to emerge in countries with well-established research capacity and where scientists enjoy some autonomy from the state."* (2016a, p. 170).

The activities conducted by these experts are related to the dimension of diplomacy for science, because the establishment and support of joint research groups or organizations means scientific activities are established and will continue in the near future. With proper support and exchange of ideas between scholars, this diplomacy has generated a soft power strategy from Germany towards Colombia, proving how research can be an effective means to reach research subjects, such as natural resources, and attract human talent with high capacities in different knowledge areas. (J. Kliesow, Interview, Köln, May 24, 2016).

Lastly, the work of epistemic communities in the German government is nurtured by both top-down and bottom-up approaches to policy making. Although policymakers suggest the development of research activities to foster economic growth and improve Germany's standing in the world, scientists are always involved in the discussion, and they propose new strategies.

Notably, their ideas for enhancing bilateral relations in scientific topics serve as social construction, enhancing the relevance of science for mankind, reinforced by personal relationships with their peers and other actors, such as diplomats. Establishing these new relationships can foster the creation and exchange of ideas, arguments, mechanisms, and programs related to scientific endeavors abroad.

4.8 Summary of the work of German epistemic communities and their science diplomacy activities towards Colombia

| <u>Field of International Cooperation</u> | <u>Members of Epistemic Communities</u> | <u>Interests of members of epistemic communities</u> | <u>Main cooperation partner</u> | <u>Main scientific cooperation outcomes</u> |
|-------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • Marine Sciences • Peace Studies | German Academic Exchange Service (DAAD) | <ul style="list-style-type: none"> • Promote the engagement of foreign academics with German counterparts through opportunities such as research projects, scholarships, training programs, among other initiatives. • Identify new areas of cooperation with Colombian counterparts | German Foreign Office | <p>Establishment of the Center of Marine Sciences and the German-Colombian Peace Institute.</p> <p>The DAAD Information Center serves as a scientific embassy to promote German interests abroad.</p> |
| <ul style="list-style-type: none"> • Infectious diseases • biodiversity | Max Planck Institute for Experimental Medicine | <ul style="list-style-type: none"> • Improve the international profile of the Max Planck Society in Latin American countries. • Support the German scientific community by improving engagement of German research organizations abroad. | Max Planck Society | <p>Creation of the Max Planck Tandem Research Groups in topics related to infectious diseases and biodiversity</p> <p>This research institute started the research cooperation process with Colombian scientists with a training program in Germany.</p> |
| International cooperation in science and technology | Alexander von Humboldt Foundation | <ul style="list-style-type: none"> • Support research activities through grants given by scientists from Germany and abroad. • Promote Germany as an outstanding place to develop science. | German Foreign Office | Among its members are high level academics and policymakers in Colombia. However, there is no evidence about programs fostered by its scholars in Colombia. |
| International cooperation in science and technology | <i>Council of Sciences (WR)</i> | <ul style="list-style-type: none"> • Promote international research activities to improve the competitiveness of the country. | DFG BMBF | The numbers of research projects with Colombian counterparts are minimal (around 10 initiatives approved). |

Source: The author.

CHAPTER V

5.1 Findings and Conclusions

Taking into account the proposed hypothesis, which is:

Scientific cooperation in the U.S. and Germany is the result of interactions between epistemic communities and governmental organizations within foreign policy, which in many cases contributes to the promotion of science diplomacy towards Colombia.

Which tries to answer the following question:

How do epistemic communities in the United States and Germany promote diplomacy for science in Colombia?

Members of epistemic communities in the U.S. and Germany promote scientific cooperation through specific government agencies to generate scientific actions within the framework of foreign policy. These activities are conducted with the help of enabling factors such as scientists' closeness to policy-makers, their expertise in a certain knowledge area, and abilities to work in terms of uncertainty. For instance, this study identifies the interactions between epistemic communities and governmental organizations in the U.S. and Germany and the effects of these interactions on promoting scientific cooperation towards Colombia

Moreover, it can be stated that these enabling factors are employed by members of epistemic communities when working within the framework of foreign policy, and these factors can improve the generation and development of scientific activities, especially in knowledge areas related to S&T, higher education, health issues, and basic sciences. This supports one of the specific objectives indicated in this study.

However, the approaches used to obtain government support in terms of foreign policy in these two countries are quite different, due to societal and institutional factors that can affect relations in the bilateral agendas. For this reason, the viewpoints expressed in the other specific objectives of this thesis are relevant and can be properly addressed.

First, Germany and the United States of America have been chosen as case studies due to their leadership in research areas such as health, energy, interdisciplinary technologies, engineering, and telecommunications, as well as their long tradition of cooperating and working abroad, particularly with Colombia. Both countries share common features, such as a federal governmental administration and a plethora of scientific institutions in their S&T systems. Another relevant

similarity is the percentage of their government investment, expressed in terms of GDP invested in research and development (R&D) activities.

For the year 2012, the total R&D GDP investment in both cases was 2.79% in the United States of America and 2.92% in Germany (The World Bank, 2013). Another similarity is that generation of knowledge is a priority for the U.S. and Germany (Abramson, 1997). Also, in both nations, the participation of regional and local institutions is a key factor enhancing their research processes. The difference between them lies in the degree of participation of regional states. Regional (Länder) funds, in Germany, dedicated to research comprise 73% of research funds, whereas, in the United States 60% of research is funded by the federal government (Abramson, 1997).

22 semi-structured interviews in Germany, the United States, and Colombia provided significant research findings in terms of how S&T have been addressed in the foreign policy of each country, especially in the bilateral relations of both developed countries towards Colombia. It can be observed that members of epistemic communities develop actions concerning diplomacy for science, and these actions can promote the generation of scientific activities in their countries that enhance the bilateral relationship with Colombia. This is due to enabling factors that facilitate scientific activities, such as the establishment of research institutions and groups that generate joint scientific endeavors in the framework of the foreign policy in each case.

It can be seen that, in each case study, scientists work under conditions that allow social construction with policy makers in order to promote scientific work abroad. Their scientific advice can produce outcomes that can serve as a foreign policy mechanism to continue further research activities, even bilateral research cooperation.

Supporting the validity of the hypothesis, I found that in the case of the United States, members of epistemic communities work with the government, providing advice in order to reduce the level the uncertainty towards the future and enhance political achievements. Thus, the foreign policy of the North American Government is nurtured by the recommendations of advocacy groups, think tanks, foundations, universities, and research centers.

However, scientific activities in U.S foreign policy have a clear a top-down approach and are related to the use of science diplomacy especially related to dealing with global issues, such as climate change, infectious diseases, natural disasters, etc.

Additionally, the involvement of members of epistemic communities in the framework of U.S. foreign policy is related to the dimension of science for diplomacy, which means that it uses science

as a mechanism to improve bilateral relations with countries such as Arab countries, especially the Islamic Republic of Iran, with its nuclear deal, Cuba in Latin America, and North Korea in Asia.

In this thesis, I have identified specific cases that prove hypothesis, since scientists and policymakers can promote joint activities that rely on science diplomacy activities within the framework of the bilateral agenda with Colombia.

Such is the case of the scientists at the Colombian NHI, and their work with the IANPHI to obtain funds and technical support from the CDC in the United States to promote the study of infectious diseases. This topic has been used by policymakers to foster foreign policy and international relations between both countries.

The relevance of this case is linked to societal factors, such as previous relationships established between scientists, access to policymakers, especially officials in government agencies, and empathy among counterparts.

This detailed research cooperation concerning infectious diseases has created common ground to develop scientific tools to deal with health issues at the international level, proving how scientists can foster research cooperation activities by playing the role of intermediaries between their home governments and institutions.

One relevant finding of this study is the lack of interest among U.S. scientists to work with Colombian counterparts due to different reasons that include a lack of knowledge about the potential work that could be done in this country. Another factor that limits the scientific partnership between both countries is the consistent lack of funding for scientific research activities by the Colombian government. However, I suggest that the sponsorship of scientific endeavors could change with a renewed bilateral relationship in the post-conflict era.

Finally, the relationship between the work of members of epistemic communities and U.S. foreign policy can be observed through history generating scientific outcomes through bilateral agendas. Examples are the institutional architecture in the framework of the Alliance for Progress that includes the creation of agencies that involved scientific activities in different knowledge areas, and more recently the activities proposed in the High-Level Partnership dialogue.

On the other hand, in the case of members of epistemic communities working with German foreign policy, it can be stated that the German S&T system works in a more homogeneous and

synchronized way than that of the United States of America. The German system covers all areas of knowledge, and most of the research centers have public status (Kroll, 2008; Prange, 2003).

In Germany, research areas and international cooperation on scientific topics have been prioritized by the Foreign Cultural and Education Policy led by the Federal Government, especially by the Federal Foreign Office, and Federal Ministry of Education and Research, with the support of the BMZ. However, the advice of important scientific actors such as research organizations, associations, institutions, scientific bodies, and businesses, among other players from civil society has helped guarantee the achievement of goals related to trade, cultural activities, and political strategies.

In the German case, research cooperation with partners in Latin America in the fields of innovation, higher education, and research is becoming increasingly important (Trueb, 2012). However, the interest in working with Latin American counterparts is part of an international strategy that includes: 1) the promotion of the country's image as an outstanding place to develop joint scientific outcomes through research grants, scholarships, and funding schemes. 2) The development of research activities in certain knowledge areas that allow obtaining support by the German government. These are key factors for the involvement of German scientists in foreign policy activities. Examples are found in research cooperation projects related to natural resources, especially biodiversity, conflict and peace studies, renewable energies, and health sciences, among other topics.

In this analysis, Colombia is interesting to German foreign policymakers because this country is suitable for research cooperation. Mainly, because German scientists and politicians are very interested in what happens in this country, since it has natural resources and social issues that could be analyzed within the framework of bilateral relations.

Moreover, there is sufficient evidence that points to the effectiveness of the work done by members of epistemic communities in generating research cooperation with Colombia. The most remarkable cases are those of the DAAD information center and the work of the Max Planck Institute of Experimental Medicine. In the first case, members of the DAAD understand and align the scientific and political interests of both countries to establish two initiatives for scientific cooperation in topics related to marine sciences and peace studies, taking into account the expertise and the close relation of scientists with policymakers.

In the second case, the work of Colombian scientists with the support of the Colombian Embassy in Germany promoted the generation of high-level research joint groups that focused on biodiversity and infectious diseases. In this special case, members of German epistemic communities served as intermediaries between their home governments and institutions to promote the creation and support of scientific activities and capacity building in the dimension of diplomacy for science.

Clearly, the work of members of epistemic communities is relevant to policymakers in the U.S. and Germany. However, there are differences between these countries, particularly in the involvement of scientists with foreign policy, expressed through funding schemes, scholarships, policy briefs, and other relevant scientific activities that can be improved with time.

In addition, the relevance of science as a tool in the foreign policy of the United States and Germany is linked to the scientific capacities of the members of epistemic communities to promote the creation and development of high level scientific outcomes that are attractive to the international community and so encourage collaborative work.

The evidence presented in this study also suggests that, depending on the attractiveness, credibility, and capacities of international counterparts, scientific cooperation could be more effective in promoting or enhancing activities in foreign policy. Moreover, I argue that one of the ways in which scientific work has a positive effect on research cooperation is by scientists serving as intermediaries between policymakers and governmental institutions in the receiver country in order to obtain funding support, development of infrastructure, training to improve scientific capacities, among other outcomes. This evidence sustains the current hypothesis stated in this thesis.

Additionally, although Germany and the U.S. have different scopes related to scientific cooperation, I argued the development of scientific activities in the framework of foreign policy allows establishing new long standing relationships between scientists and government agencies, which are expressed in diverse scientific outcomes around the world. However, the lack of and limited investment, planning, and institutional support from the Colombian side creates a clear disadvantage to enhance and advance joint scientific and academic endeavors with international partners.

In short, the development of scientific activities by members of epistemic communities in the framework of foreign policy is relevant, because scientific activities are based on societal factors that surpass the imaginary lines that divide states. However, the relevance of members of epistemic communities is most salient when they achieve close ties and reliable access to policy makers, or

become decision makers themselves, and align their interests with those of their government. This approach is vital to enhance the impact of scientific endeavors in the foreign policy of any country.

5.2 Further research

These research findings provide a contribution to the study of foreign policy from a constructivist approach, especially regarding topics linked to the generation of science and technology as a tool of bilateral cooperation.

The main reason for this claim is that there are different science diplomacy actions carried out by Latin American scientists that can be studied in the framework of foreign policy and international relations, such as: 1) the inclusion of countries in international scientific regimes, 2) the scientific outcomes obtained through cooperation processes with different regional agendas, 3) the impact of these detailed activities in terms of social and economic development, 4) other cases that can be found in regional organizations that facilitate academic and research activities, such as the EU or the World Bank.

As a result, I propose that future research should analyze regional cases and recognize a set of qualitative indicators that can reasonably be interpreted as evidence of the generation and development of scientific capacities in Latin American countries. The results obtained would seek to provide a new empirical background to the policy outcomes and use data sources such as the UNESCO Institute for Statistics (UIS) and the Organization for Economic Cooperation and Development (OECD) science technology and industry scoreboard, in order to evaluate the effectiveness of scientists in the international political system.

Moreover, it would be very interesting to analyze, using the framework of IR theory, some actions by Latin-American scientists, such as the programs of International Institutes for Interdisciplinary Innovation (I4) and the Latin American Center for Interdisciplinary Formation (CELFI). These initiatives have strong sponsorship from the Argentinian government, but also include the participation of international research institutions and scientists. It would be instructive to examine the role of the state and scientists in the generation and development of these initiatives.

Other topics to explore in further research could be the various interests of corporations that affect the generation of scientific outcomes in the framework of the U.S. Colombian bilateral agenda. One relevant example is the establishment of the norms concerning the generation of biotechnological products by the Colombian Government that affect intellectual property rights of U.S.

pharmaceutical companies (Correa, 2014). It would be interesting to study the role of scientists in this issue.

Finally, another topic for further research in diplomacy for science could be the impact of U.S. and German scientists on Colombia in terms of enhancing bilateral relations with institutions in their host country on topics concerning trade, institutional development, and research. This study could evaluate Soft Power within the framework of each country's foreign policy.

Annexes

Annex 1: List of Interviewees

| No | Date | Name or Position | Organization | Source | Place |
|----|---------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------|-------------------------------------------|
| 1 | 17 April 2015 | Dr. Ann Mason Executive Director | Fulbright Commission in Colombia | Interview | Bogotá, Colombia |
| 2 | 20 April 2015 | Interim Director | Direction of Research in Public Health – National Institute of Health (Instituto Nacional de Salud) | Interview | Bogotá, Colombia |
| 3 | 24 June 2015 | Dr. John Boright Executive Director of International Affairs | U.S. National Academies of Sciences | Interview | Washington D.C. United States of America |
| 4 | 2 July 2015 | Desk officer for Colombia | Department of State | Interview | Washington D.C. United States of America |
| 5 | 1 July 2015 | Acting Science and Technology Adviser to the Secretary of State U.S. Department of State | Department of State | Interview | Washington D.C. United States of America. |
| 6 | 1 July 2015 | Advisor | Colombian Embassy in the United States of America | Interview | Washington D.C. United States of America |
| 7 | 3 July 2015 | Dr. E. William Colglazier Visiting Scientist and Senior Scholar | Center for Science Diplomacy – American Association for the Advancement of Science | Interview | Washington D.C. United States of America. |
| 8 | 2 July 2015 | Dr. Franklin Carrero Program Manager | International Science and Engineering – National Science Foundation | Interview | Washington D.C. United States of America. |
| 9 | 2 July 2015 | President | American Friends of the Alexander von Humboldt Foundation | Interview | Washington D.C. United States of America |

| | | | | | |
|----|------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-----------------|------------------------------|
| 10 | 16 July 2015 | Science and Technology officer | U.S. Embassy in Colombia | Interview | Bogotá, Colombia |
| 11 | 27 July 2015 | Prof. Timothy J. DeVoogd | Former Fulbright Scholar | Interview | Bogotá, Colombia |
| 12 | 29 August 2015 | Prof.Dr.Walter Stuehmer Director | Max Planck Institute for Experimental Medicine | Interview | Bogotá, Colombia |
| 13 | 1 September 2015 | Country Director Dominican Republic | Centers for Disease Control and Prevention | Skype Interview | U.S. Embassy - Santo Domingo |
| 14 | 3 September 2015 | Senior Service Fellow, Medical Epidemiologist | Division of Global Health Protection Global Disease Detection Regional Center - Central America Region Office (CDC-CAR) | Skype Interview | Managua, Guatemala |
| 15 | 15 March 2016 | Head of Liaison office | Max Planck Society | Interview | Bogotá, Colombia |
| 16 | 28 April 2016 | Dr. Sven Weirkmaister - Former Director | Information Center of the DAAD in Colombia | Skype Interview | Giessen, Germany |
| 17 | 23 May 2016 | Head of Division Central and South America | AvH Foundation | Interview | Bonn, Germany |
| 18 | 23 May 2016 | Dr. Ulrike Albrecht Head of Department, Strategy and External Relations | AvH Foundation | Interview | Bonn, Germany |
| 19 | 23 May 2016 | Dr Dietrich Halm Head of International cooperation with Latin America | German Research Foundation (DFG) | Interview | Bonn, Germany |

| | | | | | |
|----|----------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------|-----------|-----------------|
| 20 | 24 May 2016 | Mr. Jonas Kliesow Officer of the Division Latin America. | International Bureau. Federal Ministry of Education and Research (BMBF). | Interview | Köln, Germany |
| 21 | 26 May 2016 | Officer from the unit of universities, science, and research | German Foreign Office | Interview | Berlin, Germany |
| 22 | 27 May 2016 | Science and Technology officer | Colombian Embassy in Germany | Interview | Berlin, Germany |

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