

IMAGINARIES OF CLIMATE CHANGE SCIENCE IN THE AMERICAS:
A CASE STUDY OF THE INTER-AMERICAN INSTITUTE FOR GLOBAL CHANGE
RESEARCH

by

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THESIS ABSTRACT

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Title: Imaginaries of Climate Change Science in the Americas: A Case Study of the Inter-American Institute for Global Change Research

Climate change is as much an issue of power as it is an environmental one. A critical geopolitical analysis of climate change illuminates the relationship between power and climate change. This thesis explores how climate change is an epistemological issue, and brings geopolitics into conversation with science and technology studies by merging subaltern geopolitics and sociotechnical imaginaries frameworks.

Through a case study of the Inter-American Institute for Global Change Research (IAI), the goal is to explore imaginaries of climate change science outside of dominant climate change narratives; and to develop an understanding of how power is experienced, mediated, and contested through scientific organizations. Findings from this thesis reveal: how the IAI leverages reconfigures geopolitical tensions between the United States and Cuba; and practices utilized to address issues of knowledge validity, credibility, and representation. Overall an examination of the IAI reveals how power is exercised and renegotiated in climate change science.

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for my loving and supportive parents,
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TABLE OF CONTENTS

Chapter	Page
I. INTRODUCTION	1
Research Problem	1
Context.....	4
Literature Review.....	6
Epistemic Geographies of Climate Change Science.....	9
Methodology	16
II. IMAGINARIES OF CLIMATE CHANGE SCIENCE IN THE AMERICAS.....	22
Introduction.....	22
Subaltern Geopolitics and Sociotechnical Imaginaries.....	24
The Inter-American Institute for Global Change Research	28
Methods.....	31
Imaginarities in Practice at the IAI	32
Regional Imaginaries of Climate Change Science.....	34
Subaltern Geopolitics at the IAI	40
Collaborating with Cuba.....	41
Colonialism and Exclusivity in Climate Change Science.....	44
Discussion.....	48
Conclusion	52

Chapter	Page
APPENDICES	54
A. LIST OF DOCUMENTS FOR TEXT-BASED ANALYSIS	54
B. HUMAN SUBJECTS APPROVAL.....	58
REFERENCES CITED.....	66

LIST OF FIGURES

Figure	Page
1. Map of member states to the IAI	5
2. Structure of the IAI	29

LIST OF TABLES

Table	Page
1. Participant Demographics.....	18
2. Interview Questions	18

CHAPTER I

INTRODUCTION

Research Problem

As the consequences of human activity continue to affect biospheric and environmental conditions, society finds itself scrambling to resolve climate change. Efforts to address climate change at an international scale have mainly focused on addressing environmental causes and impacts via innovation and technology (Hulme, 2008; Bulkeley, 2019; Demeritt, 2001); however, this neglects underlying socio-cultural causes of climate change that require systemic societal change. For climate change response efforts to be holistic, they must both grapple with environmental and social causes and address environmental and social impacts. As such, we must acknowledge that climate change is more than an environmental issue, it is, first and foremost, a matter of power and inequality (Bulkeley, 2019).

Power in climate change is manifested and perpetuated in many ways, among them via dominant representations of climate change. For example, in its assessments, the IPCC discerns that "climate change is a global commons problem that implies the need for international cooperation in tandem with local, national, and regional policies in many distinct matters" (Allen et al., 2014). This emphasis on climate change as a global commons problem has been reinforced by many organizations, policies, institutions, and scholars. However, the global commons narrative allows economically and politically dominant states –defined here as sovereign states that have a defined territory, population, government, as well as the ability to establish relations with other states– to shift the burden of their actions onto a multitude of other states and effectively “hide in a

crowd”. Take, for example, the disproportionate rates of pollution and emissions released by a handful of states. In 2014, China (30%), the United States (15%), the European Union (9%), India (7%), Russia (5%), and Japan (4%) were responsible for 70% of global carbon dioxide, a greenhouse gas (Hovi, Skodvin, and Aakre, 2013; EPA, 2014). Not much has changed since. The causes of climate change and who contribute to the problem, let alone who participates in response efforts, is inherently disproportionate.

These states (i.e., China, the United States, the European Union, India, Russia, and Japan) are simultaneously the most influential actors in climate change conventions and negotiations worldwide, and are listed are some of the most powerful states in our current global political order: three of these states (U.S., Russia, and China) comprise the five permanent members of the United Nations; Japan, the United States, and Russia are part of the Group of Eight (G8) Industrialized Nations; all of these states are members of the Group of Twenty (G20); and the majority of these states, accounting for the multi-state composition of the European Union, are geographically concentrated in the “global North.” However, in comparison, small states –in terms of economic capacity and political influence– exercise the least influence in negotiations and conventions and are nonetheless the first to feel the impacts of climate change (Carey et al., 2016; Hovi, Skodvin, and Aakre, 2013). More so, any actions taken by small states are unlikely to change current conditions –if these states were to drastically reduce or cut all emissions and take drastic actions towards climate change the impact would barely be felt (Hovi, Skodvin, and Aakre, 2013).

To conflate matters, much of the knowledge, both scientific and political, produced on climate change is also derived from more powerful states. Many of the states

responsible for driving climate change, both globally and across the Americas, produce knowledge that reinforces narratives favorable to them (Hovi, Skodvin, and Aakre, 2013). This is not to say that climate change science –the production, distribution, and use of climate change knowledge– is erroneous, however, it is neither apolitical. Among these practices is the construction of climate change narratives that drive particular representations of the issue which skew the direct causes of the problem. These narratives claim legitimacy not only through the authoritative meaning assigned to science (Jasanoff, 2010), but through dominant spatial imaginaries of the world that affect who is a credible actor and whose knowledge is valid (Mahony & Hulme, 2018; Klenk and Meehan, 2015; Felt et al., 2016; Ford et al., 2016).

To address climate change, we must engage with the issue as a matter of power and inequality. One avenue to explore this relationship between climate change and power is through a critical geopolitical analysis of climate change science. If geopolitics is about the way the world is made known (Dalby, 2013), then knowledge and knowledge production is a key component to understanding how the world is represented, and who is representing. By understanding how climate change is made known and represented via science we can explore how dominant representations of climate change are made known, understand who does and does not benefit from such representations, and examine where hegemonic structures of power are codified and ratified. In my research, I ask: How is climate change made known? How does power affect climate change science? And, how can we renegotiate and navigate sources of power in climate change science?

Context

The central analysis of this research is the Inter-American Institute for Global Change Research (hereafter referred to as the IAI or the Institute). In my research, I use the IAI as a vehicle through which I can examine the relationship between science, space, and power, and reveal ways of navigating dominant sources of power in climate change science.

Established as an intergovernmental organization, the IAI is primarily tasked with supporting (i.e. funding, resources, infrastructure) and coordinating (i.e. research programs, trainings, conferences) scientific research regarding the extent, causes, and consequences of climate change in the Americas. Their mission is to support and use the best science available to inform decision-makers and guide policy action on climate change. Their work is set in the Western Hemisphere including the areas of North, Central, and South America and the Caribbean (also referred to here as the Americas). Current members of the IAI include: Argentina, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Guatemala, Jamaica, Mexico, Panama, Paraguay, Peru, United States of America, Uruguay, and Venezuela (Figure 1). Despite its large geographic extent and range of member countries, the IAI is a small organization and not as widely known as its global counterparts, such as Future Earth. Its operational budget ranges from USD 1-2million, and its directorate is composed of a ten-person team in a small office in the LATU (*Laboratorio Tecnológico del Uruguay*) campus.

The IAI defines global change as “the long-term chemical, biological, and physical processes of the Earth system” that are subject to constant alternation and “is

both natural in origin and human-induced.” In my research, global change is rendered synonymous with climate change; that is, I am using climate change to stand for what the IAI calls global change.



Figure 1: Map of member states to the IAI

My research utilizes the IAI as its central point of analysis for several reasons. First, the IAI has been producing knowledge on climate change for over 25 years and is one of the few institutions to producing climate change science specific to the Americas.

The longevity of the IAI and its geographic scope are a useful foundation for studying the relationship between climate change and power over time; the IAI is situated in a region with historical legacies of violence (i.e., colonialism) that have implications for power relations. Second, the Institute is headquartered in a state categorized as part of the global South. This point is crucial to arguments later developed in this research that stand to illustrate: how dominant knowledge is particular to geographic location (Felt et al., 2016; Lahsen & Nobre, 2007); how the normalization of dominant knowledge affects politics and is derived from hegemonic impositions (Meehan, Klenk, and Mendez, 2018; Sharp, 2013); and how valid and credible knowledge can, and does, emanate from various places and cultures (Sharp, 2013; Agnew, 2007).

Lastly, the efforts of the IAI, as explored in later chapters, implicitly works to unravel myths tied to the arguments mentioned above. In particular, I analyze the practices of the IAI to examine how power in climate change via science can be renegotiated and navigated.

Literature Review

This section provides an overview of the conceptual framework of the thesis and its theoretical contributions. The following section examines how climate change, vis-a-vis science, is a matter of power and inequality. To build my framework, I draw on scholarly literature in science and technology studies (STS) and political geography that develops an understanding of how power operates through space and time via science and technology.

As a discipline, geography sits at a nexus between the social and physical sciences and provides an avenue to examine matters of power and inequality in climate change. Questions of power and dominance in the international system have long been a concern of political geography and geopolitics (Dalby, 2010; O'Tuathail, 1999; Slater, 2008; Sharp, Routledge, Philo, and Paddison 2000). Over the last decade, there has been a proliferation of geographic scholarship examining power and dominance in the context of climate change. To date, geographic research concerning the relationship between climate change and power have spanned several schools of thought (i.e. constructivist, positivist, feminist, etc.) and have examined varying aspects. A wide range of literature has been critical of how power and geopolitics play out in international conferences and conventions (Hovi, Skodvin, and Aakre, 2013; Craggs, 2014; Craggs and Mahony, 2014). For example, Weisser (2014) illustrates how documents produced at international climate conferences reinforce particular norms of conducting politics that have geopolitical repercussions. Documents codify rules, structures, and historical conditions that favor some states, and their input, over others. Similarly, geographic research has also explored the relationship between climate change and power in global environmental assessments (Fogel, 2004; Ford et al., 2016; Hulme, 2016; Ho-Lem et al., 2011).

Research by Hulme and Mahony (2010), delves into the implicit biases of climate change knowledge at the IPCC. The authors are critical of the authoritative momentum the IPCC has gained in normalizing some disciplinary expertise over others; they are also critical of the imbalance in the geographic origins of those who author IPCC's many reports. For Hulme and Mahony the implications of biases present in the IPCC affect which disciplines participate in climate change science, which states are given scientific

authority via authorship, how marginalized voices and knowledges are silenced via a consensus model, and how political decisions are legitimized via IPCC science.

The production of climate change knowledge is also reflective of social asymmetries (Meehan, Klenk, and Mendez, 2018; Agnew, 2007; Jasanoff, 2004; Mahony and Hulme, 2018; Lahsen & Nobre, 2007). In particular, Meehan, Klenk, and Mendez (2018) illustrate how space, place, and power influence knowledge and coproduce social orders within the science-policy interface. By deploying a sociotechnical imaginary framework, the authors reveal how transdisciplinary climate research remains subject to power imbalances and structural barriers despite its engagement in a wide variety of stakeholders and places. The authors conclude that transdisciplinary science must "grapple with its epistemic geographies and lived geopolitical realities to truly change the intellectual climate." Outside of the relationship between knowledge and power, geography has also engaged with climate change and power concerning national security (Deudney, 1990), global health (Miller, 2015), and gender (Carey et al, 2016; Sultana, 2014; Israel & Sachs, 2013). In the context of climate change, this literature provides important lessons of how climate change narratives are produced and represented, by whom, and for whose benefit.

However, political geography and human geography writ large have only recently begun to grapple with how climate change "comes into being, and what in turn it creates, entangles, undoes, and removes with it" (Bulkeley, 2019; Brace and Geoghegan, 2010). More so, geographers have recently been called to re-examine traditional geopolitical discourses (Bulkeley, 2019); to develop new questions regarding environmental geopolitics (Dalby, 2014); to include previously excluded and exploited voices and

experiences (Castree et al., 2014; Mahony and Hulme, 2018); to provide a deeper understanding of the relationships between knowledge, power, and justice (Carey et al., 2016; Sultana, 2014); and to make social science contributions that provide a spatial examination of knowledge (Hulme, 2008).

To deepen our understanding of how climate change is made known, via geography, this section presents climate change as an epistemological issue. Utilizing Mahony and Hulme's (2018) epistemic geographies, "the spatialities of the technoscientific knowledges which underpin understandings of human-induced climate change," I focus on how climate change science—the production, distribution, and use of climate change knowledge—as the primary battleground where dominant representations of climate change are made known, and where hegemonic structures of power are codified and ratified. To accomplish this goal, I take note from Mahony and Hulme (2018) who urge "geographers [to] join colleagues across science and technology studies (STS) in examining the specific spaces of climate change knowledge production."

Epistemic Geographies of Climate Change Science

Since its beginnings, science and technology studies (STS) has been engaged with the epistemology of science. The field examines science and technology as social institutions whose structures and practices are subject to change with external influence. STS is also concerned with the impacts, risks, and benefits of science and technology on society. By placing science under a microscope, scholars in STS argue that science is "co-produced" by society. Referring to the "proposition that the ways in which we know and represent that world (both nature and society) are inseparable from the ways in which we choose to live in it" (Jasanoff, 2004), the notion of co-production illustrates how

science, located in the domain of the natural, is entangled with the social; and, how both the natural and social shape and influence each other's trajectories.

Drawing from Jasanoff's (2004) work, co-production brings to light the subjective nature of science, despite its objective designation, and the implications this has for the world. For example, St Clair (2006) illustrates how expert knowledge produced by global institutions, such as the World Bank or the UN, also produces social orders. By extension, a co-productionist account of science and technology reveals a connection between science and power. Mahony and Hulme's (2010) analysis of the IPCC reveals a similar connection between producing science and social orders at the IPCC, which is not only influenced by a particular social order but reproduces it via its authors, institutional structure, and review process. Similarly, Lövbrand (2011), uses a co-productionist framework to examine how policy affects funding and research concerning climate change in the European Union, through a case study of the *Adaptation and Mitigation Strategies: Supporting European Climate Policy*, which in turn prioritizes specific practices and topics that affect how climate change policy is made and interpreted. Science is not immediately legitimate; it is made legitimate, represented as legitimate, and used to legitimize. "The ways in which we think about and represent reality are intimately linked to the ways in which it is acted upon and governed," (Lövbrand, 2011) and science is a medium through which we think about our realities.

Because science is a critical site where norms, values, meanings, and social order are developed and reproduced (Demeritt, 2001; Jasanoff, 2004), the characterization of science as a supreme objective authority has led to the production of dominant environmental narratives. One implication has been the creation of dominant narratives

that are perceived as absolute (Jasanoff, 2010). For example, narratives equating science with progress are used to justify and prioritize certain scientific or technological investments over others (Jasanoff and Kim, 2009). Similarly, Sheila Jasanoff (2010) has demonstrated how representations of the environment come into being via understandings of how we think the world should be, and how this ultimately shapes a particular representation of climate change as inherently global. Demeritt's (2001) study regarding general circulation models (GCM) illustrates how this particular technology has "constructed the problem of global warming," a consequence of climate, "in materially and politically significant ways." For Demeritt, GCMs, in part, construct a representation of climate change that prioritizes the physical properties of greenhouse gases and reduces its social properties to an afterthought, the implication of which conceals and reproduces asymmetrical social relations. More so, Demeritt takes up concern with how social relations themselves affect climate models and determine which physical properties ought to be modeled, illustrating how the subjective side of science. Demeritt's work reveals how "tacit social commitments built into the technical details of scientific knowledge and practice" have consequences for how we come to know climate change and climate change policy via scenarios that are especially porous to social relations.

Studies of global environmental assessments (Hulme and Mahony, 2010; Jasanoff, 2010; Fogel, 2004), institutions (Miller, 2004; Lahsen, 2005; Hulme, 2016; Borie & Hulme, 2015; Waterton & Wynne, 2004), and research projects (Felt et al., 2016; Lahsen 2009) have revealed how climate change science is intimately linked with politics. Such studies make apparent how some knowledge claims are legitimized over others (Mahony and Hulme, 2018), how some political actors exert more influence than

others (Lahsen, 2005; Mahony and Hulme, 2018), and how local voices and experiences are erased from global narratives (O'Reilly, 2015). The characterization of science as universal and apolitical lends itself to the assumption that climate change science cannot and is not exclusionary or exploitive (Schuttenberg & Guth, 2015; Ford et al., 2016). To be promoted as universal equates climate change science as easily accessible, neutral, and authoritative across all scales despite underlying power differentials. To continue believing that climate change science is objective and capable of painting a "true" picture of the environment (Jasanoff, 1987) is to continue giving power to those who benefit from dominant environmental narratives. However, the reach of power in climate change extends beyond discussions of how meaning is assigned to climate change science and what narratives come into being. If STS demonstrates how science and power are entangled, then the focus of geography is to demonstrate under what conditions.

In tandem with STS, political geography takes up concern with how climate change science is produced and circulated, as well as how it gains legitimacy across time and space (Carey et al., 2016). Dominant climate change narratives have steered discussions into the area of the global where we often see discourses promoting climate change as a global problem that needs global solutions. However, not only does such a narrative play a role in erasing local and marginalized voices, experiences, and histories from climate change science (O'Reilly, 2015; Fogel, 2004; Ford et al., 2016), it also hides geographic and economic disparities between who are the largest climate change contributors and who carry the burden of climate change impacts (Hovi, Skodvin, and Aakre, 2013). Here, it is important to note that spatial manifestations of power in climate change science are connected to legacies of colonialism and imperialism that have and

continue to play a role in shaping the modern world and climate change narratives (Pulido, 2017; Lahsen & Nobre, 2007; Meehan, Klenk, and Mendez, 2018; Mahony & Hulme, 2018). Klenk and Meehan's (2015) study is illustrative of how a drive to integrate across data, results, stakeholders, and projects via transdisciplinarity in climate change science and research projects results obscures "the friction, antagonism, and power inherent in knowledge co-production" through exclusionary practices that validate some knowledges over others. The "integration imperative" has consequences for oppositional, alternative, unconventional, indigenous, and other kinds of knowledge often mediated and silenced by Western science, a result of violent legacies. Instead, the authors offer up models of knowledge co-production that sits with the differences, messiness, discursive, but often hidden nature of climate change science that allows for engagement with alternative and indigenous knowledges.

Geopolitical legacies perpetuate binaries present in representations of knowledge and world politics –global North versus global south, West versus rest (Agnew, 2007)– that reinforce notions of superiority and subordination which persist in the processes of producing and distributing science. The credibility and validity of climate change science is often determined by whom and where it was produced (Mahony & Hulme, 2018; Felt et al., 2016; Ford et al., 2016). For example, global North knowledge is often privileged as the most salient and universal, despite accounts of knowledge that reveal "universal" ways of knowing the world are merely projections of specific place-based historical experiences that become mapped onto the larger world (Agnew, 2007). Claims of credibility and validity also are conflated if we consider how understudied the role of science and its perceptions are in the global South (Lahsen, 2009). Spatial manifestations

of power in climate change science are commonplace in international settings and are played out in international conferences (Mahony & Hulme, 2018; Craggs, 2014; Craggs and Mahony, 2014) and in international assessments (Mahony & Hulme, 2018; Ho-Lem et al., 2011), where some voices and experiences attain higher rates of representation and participation than others despite contestations of inequality (Lahsen 2007, 2009; Fogel, 2004; Mahony and Hulme, 2018). Contrastingly, these spaces are flaunted as producing equitable, neutral, and authoritative global knowledge (Jasanoff, 2010).

Beyond an understanding of how climate change is made known via science and how power operates through knowledge and space, geographic research must also concern itself with how dominant sources of power can be transversed. Klenk and Meehan's (2015) models of knowledge co-production provide one example of navigating power in climate change science. However, more geographic research must focus on how to navigate or renegotiate dominant power narratives that determine how climate change is made known and, as a result, what is created, entangled, undone, and removed. This is the primary undertaking of my research.

To achieve this goal, I attempt to bridge the knowledge gaps present in geography by utilizing a critical geographic approach via subaltern geopolitics (Sharp 2011, 2011, 2013). Here, I recognize as subaltern geopolitics as a way for political geography and, by extension, geopolitics to engage with a number of these often-subordinated voices and experiences (Sharp, 2013) that may reveal novel ways of making sense of climate change that are obscured by traditional geopolitical discourses. This approach can provide an understanding of how pursuing and producing alternative geographic imaginaries addresses, to an extent, address matters of power and inequality present in climate change

science. Through a qualitative case study of the Inter-American Institute for Climate Change Research (IAI), I utilize a subaltern approach to demonstrate how alternative, but not oppositional, geopolitical narratives exist in regard to climate change science and how they are playing out in the Americas. I expand the scope of Sharp's (2011, 2011, 2013) notion of geographic imaginaries by bringing it into communication with climate change science discourses, and by drawing a connection to other imaginary frameworks—specifically, Jasanoff and Kim's (2009) sociotechnical imaginary concept. In this research, the sociotechnical framework sheds light on how subaltern geopolitics, synonymous with subaltern geographic imaginaries, are pursued through science and technology, and ultimately how technoscientific and political orders are "co-produced" (Jasanoff and Kim, 2009; Jasanoff, 2004). The combined analysis of the IAI's imaginary reveals not only how power operates through space and time via science and technology, but how dominant power structures can be navigated and renegotiated. This approach aims to develop an understanding of how power is experienced, mediated, and contested through scientific organizations that produce authoritative knowledge about climate change (e.g. the IAI); and, to explore imaginaries of climate change science that are located outside of dominant climate change narratives. These bodies of literature offer ways of understanding how geographic imaginaries are actualized via science and technology, and similarly, how imaginaries of science and technology have geopolitical implications. Ultimately, the goal of this thesis, in combining these two bodies of literature, is to analyze how the IAI's imaginary: (1) renegotiates sources of spatial power; (2) opens the domain of climate change science to excluded voices and experiences; (3) describes a desirable future for Latin American and Caribbean science

that differs from hegemonic accounts; and, (4) and, influences scientific research and innovation.

Methodology

This research aims to bridge a gap in geographic research that explores how climate change is made known and what is created, entangled, undone, and removed it; and ultimately to provide an understanding of how dominant sources of power can be navigated and renegotiated. To accomplish these goals, I utilize two methods.

The first method combines two conceptual frameworks: subaltern geopolitics (Sharp, 2011, 2011, 2013) and sociotechnical imaginaries (Jasanoff 2015, Jasanoff and Kim, 2009). The former, subaltern geopolitics, has its roots in the field of political geography by way of critical geopolitics; the latter stems from science and technology studies. The aim of combining these frameworks is to reveal how power operates through space and time via science and technology, and how dominant sources of power can be transversed. Not only does this combined analysis deepen our understanding of the relationship between climate change and power, but it also makes theoretical contributions to both frameworks, and ultimately to the disciplines of geography and STS. By bringing subaltern geopolitics into conversation with STS via sociotechnical imaginaries, how geographic imaginaries can be realized via science and technology is illustrated. Similarly, the sociotechnical imaginary framework has much to gain from political geography and subaltern geopolitics. This merger identifies how the pursuit of desirable futures, that is, the pursuit of sociotechnical imaginaries, construct geographic imaginaries and are situated within traditional and subaltern geopolitics. Current

scholarship utilizing sociotechnical imaginaries takes into consideration the role of space and place, however, rarely engages with how sociotechnical imaginaries emanate from geopolitical relations; sociotechnical imaginaries are inherently geopolitical, as much as they are affected by geopolitics.

The second method is an application of the combined analysis approach via a case study of the Inter-American Institute for Global Change Research (IAI). While a text-based analysis of the IAI lends itself to understanding where power is located and how it is navigated in climate change science, a text-based analysis alone is inadequate (Wiesser, 2014). Neumann (2002) notes that text-based examinations of global political issues often ignore how such issues are lived and experienced, and encourages a more situated approach; this is heightened by calls for more embedded, ethnographic approaches that are arising in political geography and critical geopolitics (Wiesser, 2014; Woon, 2013) scholarship. To understand how science, space, and power operate one must come into contact with the practices, opinions, and experiences of those who support, coordinate, and produce climate change science. In the summer of 2018, I conducted an institutional observation of the IAI which was guided by ethnographic approaches that encourage researchers to enter a social setting, become acquainted with the people in this setting, and systematically take note of observations (Emerson, Fretz, and Shaw, 1995). As this fieldwork and research involved human subjects, I applied for and was granted Institutional Review Board approval from the University of Oregon (Protocol Number: 12132016.020) under the umbrella of a larger research project, led by Dr. Katie Meehan, aimed at understanding interdisciplinary knowledge integration in the Western Hemisphere (Appendix B).

My methods of data collection included interviews, participant observation, and the collection of key documents. First, I conducted one-on-one semi-structured interviews with participants (n=13) that were completed face-to-face, except for three interviews which were conducted via Skype (a telecommunication application) due to differences in locations between myself and the participants. Participants (Table 1) represented a range of experiences (i.e. administrators, scientists, diplomats and country representatives, and former and current collaborators) with the IAI, and were demographically and geographically diverse.

Table 1: Participant Demographics

Gender	No.	Origin	No.	Profession	No.
Female	6	North America	4	Organizational	6
Male	7	Latin America	8	Professors/Academic Researchers	4
		Europe	1	Institutional Scientists	2
				Country representative	1

Face-to-face interviews were conducted in a private and closed office to ensure privacy. Interviews were recorded with the permission and consent of participants. Interviews completed via Skype were also conducted in a private office to ensure participant privacy and anonymity; these interviews were also recorded with the consent of participants. All recorded interviews (n=13) were later uploaded to a secure and password protected server and erased from the voice recorder. Participants were asked questions (Figure 2) related to their experiences with the IAI, as well as experiences doing international scientific work outside of the IAI.

Table 2: Interview Questions

Questions
What is your disciplinary background and training?
How did you become involved with the IAI?
In your experience, what facilitates international scientific collaboration

Could you elaborate on some of the challenges of international scientific collaboration?
Are any of these challenges specific to the Americas?
IAI's mission emphasizes capacity-building, what does this mean to you?
How do you feel capacity building relates to addressing global/climate change issues?
On a scale from 1-5 (1 being the lowest and 5 being the highest) how important is capacity-building to you?
What are some challenges to capacity-building?
What capacity building activities do you think are needed?
Could you tell me about a project in which you were involved or oversaw that was successful, or close to perfect?
Have you confronted political challenges when promoting or conducting international scientific collaboration? If so, could you elaborate/provide an example?
Is scientific colonialism a concern to you?
What research project are/were you involved with and what is/was your role?
What's unique about IAI?
What do you imagine IAI looks like in the next 5 years?

Interviews were later transcribed and coded using the qualitative analysis software ATLAS.ti. Before this analysis, I attended a workshop that provided training on the methodological principles and pragmatic functions of ATLAS.ti. To supplement this training, I also engaged with literature that provided conceptual and technical understandings of qualitative data analysis (Saldaña, 2011; Saldaña, 2015; Wolcott, 2008; Friese, 2008). The coding process involved assigning a one-word or short-phrase to portions of the transcribed interview; these phrases symbolize and assign an attribute to the selection portion of the transcribed interview. The coding process is iterative and is a tool utilized to identify patterns in the data via codifying and categorizing. The process of categorizing for this research was completed inductively and deductively, by where categories were created beforehand by drawing from the literature that informed this research and by naturally identifying categories that arose from the coding analysis. Ultimately, patterns and categories that result from the coding process form themes which inform or become theories.

For this research, themes that arose from the coding process included: designing science, types of knowledge production, scale, power, geopolitics, and institutional functions. The most common codes that surfaced, related to the themes mentioned above, were: funding, capacity-building, geopolitics, uneven development, scientific colonialism, temporal scale, spatial scale, ontology, multi-disciplinary, interdisciplinary, scientific challenges, and scientific catalysts. These codes ultimately informed how I perceived the IAI has constructed its imaginary. Many of the participants affirmed the values of the IAI in their interviews, and in more implicit ways also drew meaningful connections between interdisciplinary science, regional knowledge, and uneven development –all of which are central points in my research. Through the interview and analysis process, I was most surprised to learn about the IAI's relationship with Cuba, which is discussed at length in Chapter 2. Before commencing my fieldwork, I expected to gain a greater understanding of how the IAI worked and how it mitigated challenges in the knowledge production processes. However, I did not expect the relationship between the United States and Cuba to surface as often as it did, nor for it to stand as an example of how the IAI mitigates challenges –scientific or geopolitical– in the Americas.

I also participated in online and on-site capacity-building activities, for which I recorded fieldnotes. Participation in these activities was key to witnessing how the IAI conceptualizes and practices its role in climate change science. Through these activities, I met and familiarized myself with additional climate change stakeholders through informal conversations. Additionally, participation in these activities ensured that I came into contact with the practices, opinions, and experiences of those who support, coordinate, and produce climate change science in the region.

Third, I supplemented my institutional observation with a text-based analysis of varying (n=74) documents (i.e. founding documents, press releases, policy reports, project summaries, calls for proposals, memorandums of understanding, external institutional assessments, program evaluations) emerging from and about the Institute (Appendix A). These documents were also subject to the qualitative data analysis process described above (i.e., coding). These documents provide additional insight into the imaginary of climate change science that the IAI pursues, ultimately aiding my analysis of how the IAI enacts (i.e. lived experiences and practices) its imaginary, and represents (i.e. documents) it.

However, across my methodologies, I should note that examining the relationship between science, space, and power over a short period does have its difficulties and limitations. Any understanding derived from this fieldwork is only a partial understanding of how the IAI understands and navigates power. Furthermore, my understanding is just one of many possible perspectives and is further limited by my "outsider" status. That is, while I am of Latin American descent, I do not work 'inside' the IAI, nor do I live in Latin America. More so, due to the temporal limits of my research period, I was unable to engage with the abundance of science and technology scholarship emanating from and written about Latin America. Additionally, focusing on the Institution itself, rather than member states, also limits my understanding of how member states live and experience the IAI's imaginary, if at all.

CHAPTER II

WHERE THE SUBALTERN AND SOCIOTECHNICAL MEET: IMAGINARIES OF CLIMATE CHANGE SCIENCE IN THE AMERICAS

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Introduction

As the impacts and consequences of climate change become more apparent, efforts to address climate change must become more robust. Currently, response efforts at the international scale have geared solutions towards environmental impacts (Hulme, 2008; Bulkeley, 2019; Demeritt, 2001) through the use of science and technology. However, environmental-only solutions neglect the need for systemic societal change. Climate changes response efforts must encompass both social and environmental causes and impacts. Thus, we must recognize that climate change is more than an environmental issue, but an issue of power and inequality (Bulkeley, 2019) as well.

The position of geography at the nexus between the social and physical sciences allows us to bring forward concepts and tools from the social sciences to examine how power manifests in regards to the ecological and human aspects of climate change, as well as in regards to the natural and social sciences themselves. Power and dominance have been a concern of political geography and geopolitics (Dalby, 2010; O'Tuathail, 1999; Slater, 2008; Sharp, Routledge, Philo, and Paddison 2000) for decades. In the last 10 years alone, much geographic scholarship has examined power and dominance in the context of climate change (Weisser, 2014; Craggs, 2014; Meehan, Klenk, and Mendez, 2018; Mahony and Hulme, 2018; Miller, 2015; Carey et al, 2016; Sultana, 2014; Israel &

Sachs, 2013). However, only recently has political geography considered how climate change "comes into being, and what in turn it creates, entangles, undoes, and removes with it" (Bulkeley, 2019; Brace and Geoghegan, 2010).

This research considers climate change to be an epistemological issue; as a result, I focus on how climate change science –the production, distribution, and use of climate change knowledge– plays a role in establishing and perpetuating dominant representations of climate change that make known a particular representation of the issue and support hegemonic structures of power. Understanding where power is located and how it works in climate change science is crucial to understanding how the issue comes to be represented and who is curating the narratives.

This research brings critical geopolitics into conversation with science and technology studies (STS), in order to develop an understanding of how power is experienced, mediated, and contested through scientific organizations that produce authoritative knowledge about climate change; and, to explore imaginaries of climate change science that are located outside of dominant and oppositional climate change narratives. Through a synthesis and review of two theoretical frameworks, subaltern geopolitics (Sharp 2011, 2011, 2013) and sociotechnical imaginaries (Jasanoff and Kim, 2009), I respond to scholars who have called for: a re-examination of traditional geopolitical discourses concerning climate change (Bulkeley, 2019); a deeper understanding of the relationships between knowledge and power (Carey et al., 2016; Sultana, 2014); an inclusion of voices and experiences previously excluded from climate change science (Castree et al., 2014; Mahony and Hulme, 2018); and, more social science contributions that provide a spatial examination of knowledge (Hulme, 2008). This

review is supplemented by a qualitative case study of the Inter-American Institute for Climate change Research (hereafter referred to as the IAI or the Institute) that focuses on the IAI's relationship with the United States and Cuba, as well as the IAI's research agenda and programs, to illustrate how the Institute is addressing matters of power and inequality via its imaginary of climate change science in the Americas.

Subaltern Geopolitics and Sociotechnical Imaginaries

Traditional geopolitical scholarship has a history of relying on dominant narratives, derived from Western interpretation of events, and presenting research in terms of binaries (e.g., hegemonic versus subordinate). While such analysis is useful, it limits the scope of analysis for political geography and geopolitics. A reliance on dominant narratives and the use of binaries limits both our understanding of and engagement with alternative (not to be mistaken with oppositional) geographic imaginaries. This conclusion is drawn from the consideration that any geopolitical account, whether steeped in traditional discourse or otherwise, is just one account of a reality with a plurality of perspectives that serves a particular purpose and social order. Engaging with alternative representations of space and place, or representations of how the world is made known draws attention "to the need to negotiate across perspectives so that world politics in itself can be less the outcome of hegemonic impositions (and a dialogue of the deaf) and more the result of recognition and understanding of differences, both cultural and intellectual" (Agnew, 2007). As such, traditional geopolitical discourses must be re-examined (Bulkeley, 2019). Identifying experiences and geographies of knowledge that have been traditionally excluded or misrepresented as "in oppositional to"

or "other than" hegemonic orderings of the world provide a starting point for such re-examination. Specifically, Joanne Sharp's (2011, 2011, 2013) framework for subaltern geopolitics provides the field of political geography with the tools necessary for such an undertaking.

The goal of subaltern geopolitics is to reveal the many discourses, identities, voices, and experiences that are often silenced in traditional geopolitics (Sharp, 2013); the goal is to explore other present, but frequently overlooked, geopolitical narratives and geographic imaginations. For example, Woon (2011) illustrates how violence is constructed in hegemonic discourses of fear and how, via practices of nonviolence, it can be undone. Woon offers the lived experiences of the Reblusyonaryong Partido ng Manggagawa ng Mindanao, a Philippines rebel group, and their efforts to reframe their cause and peace talks as a way to provide an alternative narrative that exposes the relationship between power and knowledge in traditional geopolitical discourses on violence and nonviolence. In many ways, subaltern geopolitics serves to break away from the binaries present in traditional geopolitical discourses that "others" experiences outside of the dominant geopolitical narratives and renders these experiences as perpetually oppositional (Sharp, 2013; Sharp, 2011). For example, Sidaway's (2012) study of Libyan sovereignty finds that Western representations of Libyan sovereignty were deeply tied to Cold war and Italian-colonialist imaginaries which perceived the anti-imperial Libyan struggle as threatening; through dominant narratives, the Libyan revolution was not a claim for sovereignty, but rather an example of rogue and dangerous states.

Subaltern geopolitics finds that various geopolitical experiences simultaneously exist in relation to and outside of dominant geopolitical narratives (e.g., global North

versus global South) and is a way for political geography and, by extension, geopolitics to engage with a number of these often-subordinated voices and experiences (Sharp, 2013). A subaltern approach creates nuance not present in dominant geopolitical narratives. Using subaltern discourses, we can uncover the multiple ways in which the world is made known to us without privileging any one history or without assuming universality (Agnew, 2007; Sharp, 2013). Subaltern geographic imaginaries – synonymous with subaltern geopolitics – are not a counter-narrative or alternative imaginary of geopolitics in the Western hemisphere. Rather, the subaltern is an additional conceptualization of geopolitics that is entangled and situated within more dominant geopolitics and holds neither to be truer than the other. In this paper, subaltern geopolitics is used to understand how the IAI reconfigures a geopolitical imaginary of climate change science in the Americas that involves producing climate change knowledge with actors that have been traditionally excluded or subordinated (i.e., Cuba, Latin American scientists and decision-makers). However, the subaltern framework has much to gain from science and technology studies and vice versa. Coupling the subaltern framework with Jasanoff and Kim's (2009) concept of sociotechnical imaginaries, we can witness to how science and technology aid in the production of geographic imaginaries. This merger identifies how the pursuit of sociotechnical imaginaries both constructs geographic imaginaries and are situated within discourses of dominant and subaltern geopolitics; sociotechnical imaginaries are inherently geopolitical, as much as they are affected by geopolitics.

Jasanoff and Kim's (2009:120) sociotechnical imaginaries “describe attainable futures and prescribe futures” that actors consider desirable and believe are feasibly

possible by way of science and technology. The concept is useful for understanding how the pursuit of a desirable future influences scientific research and innovation, creates political will or public resolve, and ultimately how technoscientific and political orders are “co-produced” (Jasanoff and Kim, 2009; Jasanoff, 2004). Sociotechnical imaginaries, like subaltern imaginaries, can be envisioned and pursued by a range of actors –states, corporations, social movements, and, as in the case of this paper, international organizations (Jasanoff, 2015). Drawing on Jasanoff’s (2004) work, co-production refers to the “proposition that the ways in which we know and represent that world (both nature and society) are inseparable from the ways in which we choose to live in it.” In regards to climate change science, Demeritt (2001) and Miller (2015, 2004) reveal how global circulation models (GCMs) construct particular understandings of our climate system. Furthermore, Miller’s (2015) account of global security imaginaries draws connections between the legitimizing power of science and the role of global institutions (i.e., UN agencies) in establishing particular social orders. “The idea of the Earth’s climate system helped give credence, meaning, and influence to the new sociotechnical imaginary of globalism by linking scientific visions of undesirable futures to social and political reconfiguration on global scales” (Miller 2015). The pursuit of a desirable future –of an imaginary– is an expression of power that affects the production of scientific knowledge and social order. Sociotechnical imaginaries are inherently an analysis of how power is achieved via science and technology, and subaltern geopolitics illustrates how power is manifested across time and space.

Among the many ways to exercise power, power in climate change science is exercised by determining research priorities, funding allocations, credible actors, and

investments in scientific capacities and infrastructures (Jasanoff and Kim, 2009). Felt et al., (2016) illustrates how visions of science-society interactions, informed by academic structures of doing science, influence how research programs value and incorporate some actors over others. Similarly, Meehan, Klenk, and Mendez's (2018) note how transdisciplinary climate knowledge and research programs, that fail to consider geopolitical realities, co-produce and reinforce social orders regardless of inclusive and apolitical language used in research objections. Particularly, the authors note how program funding can be reflective of power dynamics. The effects of power on science and technology dictate how we perceive an issue, collectively interpret our reality, how we validate actors and knowledge, and how we are governed in relation to a particular imaginary (Jasanoff and Kim, 2009).

In this paper, both Joanne Sharp's (2011, 2011, 2013) and Jasanoff and Kim's (2009) frameworks are used to identify what kind of desirable future the IAI is pursuing; and how the IAI's vision of the future influences scientific research and innovation constructs and represents actors (excluded and included) in regards to climate change science. The combined analysis of the IAI's geographic imagination, its desired future, reveals not only how power operates through space and time via science and technology, but how dominant power structures can be navigated and renegotiated.

The Inter-American Institute for Global Change Research

To examine the role of social power in climate science, this study utilizes the Inter-American Institute for Global Change Research (IAI) as a template for analysis. Based in Montevideo, Uruguay, the IAI was established in 1992 as an intergovernmental

organization primarily tasked with supporting (i.e. funding, resources, infrastructure) and coordinating (i.e. research programs, trainings, conferences) scientific research regarding the extent, causes, and consequences of global change in the Americas. The IAI is composed of the Science Advisory Committee (SAC), the Science-Policy Advisory Committee (SPAC), the Executive Council (EC), the Directorate, and associates of the Institute (i.e., member states, affiliated institutions). Once a year, all of these divisions meet at the Conference of Parties (CoP).

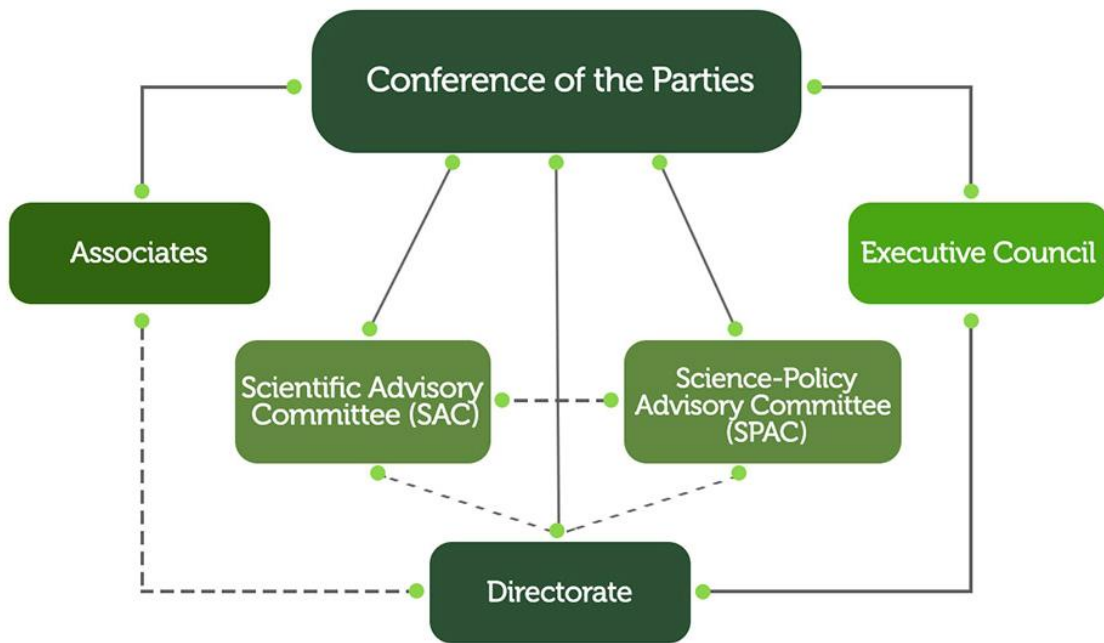


Figure 2: Structure of IAI. Image from the IAI.

The CoP is the IAI's policy-making body. Composed of the divisions mentioned above of the IAI, the CoP is tasked with establishing, reviewing, and updating the IAI's policies (e.g., procedural, institutional, and scientific policies), scientific agenda, strategic plans, and financial budgets. The CoP also monitors and evaluates the work of the IAI.

The SAC is a 10-person committee that has been elected by the CoP, and each person serves a three-year term. The SAC makes recommendations to the CoP regarding the IAI's research programs, scientific agenda, and long-term scientific strategies and goals; the SAC also leads the IAI's peer review processes that evaluate the proposals and results from the IAI's research projects and programs. In 2013, the CoP established the SPAC as a body that would advise the IAI on how to apply, design, and integrate scientific knowledge into policy and decision-making. The Executive Council is composed of nine persons, each of whom serve a two-year term and are elected by the CoP. The EC is tasked with developing policy recommendations and sees that policies approved by the CoP are implemented. Lastly, the Directorate oversees the IAI's programs and operations. The IAI Directorate is led by the Executive Director, who is assisted by staff members, a Deputy Executive Director, program managers, program officers, and interns.

The IAI defines global change as, “the long-term chemical, biological, and physical processes of the Earth system” that are subject to constant alternation and “is both natural in origin and human-induced.” In this paper, I render the IAI's understanding of global change synonymous with broader definitions of climate change. The IAI's mission is to support and use the best science available to inform decision-makers and guide policy action on climate change. Despite its large geographic extent and range of member countries, the IAI is less well known than global scientific organizations, such as Future Earth. Member states include: Argentina, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Guatemala, Jamaica, Mexico, Panama, Paraguay, Peru, United States of America, Uruguay, and Venezuela. On a day-to-day basis, some of the functions of the IAI include: developing

research programs; developing trainings, conferences, and workshops; fundraising and grant writing; supporting implemented research programs; and establishing cross-sectorial partnerships (i.e., establish relations with non-member state countries or other international organizations). Its broader functions include: implementing research programs; disseminating research findings; hosting conferences, trainings, and workshops; producing scientific literature; and supporting decision-makers using IAI science.

Methods

My interests in climate change science led me to Montevideo, Uruguay in 2018 where over the course of six weeks I conducted an institutional observation of the IAI guided by ethnographic approaches that encourage researchers to enter a social setting, become acquainted with the people in this setting, and systematically take note of observations (Emerson, Fretz, and Shaw, 1995). First, I conducted one-on-one semi-structured interviews with participants (n=13). Second, I participated in online and on-site capacity-building activities, including attending an international workshop in Panama City, Panama aimed at science diplomacy in Latin America. Third, I supplemented my institutional observation with a text-based analysis of varying (n=74) documents (i.e. founding documents, press releases, policy reports, project summaries, calls for proposals, memorandums of understanding, external institutional assessments, program evaluations) emerging from and about the Institute. Both the interviews and documents were subject to analysis via qualitative coding. The themes that evolved from qualitative analysis included: design of science, types of knowledge production, scale, power,

geopolitics, and institutional functions. Additionally, several codes surfaced as the most common during the analysis process; these codes include: funding, capacity-building, geopolitics, uneven development, scientific colonialism, temporal scale, spatial scale, ontology, multi-disciplinary, interdisciplinary, scientific challenges, and scientific catalysts.

Imagineries in Practice at the IAI

Over the last 25 years, climate change science supported and coordinated by the IAI has evolved to be needs-based, multi-scalar, and interdisciplinary –and this is precisely how the IAI imagines climate change science in the region ought to be.

The IAI focuses its scientific endeavors around its science agenda. The original science agenda, established in 1992, had seven areas of concern for scientific research: tropical ecosystems and biogeochemical cycles; impacts of climate change on biodiversity; El Niño Southern Oscillation (ENSO) and interannual climate variability; ocean, atmosphere, and land interactions in the intertropical Americas; oceanic, coastal, and estuarine processes in temperate zones; temperate terrestrial ecosystems; and, high latitude processes. The science agenda was revisited in 1998, by SAC and the CoP, and was consolidated into four areas that focused on: understanding climate variability in the Americas; ecosystems, biodiversity, land use and water resources in the Americas; changes in the composition of the atmosphere, oceans, and fresh waters; and, integrated assessments, human dimensions and applications. The science agenda was once again revisited in 2003 by SAC, but no changes were made. The science agenda has not been reviewed since and these four areas continue to guide the IAI's scientific and research

projects. Although the focus of this section is to understand the IAI's desirable future climate change science, and set to the foundation to understand how this sociotechnical imaginary informs its geographic imaginary, and ultimately a subaltern geopolitics of climate change science in the Americas, it is worthy to note that the IAI's science agenda also has implications for the IAI's imaginary. The Institute's science agenda defines what areas of climate change are worth investigating, and these areas of research affect what kinds of projects the Institute will take on. In part, the science agenda determines the relevancy of a proposed project and projects that fall outside of the agenda's scope have little place in the IAI's imaginary. Additionally, while this paper considers climate change to primarily be an issue of power and inequality with environmental consequences, the IAI's science agenda establishes a contrasting narrative: climate change a complex environmental issue with socio-cultural and political consequences. In its work, the IAI explicitly addresses climate change as an environmental problem, but only implicitly addresses climate change as a matter of power and inequality.

Over the years, the IAI has developed and executed thirteen multi-year research programs: Start-up Grants (SUG), Initial Science Programs (ISP) 1-3, Programs to Expand Scientific Capacity in the Americas (PESCA), Small Grant Programs (SGP) 1-2, Small Grants for Human Dimensions (SGP-HD), Small Grants for Collaborative Research in the Americas (SGP-CRA), Small Grants Program for Human Wellbeing (SGP-HW), and Collaborative Research Networks (CRN) 1-3. On occasion, the Institute also manages and aids the coordination and development of research and capacity building activities for research projects funded by external sources. For the sake of brevity, this paper will focus on the IAI's most notable and largest research program, the

Collaborative Research Network (CRN), which been deployed three times: CRN-1 in 1999, CRN-2 in 2006, and CRN-3 in 2012. The cost and length of support per project in a given CRN program range depending on scope and demand, but generally each CRN has funded approximately 13-17 research projects for 3-5 years with funds ranging between USD\$ 98,000-\$1,000,000. The most recent program, CRN-3, was comprised of 112 investigators across 90 institutions within 15 of the IAI's member states and took place over a five-year period. As noted in Document 31 (Appendix A) the program's first iteration, CRN-1, was perceived as "broad" and "self-contained" with little interdisciplinary opportunity; overall, CRN-1 was assessed as producing high-quality science but with little application and relevance. Now ending its third iteration, the program is considered a reflection of the IAI's sociotechnical imaginary. As such, further analysis of climate change science at the IAI in this paper will strictly focus on the CRN-3.

Regional Imaginaries of Climate Change Science

Previous to the CRN-3, the IAI had struggled to effectively increase the role of human dimensions and the social sciences in its scientific endeavors, despite these areas as critical to the IAI's science agenda. Lessons learned between the CRN-2 and SGP-HD, leading up to the CRN-3, affected how the IAI and SAC selected proposed projects for funding. As Document 1 (Appendix A) illustrates, research projects selected for the CRN-3 were considered based on the IAI's traditional criteria: scientific excellence and technical soundness; relevance to the IAI's goals and objectives; multinational and multidisciplinary collaboration; policy relevance; stakeholder interaction and knowledge dissemination; contribution to capacity building, both addressing human resources and

institutional capacities to conduct international research and address climate change issues; realistic deliverables and milestones; appropriateness of the budget request. Each project selected was also required to work with four IAI member countries, which was interpreted to mean that each project must involve personnel and institutions from four IAI member countries. However, unlike previous CRN programs, CRN-3 added additional criteria: projects had to display a real commitment to interdisciplinary research that linked human and natural sciences (Pittman et al., 2016). "Scrutiny of the project proposals and work plans had to go beyond scientific peer review to ensure interdisciplinarity," and included scrutiny of budget percentages allocated to the social sciences, social science authorship and publication, and proposed details regarding social science fieldwork (Pittman et al., 2016).

Having added such criteria, and after close consideration of the proposed projects' commitment to interdisciplinarity, the IAI ultimately rejected 93% of the CRN-3's proposals and approved only 10 projects. As Pittman et al. (2016) note, many of the CRN-3's proposed calls were found lacking and as a result "fewer proposals were funded, leaving funds for a second, more thematically focused call." The second call of the CRN-3 was targeted towards the social sciences and was aimed at the interdisciplinary process itself with a focus on improving scientific integration in scientific research, decision-making, and policy. Overall, the integration of the social sciences in the programs' research projects increased from 33% to 87% between CRN-1 and CRN-3, with an increase in the use of qualitative methods also noted (Pittman et al., 2016). Particular to its sociotechnical imaginary, the IAI utilizes its research criteria and proposal selection process, as exemplified above, to materialize and pursue interdisciplinary research as a

preferred model for climate change science in the Americas. The IAI reinforces this imaginary through its language (e.g., Documents 1, 2, 32, 33, 42, 44, and 64 in Appendix A) and its activities (e.g., providing training on interdisciplinary methods and tools). Particular to the geopolitics of the Americas, pursuing an interdisciplinary future also has implications for who participates in climate change science. As later sections will explore, the IAI utilizes interdisciplinary science and technologies to pursue a geographic imaginary that involves cooperation between the United States and Cuba.

Beyond interdisciplinarity, the CRN-3 was also aimed at providing needs-based and "policy-relevant" science, a crucial component to the Institute's values and mission. The extent to which the IAI produces policy-relevant science is up for debate and has been a point of criticism in both interviews from this project and external assessments (AAAS, 2007). Regardless of measurable success, the IAI reinforces its commitment to need-based and policy-relevant science in its work, and more specifically through the CRN-3 by funding projects (see Documents 25-30 and 66-73 in Appendix A) that have a wide variety of stakeholders (e.g. policy-makers, private sector, non-governmental organizations, community leaders, indigenous groups). These efforts are further reinforced via the Institute's additional research programs and overall capacity building efforts. Notably, the IAI has previously coordinated and hosted conferences and workshops online and onsite at the request of its member countries. For example, during my research period, a collection of Central American and Caribbean member countries had reached out to the IAI to host a workshop centered around science diplomacy and climate change. In October 2018, I attended a three-day workshop held in Panama City, Panama. As the conference agenda, Document 25 (Appendix A), shows, this included a

range of participants (i.e. scientists, academics, policy-makers, and diplomats) from nine Latin American countries, all parties to the IAI. The results of these efforts are apparent as Pitmann et al. (2016) note, "researchers who engaged in IAI's programs noted the importance of having practical outcomes," and those engaging with interdisciplinary research considered having tangible outcomes as a motivating factor. Similar to its interdisciplinary dimension, the IAI pursues needs-based, or policy-relevant, science and technologies by encouraging, support, and sometimes requiring place-based scientific knowledge. Additionally, the IAI makes itself accessible (i.e., via trainings, conferences, meetings, visits) to states and decision-makers when called upon by its member states. This too has implications for its geographic imaginary. In the case of the Panama City workshop, as mentioned above, I witnessed how the IAI answered the calls of its coastal and Central American members. The IAI hosted a science diplomacy workshop to support scientists and diplomats –who, as conversation with workshop participants revealed, felt disadvantaged by geographic location and scientific capacity– and provided tools for dialogue and collaboration on this specific topic. Lastly, the IAI also pursues and supports multi-scalar climate change science. In this regard, multi-scalar refers both to the geographic extent of a given project and the scale from which results are both derived and can be applied to. The IAI's particular imaginary of climate change science is driven by two additional factors. First, is the IAI's own identity as a regional organization. As one participant noted:

“So the global scale informs only the negotiators of the climate change framework, the local scale should inform the action of county, local governments, and that’s very important. The niche that IAI should cover is the one in between, the regional.”

The IAI's identity as a regional organization sets the scope of its work and goals. As such the IAI is geared towards incorporating as many countries as possible in the Western hemisphere, producing and disseminating knowledge in this region, and ultimately informing policy that would have implications for the region. Second, are expressed beliefs that regional knowledge is the best avenues to address climate change. Statements from past director (see Document 66 in Appendix A), Holm Tiessen, note “the effects of climate change differ greatly between ecosystems, landscapes and societies. Regional differentiation of knowledge and decision making is needed to address the challenges of global change.”

The extent to which the IAI's imaginary is impacting the production, distribution, and consumption of climate change science in the Americas, and at large, is up for debate. Further considerations of the IAI's work also acknowledges how much of the IAI's imaginary for climate change science lies within dominant climate change narratives (e.g., global commons problem that requires international collaboration, the use of GCMs to construct futures, good science leads to good policy). However, the IAI's sociotechnical imaginary is undoubtedly reshaping how science ought to be done for its network of stakeholders. Just from the CRNs, program participants noted that through the CRN programs they were able to: learn how to do interdisciplinary research; gain exposure to new tools and concepts; establish and maintain interdisciplinary networks; rely on the mentorship and support of the IAI through all stages of the projects; and, link their projects to "concrete problems and connect with actors in the applied domain" (Pittman et al., 2016). The Institute's imaginary for climate change science is also creating space and opportunities for typically marginalized actors (i.e., states, scientists,

diplomats, government officials, universities, researchers, and graduate students from Latin America and the Caribbean) in the production and distribution of climate change science. Participation in climate change science at the Institute considers stakeholder occupation (e.g., scientist, diplomat), stakeholder origin and nationality, and educational attainment; in all of these categories, the IAI tries to open up climate change science.

Overall, the IAI has been able to increase how many PIs native to Latin America and the Caribbean lead large international scientific projects (see Documents 66-73 in Appendix A), it has also increased South-South collaborations across the Americas (Pittman et al., 2016; AAAS, 2007)— an effort which leads to increased scientific capacities and decreased dependence on resources and knowledge that are both foreign and dominant.

Informal talks with IAI personnel also revealed recent efforts to engage with indigenous communities, leaders, and knowledges, as well as participatory research methods, in order to further broaden the scope of stakeholders in climate change science across the Americas. However, there was little perceivable focus on other social strata (i.e., gender, race, sexual orientation, and class) which play a role in silencing and marginalizing traditionally “othered” voices and experiences; at this juncture, the IAI has much to gain from intersectional discourses (Crenshaw, 1990). Overall, climate change science in the Americas will continue to be produced and distributed with or without the IAI, however, the Institute’s commitment to Latin American and Caribbean science and capacity-building may be one of the efforts needed to transverse dominant narratives that dismiss global South knowledge as invalid or lacking credibility.

The Subaltern Geopolitics of Climate Change Science in the Americas

Producing, doing, and distributing science in the Western hemisphere is tied to histories of violence that have and continue to affect many aspects of producing knowledge in the region. Present and past accounts of scientific endeavors in the region are intertwined with geopolitical legacies of colonialism, exploitation, and resource control and development (Meehan et al., 2018; Lahsen & Nobre, 2007; Galeano, 1997; Hecht and Cockburn, 1989). This region, made up of the Americas (North, Central, and South America and the Caribbean), is itself "a constructed spatial imaginary and social order" that has served to sustain hegemonic and geopolitical power structures (Meehan et al., 2018) that remain alive and well today. As a result, climate change science in the Americas is witness to dominant narratives that: determine who can and cannot participate; legitimize particular social orders (Mahony and Hulme, 2010; Miller, 2015); and, give credibility and validity to a range of knowledges, environmental or otherwise, based on geographic origin (Felt et al., 2016; Lahsen & Nobre, 2007; Agnew, 2007). The consequences of these power structures produce and perpetuate binaries that posit states in the region as either part of the global North or outside of it, in the global South (Sharp, 2011; Agnew, 2007). The implications of this are far-reaching, but for climate change science it can mean some actors are considered more credible or capable than others solely based on spatial arrangements. However, the subaltern geopolitics of the Americas, through the IAI, offers up a different vision. The subaltern geopolitical imaginary of the IAI is, in part, born through the Institute's understanding and embodiment of climate change science, and is demonstrated below.

Collaborating with Cuba

While the majority of the IAI's membership and research is focused in Latin America, the majority of its funding (participants approximated somewhere between 75-85% of the research budget) is provided by the United States. The funds provided for the IAI's research budget supports small grant programs, research networks and larger research programs, workshops, trainings, and other short-term educational opportunities. This financial relationship comes with strings attached. By accepting money from the United States, the IAI must adhere to U.S. foreign policy when using U.S. funds. As one participant noted:

"Um, in the case of the US, of course we have additional rules on spending money that has to be constituent with US foreign policy and in the case of Cuba, obviously there were considerations there for what activities we could and could not support for Cuba. We cautioned the IAI Directorate itself, once it had its own financial system to be up and running to be able to comply with those regulations."

Of the numerous implications this caveat has, the most noteworthy is how this funding structure determines who can and cannot participate in the IAI's research endeavors and by extension who can and cannot participate in climate change science within the region. This has specific consequences for Cuba, one of three states the United States has severed diplomatic relations with. Although relations with Cuba are not as restricted in comparison to those with Iran or North Korea (the other two states without full U.S. diplomatic relations), the United States continues to uphold austere restrictions regarding travel to and funding for Cuba or Cuban nationals. As a participant summarized:

"One issue in terms of geopolitics in the region is the, because our funding comes from the US government, the issue with Cuba. Unfortunately, we haven't been able to fund a lot of Cuban scientists or research projects because of the embargo and the current politics... Um, for the IAI, the only issue uh so far has been the Assistance Act issues for Cuba. Um, under the Assistance Act, we're not allowed to assist, I'll get back to that, any country with whom we do not have full diplomatic

relations. Now while partial diplomatic relations were achieved with Cuba, the full set were not, and so the Assistance Act still applies.”

This relationship between the U.S. and Cuba is complex and was strained during the Cold War era, where a geopolitical imaginary of the world was pervasive. The history between these states is lengthy, complex, and has been subject to numerous analyses. Although the history between the United States and Cuba dates further back than the 1960s embargo, the starting point for this research begins with the rise of Fidel Castro. A recap of modern history between the United States and Cuba dates tensions to October 1960, when the United States placed an economic embargo on Cuba and severed diplomatic relations (Domínguez, 1997). The motives for such political action from the United States were driven by disparate political ideologies (i.e., communism versus capitalism, socialism versus democracy). During the Cold War, U.S. motives in the Western hemisphere were to contain the rise and spread of communism; a “responsibility” the United States took upon itself that has been linked to its historical hegemonic power in the region as a result of the Monroe Doctrine. However, when Fidel Castro, the communist revolutionary turned president turned dictator, rose to power and established relations with the Soviet Union, the United States proceeded to pursue a series of political and military strategies (i.e., economic embargo, Bay of Pigs invasion) meant to undermine Castro and beat the “Red Scare” (Domínguez, 1997). However, these strategies backfired and strengthened ties between the Soviet Union and Cuba, who economically and ideologically supported Cuba until its demise at the end of the Cold War. Yet, well after the end of the Cold War, relations with Cuba remain frozen; in some years they seem to thaw (i.e., Obama-era changes), but little has changed overall.

This funding structure is reflective of hegemonic and regional geopolitical power that, in part, exerts control via economic domination (Sharp, 2013). However complicated the relationships the IAI has with Cuba and the U.S., the IAI has long taken a position to include and collaborate with Cuba. For example, in 2001 (see Document 24 in Appendix A) the IAI organized a meeting of the IAI's executive council in La Habana, Cuba, requiring the IAI's U.S. representatives and other relevant U.S. nationals to seek special permission to participate in the meeting. Generally, the IAI is not required to use U.S. funds in all of its research endeavors, and that means when utilizing non-U.S. monies, the IAI is not required (some exceptions apply) to uphold U.S. foreign policy. The IAI uses this loophole to advance its relationship with Cuba, as well as Cuba's relationship with other Latin American states. On numerous occasions, past and present, the IAI has leveraged its diplomatic relations with its other member parties to support Cuba, most of whom have no historical animosity for the state. As one participant says:

“One issue in terms of geopolitics in the region is the, because our funding comes from the US government, the issue with Cuba... We've been trying to overcome that barrier, you know, looking for resources somewhere else.”

The IAI works with its member parties to find in-kind and external funds to support Cuban attendance and participation in all of its research endeavors. For example, during the science diplomacy workshop in Panama, Cuban representatives and scientists were able to attend and participate due to support from Guatemala and Panama. Similarly, the IAI works to ensure Cuban stakeholders can participate in its research programs, attend the annual CoP, and participate in other activities such as trainings and workshops. In this manner, the IAI constantly challenges the power relations derived from such an imaginary that seeks to "reproduce subordinate modes of representation" (Sharp, 2013;

Sharp, Routledge, Philo, & Paddison, 2000; Slater, 2008). The IAI's rejection and navigation of regional hegemonic power is a reworking of dominant geopolitics (Sharp 2011; Sharp 2013). While the U.S. and Western representations of Cuba position it as outside of or resistant to U.S. geopolitical imaginaries, the IAI repositions Cuba within different geopolitics –subaltern geopolitics. The IAI pulls Cuba out of the margins of geopolitical discourses via a reimagination of what geopolitics in the region ought to be like that is actualized through the IAI's vision of climate change science and technologies. The IAI, and by extension, Cuba, are Sharp's (2013) "people" who "have been differently entangled with networks of domination and resistance, who can neither be seen as below or outside, but nor could they be seen as powerful, central, or dominant."

Colonialism and Exclusivity in Climate Change Science

The power structures and dominant narratives established from centuries of violent geopolitical legacies in the Western hemisphere affect more than just political relations, as demonstrated above. These legacies have established and reinforced dominant narratives of knowledge validity and credibility based on geographic origin. In this section, I focus on how the IAI has pursued a subaltern geopolitics of knowledge production, working to increase perspectives in climate change science that “do not either privilege a singular history of knowledge [...] or presume conceptions of knowledge that implicitly or explicitly assume their own self-evident universality” (Agnew, 2007).

Considering geopolitical narratives affect “knowledge relations” (Felt et al., 2016) in the Americas, then the relationship between actors can be defined through the exchange of knowledge. Here, the term “knowledge relations” refers to how place is

related to knowledge; specifically, “relationships between actors are defined through the exchange of knowledge” as well as to the positioning of different types of knowledge to one another (Felt et al., 2016). Thus, based on a history of the region, the relationship between the categorical global North and global South in the Western hemisphere can be defined as exploitive. A history of Latin America reveals practices of “scientific colonialism” (Lahsen & Nobre, 2007) –“the use of less developed countries’ human and material resources in ways that minimally benefit the poorer host countries in terms of intellectual, human, and material gains”– that are as problematic today. For centuries, the global North has dug up, carved, and destroyed many ecosystems, among other resources, in the name of science, with little regard for environmental, social, economic, or political consequences. These effects of colonialism linger today; violent practices and legacies have entrenched particular social orders within the region, the result of which are a reinforcement of uneven power structures, and systems of oppression and inequality often perpetuated by previous colonial subjects.

In Latin America, we don’t have to look much farther than Amazonia for an example. As Hecht (2013) notes, “The Scramble for the Amazon has received little attention... yet the final outcome is reflected in every modern map of South America.” Today, in the context of producing, distributing, and using climate change science, these practices look different. During the interview process participants identified what some exploitive practices look like today: an international research project with an American primary investigator (PI), mostly American research assistants, and underpaid local translators; or multi-national projects with non-Americans serving in marginal roles as a check for funding requirements; or conflicts over authorship and research publication; or

research projects that extract knowledge but do not benefit the local community or host country; the list could go on. As a participant recalls:

"I felt sort of sad for Latin America. It was clear what was happening was that you would get a team from US and maybe a team from Canada who were the ones who really knew what they wanted to do what kind of research and then because it was a prerequisite to involve more than I think 2 or 3 countries, this was like you know like European culture, they would invite people from I don't know Bolivia or Nicaragua so it was like a check. I involved people from Bolivia, check. I involved people from Nicaragua, check. It was a very uneven situation, you had very strong research teams and often students from Canada, U.S. and then weak teams from other countries. It was like a joke, it was like a game."

These practices are conflated by other factors favoring sustained hegemonic power, such as the acceptance of English as the de facto language of science, or deep asymmetries in the scientific infrastructure and capacities between states.

The IAI has certainly been working to redefine knowledge relations in Latin America in two key ways. Primarily, the IAI has sought to improve scientific capacities in Latin American and the Caribbean via its scientific research and capacity building efforts, the latter of which is "particularly important in less developed countries, as they have fewer financial resources and are most vulnerable to the multiple stresses that arise from rapid, simultaneous changes in social and environmental systems" (Lahsen & Nobre, 2007; Kates et al., 2001). A 2007 (AAAS) external evaluation of the IAI, conducted by the American Association for the Advancement of Science (AAAS) notes that "Over the past 13 years, the IAI has witnessed a steady increase in the number of member countries with sufficient capacity to lead large CRN projects [...] the Institute's greatest regional contribution has been in successfully building scientific capacity throughout the Americas." The IAI has achieved success in its capacity-building efforts through several practices that include: providing consistent mentorship across time and space, encouraging scientific innovation, funding and coordinating networking and

network-building, keeping stakeholders up to date with concepts and methodologies, and providing feedback through all stages (calls for proposals, proposal selection, and implementation) of a program (Pittman et al., 2016). Additionally, the IAI has also worked to challenge who can and cannot participate in climate change science at the level of the body. The AAAS's (2007) external evaluation of the IAI reveals that since 1996 the number of Latin American and Caribbean PIs has steadily increased. Currently, Latin American and Caribbean PIs exceed U.S. or Canadian PIs by more than 65%. Additionally, the IAI has significantly promoted research collaborations between Latin American and Caribbean states, an attempt to increase "South-South collaborations" and minimize dependency on global North institutions and resources. Between the two most recent iterations of its largest research program, Collaborative Research Networks (CRN), CRN-2 and CRN-3, the number of South-South collaborations increased from 52% to 67% respectively (Pittman et al., 2016).

Over time, the IAI has steadily increased the number of Latin American and Caribbean stakeholders involved in climate change science. The interdisciplinary approach pursued by the IAI, discussed in previous sections, has increased participation from the non-science community. In its work, the Institute pursues and requires work from the private sector, non-governmental organizations, community leaders, and decision-makers. This is evidenced, in part, by: its partnership with the funding platform Belmont Forum (see Document 65 in Appendix A); other partnerships with organizations such as the AAAS, or Organization for American States (see Documents 36-40 in Appendix A); participants from its previous seminars, conferences, and workshops (see Documents 25-30 in Appendix A); and, its research projects and calls for proposals (see

Documents 1-3 and 66-73 in Appendix A). The IAI's efforts to increase and improve scientific capacity works in tandem with the representation efforts detailed above to address issues of exclusion, representation, and knowledge validity, to an extent, in climate change science. Some of the IAI's most recent endeavors have also sought to broaden the inclusion of participatory research, and local and indigenous knowledges. However, the IAI's work does meet a limitation here; the IAI has pursued a model of inclusivity that does not consider all social strata; as earlier sections commented, the IAI could benefit from intersectional discourses (Crenshaw, 1990).

Discussion

The dual imaginary approach utilized in this paper focuses on the spaces that traditional geopolitics ignores to reveal new pathways of engaging with and representing climate change science. More broadly, the significance of the IAI's imaginary through a synthesis of subaltern geopolitics and sociotechnical imaginaries reveals new ways of engaging with geopolitical discourses. For example, breaking away from traditional geopolitical discourses reveals not only how we can include previously excluded or exploited voices, by way of documenting their lived experience (i.e., the experience of the IAI), but also how its already being done. Engaging with geopolitical discourses outside of the dominant literature allows us to deepen our understanding between science, space, and power so that we may ask new questions moving forward. More importantly, this engagement allows us to address matters of power in climate change science, and follow in the footsteps of those already working towards fair and equitable representations of climate change.

The subaltern and sociotechnical frameworks utilized in this paper reveal how the IAI's imaginary is both subjected to and a mediator of power in climate change science. For the IAI, power is mainly experienced by way of funding and support structures, geopolitical legacies and relations, and exclusivity in knowledge production. The combined consequences of dominant geopolitical narratives, exploitive practices, and additional factors revealed two problems. First, environmental knowledge production has a representation problem. Second, environmental knowledge produced in the global South is perceived as less credible or less valid. However, the IAI navigates these obstacles by pursuing their own particular vision of how climate change science ought to be. The IAI accomplishes this vision through practices and activities (i.e., capacity-building, workshops, seminars, research projects) that codify climate change science in the region as multi-scalar, needs-based, interdisciplinary, and inclusive. Across the Americas, the IAI has been instrumental in developing South-South relations and scientific capacities, which not only minimizes dependence on global North resources and institutions, but lends itself to challenging misconceptions about knowledge validity produced outside of the global North imaginary. This is supplemented by the Institute's efforts to increase participation in climate changes science by opening up science-making to previously excluded states and individuals. In broader terms, the dual imaginary approach may prove beneficial to identifying experiences, like the IAI's, that are rendered as outliers in the climate change science community. The IAI's small presence in this community, compared to the IPCC or other organizations such as Future Earth, often renders its efforts invisible. To date, only a handful of studies take up discussion with the social processes involved with producing climate change science at the IAI, and

across the Americas more broadly. Yet further analysis of the climate change science in the region and at the Institute could be revealing of both additional tensions and challenges, as well as novel practices for navigating power in a crowded international system.

As this paper shows, the IAI's imaginary for climate change science relies on a reconfiguration of geopolitics in the Americas, as well as on particular science and technologies. However, the IAI's imaginary does have its limits, as it always will. In terms of dominant geopolitical narratives, any reconfiguration of geopolitical relations is not completely outside of hegemonic special and social orderings. Much of the work the IAI does may address some of these sources of power, but ultimately, hegemonic orderings of the world will continue to affect how we produce climate change science and how we come to know it. For example, while the IAI can find ways of circumventing U.S. influence in terms of supporting Cuba, these geopolitical relations remain a hindrance to science in the region at large. More broadly the IAI must still navigate systems of oppression and inequality that its member states are simultaneously subject and complicit to. The ability for the IAI to address every challenge is impossible, and rather a total reconfiguration of society, and how we produce knowledge, would be required. Additionally, the IAI itself is complicit to excluding and silencing voices and experiences. Although much of the IAI's work places emphasis on uplifting voices from the Americas, its lack of intersectional awareness perpetuates systems of exclusion especially along lines of race and gender. Further analysis of the Institute could reveal additional tensions among its stakeholders, especially if we ask questions regarding the values of some actors in comparison to others. My experiences at the IAI have,

superficially, led me to conclude that, for the IAI, scientists and high-level decision-makers are valued more than extra-scientific actors, such as the public. I should note that this is also a result of the IAI's mission and mandate; it was designed specifically to engage with these two actors. Additionally, regarding dominant climate science representations, the IAI engages with many discourses that accept the global commons problem as true, and GCMs as authoritative renderings of the Earth system's future. Similar to the work of Van der Hel (2015), the IAI operates "on a precarious balance between doing more of the same under a different name, and supporting and steering research communities towards new modes of knowledge production."

More broadly, the synthesis of subaltern geopolitics and sociotechnical imaginary frameworks can inform our understanding of similar organizations. Applying this dual analysis approach to other organizations, be it Future Earth, the IPCC, or beyond, we can identify how particular imaginaries are pursued across time and space via science and technology. Yet, because these frameworks are also inherently about discussing power and where it's held, utilizing subaltern geopolitics and sociotechnical imaginaries together can be revealing of how similar organizations exercise or navigate power in regards to climate change. More so, the application of subaltern geopolitics to climate change helps us draw out the multitude of places and experiences that are silenced in more traditional discourses which can provide a more meaningful understanding of how power operates and is simultaneously renegotiated.

Conclusion

Climate change is not just an environmental problem. Climate change is a matter of power and inequality with environmental consequences. However, we come to understand climate change as an environmental problem through dominant representations and narratives of the environment that obscure underlying sources of power and inequality. More so, dominant environmental narratives work to obscure the relationship between science, space, and power; a synthesis of STS and political geography literature draws attention to such a relationship. In the context of climate change science, STS reveals how the objective designation given to science reinforces dominant narratives, projects place-based knowledge as universal and authoritative, removes subjectivity and meaning from science, and serves to perpetuate modes of subordination via exclusion. Geographic literature in this regard, supplements findings from STS scholarship by contextualizing how the relationship between climate change science and power has a spatial component that regulates knowledge production and distribution, and participation and representation. The combination of these disciplines broadens our understanding of how power utilizes science and space as a vehicle. However, little scholarship has looked at sites that seek to renegotiate power structures and differentials. By combining a geopolitical and STS framework, this research illustrates the additional, alternative imaginaries of climate change science that are playing out in the Americas. These imaginaries, both subaltern and sociotechnical, work to uncover how narratives regarding climate change science exist both within and outside of dominant environmental narratives. Ultimately, such an analysis illustrates how power is being navigated and renegotiated across science and space. Additionally, this research

serves to, an extent, answer scholars calling for the re-examination of traditional geopolitical discourses concerning climate change (Bulkeley, 2019); a deeper understanding of the relationships between knowledge and power (Carey et al., 2016; Sultana, 2014); an inclusion of voices and experiences previously excluded from climate change science (Castree et al., 2014; Mahony and Hulme, 2018); and, more social science contributions that provide a spatial examination of knowledge (Hulme, 2008).

APPENDICIES

APPENDIX A: LIST OF DOCUMENTS FOR TEXT-BASED ANALYSIS

No.	Document Name	Document Type
1	Inter-American Institute for Global Change Research Call for Proposals, Collaborative Research Network 3	Call for Proposal
2	Inter-American Institute for Global Change Research Small Grants Program for Human Wellbeing Call for Proposals	Call for Proposal
3	Inter-American Institute for Global Change Research Small Grants Program for Human Wellbeing Call for Proposals, Full Proposal Guidelines	Call for Proposal
4	Conference of Parties 2015 Report of 40th meeting of the Executive Council	Conference of Parties Report
5	Conference of Parties 2015 Report of the 39th Meeting of the Inter-American Institute for Global Change Research Executive Council (EC)	Conference of Parties Report
6	Conference of Parties 2015 Report of the 23rd Inter-American Institute for Global Change Research Conference of the Parties (Conference of Parties)	Conference of Parties Report
7	Conference of Parties 2016 Report of the 24th meeting of the Conference of the Parties	Conference of Parties Report
8	Conference of Parties 2016 Report of the 41th meeting of the Executive Council	Conference of Parties Report
9	Conference of Parties 2016 Report of the 42th meeting of the Executive Council	Conference of Parties Report
10	Conference of Parties 2017 Report of the 25th meeting of the Conference of the Parties	Conference of Parties Report
11	Conference of Parties 2017 Report of the 43th meeting of the Executive Council	Conference of Parties Report
12	Conference of Parties 2017 Report of the 44th meeting of the Executive Council	Conference of Parties Report
13	Conference of Parties 2018 Report of the 25th meeting of the Conference of the Parties	Conference of Parties Report
14	Conference of Parties 2018 Report of the 2nd Science-Policy Workshops of the Inter-American Institute for Global Change Research	Conference of Parties Report
15	Conference of Parties 2018 Report of the 43th meeting of the Executive Council	Conference of Parties Report
16	Conference of Parties 2018 Report of the 44th meeting of the Executive Council	Conference of Parties Report
17	Conference of Parties 2018 Report of the Directorate on Capacity Building	Conference of Parties Report
18	Conference of Parties 2018 Report of the Inter-American Institute for Global Change Research Directorate on Science-Policy	Conference of Parties Report

19	Conference of Parties 2018 Report of the Inter-American Institute for Global Change Research Directorate on Science	Conference of Parties Report
20	Conference of Parties 2018 Report of the 26th meeting of the Conference of Parties to the Inter-American Institute for Global Change Research	Conference of Parties Report
21	Conference of Parties 2018 Report of the 45th meeting of the Inter-American Institute for Global Change Research Executive Council	Conference of Parties Report
22	Conference of Parties 2018 Report of the 46th meeting of the Inter-American Institute for Global Change Research executive council	Conference of Parties Report
23	Conference of Parties 2018 2nd joint meeting of the Scientific Advisory Committee and Science Policy Advisory Committee	Conference of Parties Report
24	Conference of Parties Report of the 14 th Meeting of the Executive Council	Conference of Parties Report
25	Objectives of the Science Diplomacy Workshop	Event Program
26	Professional Development Seminar: Transdisciplinary Approaches to Integrating Policy and Science for Sustainability	Event Program
27	Workshop on South-South Cooperation for Climate and Sustainable Development Progress, Latin American and Caribbean Climate Week	Event Program
28	The Third Science for Biodiversity Forum	Event Program
29	São Paulo School of Advanced Science on Ocean Interdisciplinary Research and Governance	Event Program
30	Professional Development Seminar on modeling strategies and decision-support tools for the management of complex socio-ecological systems	Event Program
31	Report of the External Review Committee Assessment of the Inter-American Institute for Global Change Research	External evaluation
32	Conference of Parties Rules and Other Internal Regulations	Institutional document
33	Agreement establishing the Inter-American Institute for Global Change Research	Institutional document
34	Agreements concerning the directorate headquarters and offices	Institutional document
35	Association agreement between FAPESP and the Inter-American Institute for Global Change Research	Institutional document
36	Memorandum of Understanding for the Creation of INCCETT 4CB	Institutional document
37	Memorandum of Understanding between Future Earth and Inter-American Institute for Global Change Research	Institutional document
38	Memorandum of Understanding between IPBES and Inter-American Institute for Global Change Research	Institutional document

39	Memorandum of Understanding between OAS and Inter-American Institute for Global Change Research	Institutional document
40	Memorandum of Understanding between AAAS and Inter-American Institute for Global Change Research	Institutional document
41	Open data policy and principles of the Inter-American Institute for Global Change Research	Institutional document
42	Outline of the draft Inter-American Institute for Global Change Research Strategic Plan	Institutional document
43	Partnership between the Inter-American Institute for Global Change Research, UNESCO and ICSU	Institutional document
44	Responding to the Challenges of Global Change in the Americas: A decade of Achievement	Institutional document
45	Argentina Member Party Data Sheet	Member Data Sheet
46	Bolivia Member Party Data Sheet	Member Data Sheet
47	Brazil Member Party Data Sheet	Member Data Sheet
48	Canada Member Party Data Sheet	Member Data Sheet
49	Chile Member Party Data Sheet	Member Data Sheet
50	Colombia Member Party Data Sheet	Member Data Sheet
51	Costa Rica Member Party Data Sheet	Member Data Sheet
52	Cuba Member Party Data Sheet	Member Data Sheet
53	Dominican Republic Member Party Data Sheet	Member Data Sheet
54	Ecuador Member Party Data Sheet	Member Data Sheet
55	Guatemala Member Party Data Sheet	Member Data Sheet
56	Jamaica Member Party Data Sheet	Member Data Sheet
57	Mexico Member Party Data Sheet	Member Data Sheet
58	Panama Member Party Data Sheet	Member Data Sheet
59	Paraguay Member Party Data Sheet	Member Data Sheet
60	Peru Member Party Data Sheet	Member Data Sheet
61	United States of America Member Party Data Sheet	Member Data Sheet
62	Uruguay Member Party Data Sheet	Member Data Sheet
63	Venezuela Member Party Data Sheet	Member Data Sheet
64	How to improve the dialogues between science and society: The case of global environmental change	Policy brief
65	IAI Directorate to host the Belmont Forum Secretariat in Montevideo	Press Release
66	Balancing CO2 in South America - Inter-American Institute for Global Change Research research backs regional approaches to climate change	Project Brief
67	Arid America: a challenge to guarantee water for society and environment	Project Brief
68	From climate knowledge to action	Project Brief
69	Nitrogen management policies urgently needed	Project Brief
70	Sustainability strategies and sustainability research in Latin America	Project Brief

71	Thee importance of studying tropical rainforests	Project Brief
72	The secrets of the ocean	Project Brief
73	The state of the American lakes and lagoons	Project Brief
74	MOOC: Impacts of Climate Change in Latin America	Syllabus

APPENDIX B: HUMAN SUBJECTS APPROVAL



UNIVERSITY OF OREGON

DATE: November 29, 2018 **IRB Protocol Number: 12132016.020**

TO: Katie Meehan, Principal Investigator
Department of Geography

RE: Protocol entitled, "An Ethnography of Pathways to Interdisciplinary Knowledge Integration at Two Environmental Science Sites in Brazil"

Notice of IRB Review and Approval-Continuing Review Expedited Review as per Title 45 CFR Part 46 # [6,7]

The continuation of the project identified above has been reviewed and approved by the Committee for Protection of Human Subjects (CPHS), the University of Oregon Institutional Review Board (IRB). This research has been determined to be no greater than minimal risk and qualifies for expedited review procedures.

For this research, the following additional determinations have been made:

- The IRB has waived the requirement to obtain documentation of informed consent under 45 CFR 46.117(c)(2) to allow for Phase 1 interviews and observations and for a remote consent process for Phase 2 online surveys.

The IRB has approved the research to be conducted as described in the attached materials. As a reminder, it is your responsibility to submit any proposed changes for IRB review and approval prior to implementation.

Approval period: November 29, 2018 - November 28, 2019

If you anticipate the research will continue beyond the IRB approval period, you must submit a request for continuing review approximately 60 days prior to the expiration date. **Without continued approval, the protocol will expire on November 28, 2019 and human subject research activities must cease.** A closure report must be submitted once human subject research activities are complete. Failure to maintain current approval or properly close the protocol constitutes non-compliance.

You are responsible for adhering to the *Investigator Agreement* submitted with the initial application for IRB review. The responsibilities of the agreement are reiterated at the end of this letter below. You are responsible for conduct of the research and must maintain oversight of all research personnel to ensure compliance with the IRB approved protocol.

The University of Oregon and Research Compliance Services appreciate your commitment to the ethical and responsible conduct of research with human subjects.

Sincerely,

A handwritten signature in black ink, appearing to read 'Brandi Fleck'.

Brandi Fleck
Research Compliance Administrator

COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS ● RESEARCH COMPLIANCE SERVICES
677 E. 12th Ave., Suite 500, 5237 University of Oregon, Eugene OR 97401-5237
T 541-346-2510 F 541-346-5138 <http://rcs.uoregon.edu>

An equal-opportunity, affirmative-action institution committed to cultural diversity and compliance with the Americans with Disabilities Act



UNIVERSITY OF OREGON

DATE: November 29, 2018 **IRB Protocol Number: 12132016.020**
TO: Katie Meehan, Principal Investigator
Department of Geography
RE: Protocol entitled, "An Ethnography of Pathways to Interdisciplinary Knowledge
Integration at Two Environmental Science Sites in Brazil"

**Notice of IRB Review and Approval-Continuing Review
Expedited Review as per Title 45 CFR Part 46 # [6,7]**

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Sincerely,

Brandi Fleck
Research Compliance Administrator

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T 541-346-2510 F 541-346-5138 <http://rcs.uoregon.edu>

An equal-opportunity, affirmative-action institution committed to cultural diversity and compliance with the Americans with Disabilities Act



UNIVERSITY OF OREGON

DATE: December 22, 2017 IRB Protocol Number: 12132016.020
TO: Katie Meehan, Principal Investigator
Geography, Department of
RE: Protocol entitled, "An Ethnography of Pathways to Interdisciplinary Knowledge
Integration at Two Environmental Science Sites in Brazil"

Notice of IRB Review and Approval-Continuing Review
Expedited Review as per Title 45 CFR Part 46 # 6, 7

The continuation of the project identified above has been reviewed and approved by the Committee for Protection of Human Subjects (CPHS), the University of Oregon Institutional Review Board (IRB). This research has been determined to be no greater than minimal risk and qualifies for expedited review procedures.

For this research, the following additional determinations have been made:

- The IRB has waived the requirement to obtain documentation of informed consent under 45 CFR 46.117(c)(2) to allow for Phase 1 interviews and observations and for a remote consent process for Phase 2 online surveys.

The IRB has approved the research to be conducted as described in the attached materials. As a reminder, it is your responsibility to submit any proposed changes for IRB review and approval prior to implementation.

Approval period: December 22, 2017 - December 21, 2018

If you anticipate the research will continue beyond the IRB approval period, you must submit a request for continuing review approximately 60 days prior to the expiration date. Without continued approval, the protocol will expire on December 21, 2018 and human subject research activities must cease. A closure report must be submitted once human subject research activities are complete. Failure to maintain current approval or properly close the protocol constitutes non-compliance.

You are responsible for adhering to the *Investigator Agreement* submitted with the initial application for IRB review. The responsibilities of the agreement are reiterated at the end of this letter below. You are responsible for conduct of the research and must maintain oversight of all research personnel to ensure compliance with the IRB approved protocol.

The University of Oregon and Research Compliance Services appreciate your commitment to the ethical and responsible conduct of research with human subjects.

Sincerely,

Christina Spicer, J.D., C.I.P.

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DATE: December 18, 2017 **IRB Protocol Number: 12132016.020**
TO: Katie Meehan, Principal Investigator
Department of Geography
RE: Protocol entitled, "An Ethnography of Pathways to Interdisciplinary Knowledge
Integration at Two Environmental Science Sites in Brazil"

**Notice of IRB Review and Approval-Amendment
Expedited Review as per Title 45 CFR Part 46 # 6,7**

The amendment submitted on December 13, 2017 for the project identified above has been reviewed and approved by the Committee for Protection of Human Subjects (CPHS), the University of Oregon Institutional Review Board (IRB). The IRB has approved the changes to the research as described in the attached materials. As a reminder, it is your responsibility to submit any proposed changes for IRB review and approval prior to implementation.

Amendment Description:

- Addition of Lourdes Ginart to research team.

This research has been determined to be no greater than minimal risk and qualifies for expedited review procedures. For this research, the following additional determinations have been made:

- The IRB has waived the requirement to obtain documentation of informed consent under 45 CFR 46.117(c)(2) to allow for Phase 1 interviews and observations and for a remote consent process for Phase 2 online surveys.

Approval period: December 14, 2017 - January 31, 2018

If you anticipate the research will continue beyond the IRB approval period, you must submit a request for continuing review approximately 60 days prior to the expiration date. **Without continued approval, the protocol will expire on January 31, 2018 and human subject research activities must cease.** A closure report must be submitted once human subject research activities are complete. Failure to maintain current approval or properly close the protocol constitutes non-compliance.

You are responsible for adhering to the *Investigator Agreement* submitted with the initial application for IRB review. The responsibilities of the agreement are reiterated at the end of this letter below. You are responsible for conduct of the research and must maintain oversight of all research personnel to ensure compliance with the IRB approved protocol.

The University of Oregon and Research Compliance Services appreciate your commitment to the ethical and responsible conduct of research with human subjects.

Sincerely,

Brandi Fleck

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DATE: September 29, 2017 **IRB Protocol Number: 12132016.020**

TO: Katie Meehan, Principal Investigator
Department of Geography

RE: Protocol entitled, "An Ethnography of Pathways to Interdisciplinary Knowledge Integration at Two Environmental Science Sites in Brazil"

*****CORRECTION*****

**Notice of IRB Review and Approval-Amendment
Expedited Review as per Title 45 CFR Part 46 [#6, 7]**

The amendment submitted on September 25, 2017 for the project identified above has been reviewed and approved by the Committee for Protection of Human Subjects (CPHS), the University of Oregon Institutional Review Board (IRB). The IRB has approved the changes to the research as described in the attached materials. As a reminder, it is your responsibility to submit any proposed changes for IRB review and approval prior to implementation.

Note: This approval only applies for Phase 1 and Phase 2 research activities.

Amendment Description:

- Adding research personnel Fiona De Los Rios-McCutcheon to the protocol.

This research has been determined to be no greater than minimal risk and qualifies for expedited review procedures. For this research, the following additional determinations have been made:

- The IRB has waived the requirement to obtain documentation of informed consent under 45 CFR 46.117(c)(2) to allow for Phase 1 interviews and observations and for a remote consent process for Phase 2 online surveys.

Approval period: September 29, 2017 - January 31, 2018

If you anticipate the research will continue beyond the IRB approval period, you must submit a request for continuing review approximately 60 days prior to the expiration date. **Without continued approval, the protocol will expire on January 18, 2018 and human subject research activities must cease.** A closure report must be submitted once human subject research activities are complete. Failure to maintain current approval or properly close the protocol constitutes non-compliance.

You are responsible for adhering to the *Investigator Agreement* submitted with the initial application for IRB review. The responsibilities of the agreement are reiterated at the end of this letter below. You are responsible for conduct of the research and must maintain oversight of all research personnel to ensure compliance with the IRB approved protocol.

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DATE: September 29, 2017 **IRB Protocol Number: 12132016.020**

TO: Katie Meehan, Principal Investigator
Department of Geography

RE: Protocol entitled, "An Ethnography of Pathways to Interdisciplinary Knowledge Integration at Two Environmental Science Sites in Brazil"

**Notice of IRB Review and Approval-Amendment
Expedited Review as per Title 45 CFR Part 46 [#6, 7]**

The amendment submitted on September 25, 2017 for the project identified above has been reviewed and approved by the Committee for Protection of Human Subjects (CPHS), the University of Oregon Institutional Review Board (IRB). The IRB has approved the changes to the research as described in the attached materials. As a reminder, it is your responsibility to submit any proposed changes for IRB review and approval prior to implementation.

Note: This approval only applies for Phase 1 and Phase 2 research activities.

Amendment Description:

- Adding research personnel Fiona De Los Rios-McCutcheon to the protocol.

This research has been determined to be no greater than minimal risk and qualifies for expedited review procedures. For this research, the following additional determinations have been made:

- The IRB has waived the requirement to obtain documentation of informed consent under 45 CFR 46.117(c)(2) to allow for Phase 1 interviews and observations and for a remote consent process for Phase 2 online surveys.

Approval period: September 29, 2017 - January 18, 2018

If you anticipate the research will continue beyond the IRB approval period, you must submit a request for continuing review approximately 60 days prior to the expiration date. **Without continued approval, the protocol will expire on January 18, 2018 and human subject research activities must cease.** A closure report must be submitted once human subject research activities are complete. Failure to maintain current approval or properly close the protocol constitutes non-compliance.

You are responsible for adhering to the *Investigator Agreement* submitted with the initial application for IRB review. The responsibilities of the agreement are reiterated at the end of this letter below. You are responsible for conduct of the research and must maintain oversight of all research personnel to ensure compliance with the IRB approved protocol.

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DATE: March 17, 2017 IRB Protocol Number: 12132016.020
TO: Katie Meehan, Principal Investigator
Geography, Department of
RE: Protocol entitled, "An Ethnography of Pathways to Interdisciplinary Knowledge
Integration at Two Environmental Science Sites in Brazil"

Notice of IRB Review and Approval-Amendment
Expedited Review as per Title 45 CFR Part 46 # 6, 7

The amendment submitted on March 08, 2017 for the project identified above has been reviewed and approved by the University of Oregon Institutional Review Board (IRB) and Research Compliance Services using an expedited review procedure. This is a minimal risk study. This approval is based on the assumption that the materials, including changes/clarifications that you submitted to the IRB contain a complete and accurate description of all the ways in which human subjects are involved in your research.

Please note this approval only applies to Phase 1 and 2 research activities.

For this research, the following additional determinations have been made:

- The IRB has waived the requirement to obtain documentation of informed consent under 45 CFR 46.117(c)(2) to allow for a verbal consent process for Phase 1 interviews and observations and for a remote consent process for Phase 2 online surveys.

The purpose of this Amendment is to:

- Update protocol title to match funding application;
- Corresponding changes to Research Plan, consent, and other protocol materials as necessary.

This approval is given with the following standard conditions:

1. You are approved to conduct this research only during the period of approval cited below;
2. You will conduct the research according to the plans and protocol submitted (approved copy enclosed);
3. You will immediately inform Research Compliance Services of any injuries or adverse research events involving subjects;
4. You will immediately request approval from the IRB of any proposed changes in your research, and you will not initiate any changes until they have been reviewed and approved by the IRB;
5. You will only use the approved informed consent document(s) (enclosed);
6. You will give each research subject a copy of the informed consent document;
7. If your research is anticipated to continue beyond the IRB approval dates, you must submit a Continuing Review Request to the IRB approximately 60 days prior to the



DATE: February 01, 2017 **IRB Protocol Number: 12132016.020**

TO: Katharine Meehan, Principal Investigator
Department of Geography

RE: Protocol entitled, "Climate science at the molecular scale: pathways to interdisciplinary knowledge integration"

Notice of IRB Review and Approval
Expedited Review as per Title 45 CFR Part 46 # 6, 7

The project identified above has been reviewed by the University of Oregon Institutional Review Board (IRB) and Research Compliance Services using an expedited review procedure. This is a minimal risk study. This approval is based on the assumption that the materials, including changes/clarifications that you submitted to the IRB contain a complete and accurate description of all the ways in which human subjects are involved in your research.

Please note this approval only applies to Phase 1 and 2 research activities.

For this research, the following additional determinations have been made:

- The IRB has waived the requirement to obtain documentation of informed consent under 45 CFR 46.117(c)(2) to allow for a verbal consent process for Phase 1 interviews and observations and for a remote consent process for Phase 2 online surveys.

This approval is given with the following standard conditions:

1. You are approved to conduct this research only during the period of approval cited below;
2. You will conduct the research according to the plans and protocol submitted (approved copy enclosed);
3. You will immediately inform Research Compliance Services of any injuries or adverse research events involving subjects;
4. You will immediately request approval from the IRB of any proposed changes in your research, and you will not initiate any changes until they have been reviewed and approved by the IRB;
5. You will only use the approved informed consent document(s) (enclosed);
6. You will give each research subject a copy of the informed consent document;
7. **If your research is anticipated to continue beyond the IRB approval dates, you must submit a Continuing Review Request to the IRB approximately 60 days prior to the**

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