A Changing Arctic Climate

Science and Policy in the
Arctic Climate Impact Assessment

Annika E. Nilsson

Linköping University
FACULTY OF ARTS AND SCIENCES

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Key words: Arctic, climate, framing, knowledge production, regime, institution, actor network, co-production, indigenous knowledge

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A Changing Arctic Climate

For Cindy

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Preface

Writing a book is like a journey that starts long before you know you are on the way and where there is no predetermined destination. As this dissertation is starting to become a book with words on pages, I have come to appreciate a number of circumstances that have contributed to making it possible. The recurring theme is the opportunity to think about the role of science in society.

The starting point was no doubt growing up in a family in which science was part of every-day conversations, even if my own interests brought me more towards writing about science than to its practice. My education as a science writer in the late 1970s coincided in time with the emergence of gene technology and highly contentious debates about the societal implications of scientific developments. In my undergraduate coursework at the University of Kansas, I was lucky enough to not only encounter the microbiologists' perspectives on these issues but also views from thinkers who discussed biology in the context of science for the people. I was, thereby, exposed to perspectives on science as something more and often different from objective descriptions of nature. It was also during these years that I became engaged in the women's movement. The connection between science and feminism became an entry point to an inspirational journey together with women friends towards defining a feminist perspective on biology. It was in these informal discussions that I had my basic training in the philosophy of science. In the mid-1980s, this was far from mainstream academic thinking. It was therefore a delightful surprise for me to see that some of the same authors and further development of ideas about science and society had become integrated into graduate education at the Tema Institute at Linköping University when I decided to return to school 20 years later.

During the mid-1980s, global environmental issues were becoming an increasing part of my professional life as a science writer. Images of the ozone hole caught mine and many others attention, as did the emerging discussion of climate change. The debates on gene technology also included environmental dimensions. In my work as a radio producer, I was fortunate enough to be able to follow how these debates became both global and explicitly political, not least in connection with the United Nations Conference on Environment and Development in Rio de Janeiro in 1992. Critiques of western science from Third World thinkers brought me many new perspectives and reinforced my interests in the politics of science. Even environmental science was no longer necessarily benign. There were ethical and political issues to consider. They had to be analyzed with tools other than those I had available from my undergraduate training in biology and journalism. My most important introduction to the world of social science came from the Swedish Human Dimensions Committee. The discussions that this committee invited me into became a first step in returning to academia. Here was a field of study with questions that linked my interest in environmental sciences and society.

Approximately parallel in time, I started to work with Arctic issues with an assignment to write a popular science version of a scientific assessment of pollution. My focus was on translating the natural science jargon to make it accessible to political decision makers but in doing so I was also in the midst of the science-politics interface. An epi-

sode during this work sparked by curiosity about how political cooperation affects knowledge production. It was a meeting in Ilulissat, Greenland, where scientists from different disciplines started talking to each other, finding connections between their different lines of work, and raising new questions that neither group had asked before. The exercise was supposed to be an assessment of available knowledge but what I witnessed was the creation of something new.

In 2002, my different seeds of thought about the science-politics interface came together in an idea to pursue a PhD. With my lack of formal education in the social sciences, it was not self-evident where I could apply. Luckily enough, there are interdisciplinary environments available and I was fortunate to be admitted to the Department of Water and Environmental Studies in Linköping. This environment has shaped the translation of my vague ideas and interests into this dissertation about the role of science and policy in framing Arctic climate change. Together with the other parts of the Tema Institute, it provided the theoretical and methodological perspectives that made this a different exercise than my previous journalistic work. Of great value was also the development of the Centre for Climate Science and Policy Research. It provided me with colleagues to discuss the climate science-policy interface, in particular, including connections to both the natural and social science aspects. I want to thank all my colleagues in these environments – teachers, fellow graduate students, and support personnel – for inspiration and support during this research project. Your work has provided an invaluable interdisciplinary context and your comments during seminars and discussions of draft text have many times forced me to rethink or clarify my own arguments. For that and for your friendship, I am graciously thankful. In particular I want to thank my advisor Björn-Ola Linnér, who took on the role as a sparring partner and critical reader from the beginning of the research process all the way through, and also my co-advisor Sofie Storbjörk for her patient reading and her useful comments to draft versions of the dissertation. I also want to thank Johan Hedrén for challenging comments at numerous seminars including the initial definition of my project. Widening the circle outside the department, I also owe thanks to Henrik Selin for pointing me to the Arctic Climate Impact Assessment as a possible case study and suggesting useful analytical tools, to Karin Bäckstrand for providing invaluable input to this dissertation at my final seminar, and to Natasha Webster for help with language editing.

There are also some other circles of colleagues that helped me along in this work. They include everyone who worked on the Arctic Human Development Report, who provided me with many valuable entry points to social science perspectives on the Arctic and who helped widen my Arctic networks. I also want to thank Stockholm Environment Institute for welcoming me to work there for a few months last fall. This was a very inspiring environment that put my project into a larger perspective and brought me new friends and colleagues. A different social context but equally important for my research has been the cooperation and interest from many people in the Arctic Climate Impact Assessment who took time to provide me with invaluable empirical material for my study. Without your contribution, this dissertation would not be.

A prerequisite for research is funding. My work has been financed mostly by Linköping University but with additional funds from the Swedish Journalist Fund for Further Training, the Swedish Research Council for the Environment, Agricultural Sci-

ence and Spatial Planning (Formas), and Mistra's Climate Policy Research Program (Clipore).

Finally, none of this dissertation work would have been possible without the support at home. Thank you Cindy, for all your patience, and Dane, for reminding me that sometimes it is more important to play.

Several years ago, a friend and colleague told me to remember to budget time for thinking. I have been very fortunate to be able to take time off in mid-life to pause and reflect on the science-politics interface in which I have been working professionally. The future will tell where it will lead me.

April 2007 in Huddinge

Annika Nilsson

Abbreviations

ACIA	Arctic Climate Impact Assessment
ACSYS	Arctic Climate System Study
AEPS	Arctic Environmental Protection Strategy
AMAP	Arctic Monitoring and Assessment Programme
AOGCM	Atmosphere-Ocean Global Circulation Model
ASC	Assessment Steering Committee
BASIS	Barents Sea Impact Study
BESIS	Bering Sea Impact Study
CAFF	Conservation of Arctic Flora and Fauna
CFC	Chlorofluorocarbon
CLIC	Climate and Cryosphere
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GARP	Global Atmospheric Research Program
GEA	Global Environmental Assessment Project
GHG	Greenhouse gas
ICC	Inuit Circumpolar Conference
ICES	International Council for the Exploration of the Sea
ICSU	International Council for Science (previously International Council of Scientific Unions)
IDGEC	Institutional Dimensions of Global Environmental Change
IGBP	International Geosphere-Biosphere Program
IGY	International Geophysical Year
IMO	International Meteorological Organization
IPCC	Intergovernmental Panel on Climate Change
IPY	International Polar Year
IWC	International Whaling Commission
LRTAP	Long-range Transboundary Air Pollution
NATO	North Atlantic Treaty Organization
NOAA	National Oceanic and Atmospheric Administration
RCM	Regional Climate Model
SAAO	Senior Arctic Affairs Official
SAO	Senior Arctic Official
SBSTA	Subsidiary Body for Scientific and Technological Advice
SCAR	Scientific Committee on Antarctic Research
SMIC	Study of Man's Impact on Climate
SRES	IPCC Special Report on Emission Scenarios
UN	United Nations
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
US	United States
UV	Ultraviolet (radiation)
WCRP	World Climate Research Programme
WG	Working Group
WMO	World Meteorological Organization
WWF	World Wide Fund for Nature

Chapter 1

Introduction

1.1 The challenge of change

The global climate is changing at an increasingly rapid rate. Not only are air temperatures rising but there is also widespread melting of ice and rising sea levels. The consequences of this include more unpredictable weather patterns with increasing risks of both droughts and flooding.¹ And climate change is only one of many changes to the Earth as a system. Other changes entail various biogeochemical cycles as well as economic, social, and cultural processes.² Some even claim that the changes of Earth as a system are so major and fast that we have entered into a new geological era, the Anthropocene, where the human society is the dominating driving force.³

The rate of change creates new challenges for people and societies. Knowledge based on previous experience may no longer be valid and old ways of managing nature may yield unexpected results. Unless we better understand the relationships between nature and society, the rate of change may therefore make it more difficult to cope with and adapt to climate change. We therefore need effective ways to detect changes. We also need processes to understand the relationship between society and nature, and to translate our understanding into activities that help us cope. Society's capacity to learn becomes a key issue.⁴

¹ IPCC, *Climate Change 2007: The Physical Science Basis. Summary for Policymakers. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Geneva: Intergovernmental Panel on Climate Change, 2007).

² Will Steffen, Jill Jäger, David J. Carson, and Clare Bradshaw, eds. *Challenges of a Changing Earth* (Berlin: Springer, 2002); Oran R. Young, Frans Berkhout, Gilberto C. Gallopin, Marco A. Janssen, Elinor Ostrom, and Sander van der Leeuw, "The Globalization of Socio-Ecological Systems: An Agenda for Scientific Research," *Global Environmental Change* 16, (2006): 304.

³ Paul J. Crutzen and Eugene F. Stoermer, "The 'Anthropocene,'" *Global Change Newsletter* no. 41 (2000): 17.

⁴ Carl Folke, Johan Colding, and Fikret Berkes, "Synthesis: Building Resilience and Adaptive Capacity in Social-Ecological Systems," in *Navigating Social-Ecological Systems*, eds. Fikret Berkes, Johan Colding, and Carl Folke, 352-387 (Cambridge: Cambridge University Press, 2003), 382; Brian Walker, Lance Gunderson, Ann Kinzig, Carl Folke, Steve Carpenter, and Lisen Schultz, "A Handful of Heuristics and Some Proposals for Understanding Resilience in Social-Ecological Systems," *Ecology and Society* 11, no. 1 (2006): 13; Young, et al., "The Globalization of Socio-Ecological Systems:

The role of social institutions for structuring the relationship between human societies and the natural environment has received increasing attention in recent years. This includes a number of approaches, such as studies of how governance arrangements can both cause and help solve environmental problems and analyses of how scientific knowledge is transformed into policy action.⁵ Some scholars emphasize that knowledge systems are part of society's processes of institutional and social learning to deal with ecosystem dynamics.⁶ There are also a few studies that specifically focus on institutional mechanisms through which societies generate knowledge and accept or privilege certain ways of understanding the world.⁷

As scientific knowledge becomes increasingly important for political decisions, we need a better understanding of how this knowledge is generated. This includes better ways to make apparent what changes, and what understandings, our current knowledge systems are not able to highlight. Such critical evaluations should help increase society's ability to detect changes and to understand the implications, which in turn are prerequisites for any translation into adequate action. This dissertation explores further the theme of how governance systems affect knowledge production. It takes its empirical starting point from a regional assessment of climate change impacts in the Arctic in an attempt to highlight how the structure of international cooperation influences our understanding of an environmental issue.

1.2 Aim and research questions

The aim of this dissertation is to examine how the interplay between policy and knowledge production affects the framing of Arctic climate change. The emphasis is on analyzing how structures of international cooperation can shape knowledge production. It will also discuss how knowledge production influences policy. The empirical basis is the history, process, and content of Arctic Climate Impact Assessment (ACIA) with an analytical focus on the following questions:

-
- An Agenda for Scientific Research"; Carl Folke, "Resilience: The Emergence of a Perspective for Social-Ecological Systems Analyses," *Global Environmental Change* 16, (2006): 253.
- ⁵ E.g. Oran R. Young, *The Institutional Dimensions of Environmental Change. Fit, Interplay, and Scale* (Cambridge, MA: MIT Press, 2002); Ronald B. Mitchell, William C. Clark, David W. Cash, and Nancy M. Dickson, eds. *Global Environmental Assessments: Information and Influence* (Boston: MIT Press, 2006).
- ⁶ Folke, et al. "Synthesis: Building Resilience and Adaptive Capacity in Social-Ecological Systems," 373.
- ⁷ Oran R. Young, "Institutions and the Growth of Knowledge: Evidence From International Environmental Regimes," *International Environmental Agreements: Politics, Law and Economics* 4, (2004): 215; Virginia M. Walsh, *Global Institutions and Social Knowledge* (Cambridge, MA: MIT Press, 2004); Leslie King, "Competing Knowledge Systems in the Management of Fish and Forests in the Northwest Pacific," *International Environmental Agreements: Politics, Law and Economics* 4, (2004): 161; Louis Lebel, Antonio Contreras, Suparb Pasong, and Po Garden, "Nobody Knows Best: Alternative Perspectives in Forest Governance in Southeast Asia," *International Environmental Agreements: Politics, Law and Economics* 4, (2004): 111; Syma A. Ebbin, "Black Box Production of Paper Fish. An Examination of Knowledge Construction and Validation in Fisheries Management Institutions," *International Environmental Agreements: Politics, Law and Economics* 4, (2004): 143-159.

- How is climate change framed in the ACIA? Whose knowledge traditions come to the fore? What knowledge is highlighted?
- How do different framings of Arctic climate change relate to structures of international cooperation?

The structures most in focus are international regimes, but also with attention to how these issue-specific cooperative efforts relate to large-scale changes in the structure of international society. The analysis also pays attention to the role of individual actors and networks of actors and how they relate to regimes. The study is used as a basis for discussing what the ACIA history and process might tell about the potential for future climate knowledge production and policy in regional arenas. The following section provides a short introduction to the topic of Arctic climate change.

1.3 Climate change and the Arctic

Global climate change

Since climate change started to be recognized as a major environmental challenge, there has been increasing concern about its impacts on society. These impacts include higher average global temperatures as well as increasing risks for weather extremes and rising sea levels that can inundate low-lying coastal areas and islands.

According to the 2007 report from the Intergovernmental Panel on Climate Change (IPCC), the warming of the global climate is now unequivocal. The IPCC also concludes that the warmth of the last half century is unusual in a time perspective of 1,300 years. The rate of change appears to be increasing and eleven of the twelve years between 1995 and 2006 were the warmest since the beginning of instrumental records. The consequences of this global warming are becoming increasingly apparent, with observational evidence from all continents and most oceans that many natural systems are affected by regional climate change. Many observations are from the Arctic. One of many signs of climate change is that sea ice has shrunk by almost 3 percent per decade since the beginning of the satellite data records in 1978. At a global level, observations have now documented more intense and longer droughts since the 1970s, especially in the tropics and subtropics, increased frequency of heavy precipitation, and widespread changes in weather extremes, such as heat waves.⁸

By now it is well established that the most important factor behind the warming of the climate system is an increase in anthropogenic greenhouse gases. In its 2007 report, the IPCC concludes with “very high confidence that the globally averaged net effect of human activities since 1750 has been one of warming.”⁹ The most important of the

⁸ IPCC, *Climate Change 2007: The Physical Science Basis. Summary for Policymakers*; IPCC, *Climate Change 2007: Climate Change Impacts, Adaptation and Vulnerability. Summary for Policymakers. Working Group II Contribution to the Intergovernmental Panel on Climate Change Fourth Assessment Report* (Geneva: Intergovernmental Panel on Climate Change, 2007).

⁹ IPCC, *Climate Change 2007: The Physical Science Basis. Summary for Policymakers*, 3.

greenhouse gases from human activities is carbon dioxide. Today, the atmospheric concentration of this gas is higher than it has been in the past 650,000 years. Adding to this disturbing observation is that the growth rate in carbon dioxide was faster during the past decade (1995-2005) than it has been since measurements began. This indicates that the political recognition of climate change as a major challenge to human society has not yet led to any change in the trend of constantly increasing global emissions. The major source of carbon dioxide is the burning of fossil fuels with a lesser contribution from land-use changes, such as deforestation.

Climate change has often been viewed as a global issue and today this framing is firmly entrenched in structures of climate governance as intergovernmental in nature and global in scope. However, the global view has also been challenged from many directions. Politically it has been questioned because it hides the fact that the industrialized global North is responsible for the lion's share of the historical emissions of greenhouse gases.¹⁰ Efforts to deal with climate change are now also occurring in other international fora based on an idea that many paths can lead to the same goal.¹¹ There are also growing numbers of sub-national initiatives.¹² Analytically, social scientists have started to actively seek new vantage points in order to better understand global-local interactions in knowledge production and policy.¹³ Within international assessments of climate science, there is increasing attention to the fact that climate change and its impacts will vary across the world and subsequently a drive towards focusing more on impacts and vulnerability at the regional level. This includes the development of climate models with higher resolution to make the scenarios more useful for national or local planners and policy makers who have to make decisions about adaptation to climate change. In short, the challenge of climate change is no longer only a global matter.

The Arctic

A region of particular interest to climate science has been the Arctic. There are several reasons for this. First, its physical characteristics, such as the predominance of snow and ice, create feedback mechanisms that are important for understanding the global climate change. Second, climate models project larger and more rapid changes in climate in the Arctic than anywhere else globally. Third, there have been an increasing number of signs from parts of the Arctic that the climate has started to change. This also makes the Arctic politically important, as the region could be a showcase for assertions that climate change is happening here and now and therefore requires immediate political actions to halt emissions of greenhouse gases.

¹⁰ Frank Biermann, "Whose Experts? The Role of Geographic Representation in Global Environmental Assessments," in *Global Environmental Assessments: Information and Influence*, eds. Ronald B. Mitchell, William C. Clark, David W. Cash, and Nancy M. Dickson, 87-112 (Cambridge, MA: MIT Press, 2006).

¹¹ Mattias Hjerpe and Björn-Ola Linnér, "Mapping synergies between climate change and trade agreements at different scales." Paper presented at the International Studies Association Annual Convention in Chicago Feb. 28-Mar. 3, 2007.

¹² Henrik Selin and Stacy D. VanDeveer, "Political Science and Prediction: What's Next for the U.S. Climate Change Policy?," *Review of Policy Research* 24, no. 1 (2007): 1.

¹³ Sheila Jasanoff and Marybeth Long Martello, eds. *Earthly Politics: Local and Global in Environmental Governance* (Cambridge, MA: MIT Press, 2004).

The Arctic is also an interesting arena in relation to environmental governance and the role of knowledge. Since the end of the Cold War, it has emerged as a region with innovative international institutions, with the Arctic Council as a high-level inter-governmental forum. Environmental cooperation and knowledge production are at the heart of the Arctic Council's activities.¹⁴ The cooperation includes not only nation states but also the indigenous peoples of the regions, who have played a key role in pushing Arctic concerns in international environmental agenda setting.¹⁵ Their increasing participation at both the international level and in local co-management of resources has created a dynamic that questions the exclusive prominence of conventional western science as the basis for policy making.¹⁶ Furthermore it does so in ways that highlight the relationship between knowledge production and power structures.¹⁷ Questions of who has the right to speak for nature and whose knowledge should guide policy come to the fore, i.e. questions that lie close to how certain knowledge claims can gain privilege in framing an issue such as climate change.

The Arctic Climate Impact Assessment (ACIA)

Climate change became a key issue on the Arctic political agenda in 2000, when the Arctic Council launched the Arctic Climate Impact Assessment (ACIA). This was the first international regional climate impact assessment and its results have created major media attention since they became public in 2004.¹⁸

The ACIA provides an excellent opportunity to examine how international structures and various actors might affect knowledge production. It also allows for a first look at the potential and limitations of international regional knowledge production regarding climate change, in contrast to the efforts at the global level within the IPCC. It does so in a setting that is different from the global context, creating a contrasting analytical window into the role of regimes in framing climate change. Moreover, the assessment's regional scope allows a focus on key issues of the interplay between governance and knowledge production at different level. With a trend towards devolution of political power to indigenous peoples of the region, the Arctic is also likely to provide an illuminating empirical base for analyzing the interplay of political power and knowledge production.

¹⁴ Oran R. Young, "Governing the Arctic: From Cold War Theater to Mosaic of Cooperation," *Global Governance* 11, (2005): 9; Olav Schram Stokke, "International Institutions and Arctic Governance," in *International Cooperation and Arctic Governance: Regime Effectiveness and Northern Region Building*, eds. Olav Schram Stokke and Geir Hønneland, 330-354 (London: Routledge, 2006).

¹⁵ Especially in relation to persistent organic pollutants, see David Leonard Downie and Terry Fenge, *Northern Lights Against POPs* (Montreal & Kingston: McGill-Queen's University Press, 2003).

¹⁶ See e.g. Richard A. Caulfield, "Resource Governance," in *Arctic Human Development Report*, ed. AHDR, (Akureyri: Stefansson Arctic Institute, 2004).

¹⁷ Mark Nuttall, "Indigenous Peoples, Self-Determination and the Arctic Environment," in *The Arctic. Environment, People, Policy*, eds. Mark Nuttall and Terry V. Callaghan, 377-409 (Amsterdam: Harwood Academic Publishers, 2000).

¹⁸ Andreas Tjernhaugen and Guri Bang, *ACIA og IPCC. En sammenligning av mottakelsen i amerikansk offentlighet* (Oslo: Cicero, Center for International Climate and Environmental Research, 2005).

1.4 Key concepts and analytical points of departure

At a general level, our understanding or knowledge about an issue can be captured in how we frame it. Framing refers to how we define a problem, its impacts, and potential solutions in ways that highlight certain aspects and downplay others.¹⁹ Frames depict the basic cognitive structures that guide how the world around us becomes visible to us.²⁰ In scientific assessments, framing influences what features of an issue are included or excluded within a specific context. Framing is important because it molds the rhetoric of policy debates.²¹ This dissertation uses an analysis of how framings of Arctic climate change have developed over time as a way of unraveling the circumstances that have contributed to highlighting certain aspects of Arctic climate change.

The term framing can be placed in a research tradition that emphasizes that knowledge is the result of social processes. When discussing policy-relevant science, the term co-production of science and policy is increasingly used in the literature. It emphasizes that a myriad of interactions structure both knowledge production and policy and that knowledge and power are intimately intertwined.²² A co-production view can be placed in contrast to ways of conceptualizing the science-policy interface that are captured in the phrase “science speaking truth to power.”²³

Environmental change is often framed as a global issue, both scientifically and politically. This calls for an analysis of the role that social structures in the international system might play in gathering and organizing knowledge. For example, we need to recognize that a certain structure might lead to an emphasis on particular ways of understanding environmental and social changes, while de-emphasizing others. Moreover, an increasing amount of environmental research and a growing number of assessments of environmental challenges are conducted under the auspices of international institutions. Some institutions cover only a certain issue area, such as climate change, while others focus on a broader scope of common interests, for example in a region. Regardless of which, their increasing role in international society makes it important to understand their role, not only to international politics, but also in shaping our understanding of the world. Although research focusing on institutions has shown that they can play a role in

¹⁹ Ronald B. Mitchell, William C. Clark, and David W. Cash, "Information and Influence," in *Global Environmental Assessments: Information and Influence*, eds. Ronald B. Mitchell, William C. Clark, David W. Cash, and Nancy M. Dickson, 307-338 (Cambridge, MA: MIT Press, 2006), 315.

²⁰ Thomas König, "Frame Analysis: A Primer," http://www.lboro.ac.uk/research/mmethods/resources/links/frames_primer.html (Accessed 3 Oct. 2006).

²¹ Alexander E. Farrell and Jill Jäger, "Overview. Understanding Design Choices," in *Assessments of Regional and Global Environmental Risks. Designing Processes for the Effective Use of Science in Decisionmaking*, eds. Alexander E. Farrell and Jill Jäger, 1-24 (Washington, DC: Resources for the Future, 2006), 15.

²² Bruno Latour, *Science in Action* (Cambridge, MA: Harvard University Press, 1987); Bruno Latour, *We Have Never Been Modern* (Cambridge, MA: Harvard University Press, 1993); Sheila Jasanoff and Brian Wynne, "Science and Decision Making," in *Human Choice & Climate. Vol. 1. The Societal Framework*, eds. Steve Rayner and Elizabeth L. Malone, 1-87 (Columbus, Ohio: Battelle Press, 1998); Sheila Jasanoff, ed. *States of Knowledge. The Co-Production of Science and Social Order* (London and New York: Routledge, 2004).

²³ Aaron Wildavsky, *Speaking Truth to Power. The Art and Craft of Policy Analysis* (Boston: Little Brown, 1979).

shaping knowledge, this facet of the co-production of science and policy has not been extensively explored. There is, for example, a need to understand how different international governance arrangements relate to each other and their role in relation to various actors.

This dissertation will thus focus on how international structural dynamics shape knowledge production. By structure, I mean the context and the condition that define the range of actions available for the various actors. It can be placed in contrast to agency, which is the individual or group abilities to affect the environment.²⁴ I will specifically focus on the role of international regimes. As discussed in detail in Chapter 2 of this dissertation, I use the word regime to capture the principles, norms, rules, and decision-making procedures around which actor expectations converge in a given issue area or area of international relations.²⁵ This dissertation explores their role in shaping our understanding of the world by analyzing the development of knowledge about Arctic climate change. As an analytical counterpoint to the focus on structure in the regime concept, the analysis will also pay attention to how actors and actor networks link or relate to regimes or other structures in international society.

1.5 An interdisciplinary dissertation

This is an interdisciplinary dissertation in that it does not draw on only one research tradition. It relates partly to the study of international relations and partly to science studies. Although methodologically and theoretically based in the social sciences, it is my hope to communicate with natural scientists interested in science-policy interactions or climate issues, as the empirical focus is on issues where the natural sciences have historically had center stage.

This dissertation may also interest readers outside the academic community. For example, it may interest policy makers who work with science-intensive questions or science planning. It could also provide new angles for journalists and others with a professional need to better understand arenas that are both highly political and rely heavily on scientific knowledge.

1.6 Dissertation structure

The dissertation consists of three major components: I) a theoretical and methodological framework, II) a literature review to provide context by outlining the development of climate science and policy with a focus on the Arctic, and III) an in-depth study of the history, process, and content of the ACIA. This is followed by an overall conclusion and discussion in part IV.

²⁴ Stuart McAnulla, "Structure and Agency," in *Theory and Methods in Political Science*, eds. David March and Gerry Stoker, 271-291 (Houndmills: Palgrave Macmillan, 2002), 271.

²⁵ Stephen D. Krasner, "Structural Causes and Regime Consequences: Regimes As Intervening Variables," in *International Regimes*, ed. Stephen D. Krasner, 1-21 (Ithaca and London: Cornell University Press, 1983), 1-2.

I. Theoretical and methodological framework

Chapter 2. International Regimes and Knowledge Production presents the theoretical framework for the dissertation. It takes its starting point from international relations theory with a focus on the role of knowledge and international environmental regimes. It presents the basic epistemological premise in the dissertation – that scientific knowledge is socially constructed, and that this process can be best understood as co-construction between nature and culture/society – and it goes on to explore different approaches for analyzing the co-production of nature and society/culture. The chapter highlights the basic analytical tension between structure, as it is expressed in for example environmental regimes, and agency. By combining this tension with the tension expressed in the idea of co-production of science and policy, a framework is created that is later used for analyzing how and when international regimes influence knowledge production. It also presents and discusses key analytical concepts that are used throughout the dissertation.

Chapter 3. Research Approach lays out the research methodology used for analyzing science-policy and structure-actors dynamics and their role in framing environmental issues. It includes a discussion of using a case study approach, its focus on Arctic climate change, and the methods used for gathering empirical material. Finally, the chapter presents an ethical analysis of the project, some notes on my role as a researcher in terms of situated knowledge, and some comments on language.

II. Context

Chapter 4. From Ice Ages to Bellwether for Global Warming: The Arctic in Climate Science and Policy provides a historical backdrop for today's discussion of climate change by outlining the development of climate science since the mid-1800s up until the late 1990s. It is based on a review of published literature and discusses developments in relation to various drivers, including international regimes and actor networks. The chapter specifically focuses on when and how the Arctic has been part of the climate change debate. It also provides a short presentation of recent international cooperation in the Arctic and thereby gives a context for the initiation of the ACIA.

III. A case study of the Arctic Climate Impact Assessment

The case study of the ACIA is presented in two chapters. The purpose of Chapter 5 is to provide the reader with an overview of the ACIA process and thus the immediate context for the framing of Arctic climate change in the ACIA reports, which is the focus for Chapter 6.

Chapter 5. Science and Policy in the ACIA Process analyzes the ACIA process from a perspective of how the co-production of climate science and policy has played out in the Arctic regional arena. A specific focus is on the interplay between international regimes and the way in which various actors use or challenge current structures in international cooperation. The chapter provides a chronological account of both the scientific and policy processes in the ACIA based on formal documentation, observations, and interviews. The emphasis is on how the ACIA process develops rather than the final content of the ACIA reports.

Chapter 6. The Scientific Framing of Arctic Climate Change is based on content analyses of ACIA's scientific and overview reports and discusses what issues are brought to the fore, why, and by whom. It analyzes ACIA's framing of Arctic climate change in relation to its knowledge base and also in relation to how the context of the assessment might explain why the reports place more emphasis on some issues and less on others. As background for a discussion on the role of regional climate impact assessments in a global context, the chapter also compares the ACIA scientific report to the IPCC's 2001 assessment.

IV. Conclusions and discussion

Chapter 7. Regional Knowledge Production and the Politics of Scale discusses the review of the history of climate science and the empirical study of the ACIA to reach the overall aim of this dissertation, which is to examine how the interplay of science and policy affects the framing of Arctic climate change. Specifically, this chapter discusses the politics of scale and how tensions between global, regional, and local perspectives play out in the ACIA. It also analyzes the role of structures in international cooperation to make the ACIA salient, credible, and legitimate to different actors. In addition, it revisits the regime concept relating it to the empirical findings of the relationship between structure and agency. It proposes increased examination of the relationship between regimes and actors networks. The chapter concludes with a discussion of the potential and limitations of regional regimes for climate knowledge production. While the predominant global framing of climate policy limited the immediate policy impact of the ACIA, the analysis also emphasizes that the ACIA brought new actors into the international production of climate knowledge. This helped highlight human dimensions of Arctic climate change and also made the assessment relevant for the Arctic indigenous peoples, which affected the dynamics of the ACIA policy process.

I. Theoretical and methodological framework

Chapter 2

International Regimes and Knowledge Production

The science and politics of climate change are intimately intertwined and their dynamic relationship to each other is a central theme in this dissertation. How can this dynamic relationship be understood? The purpose of this chapter is to review theoretical developments that are important for analyzing the history, process, and content of the Arctic Climate Impact Assessment (ACIA). It lays out a theoretical frame for following chapters.

The chapter takes its point of departure in international relations theory with a focus on environmental regimes. However, regime theory has traditionally paid limited attention to the contingency and plurality of scientific knowledge. Therefore, the chapter will also review developments within science and technology studies focusing on the interplay between knowledge and power. The chapter is organized in four parts. The first part places the concept of regimes into the historical development of international relations theories and elaborates on how I will use the concept in this dissertation. The second part explores theories about the co-production of knowledge and political power. The third part addresses some basic epistemological issues, including the theoretical dichotomy between structure and agency. The fourth part presents in more detail some analytical concepts that are used throughout the dissertation.

2.1 International environmental regimes

This section introduces the concept of regimes within the context of the historical development of international relations theory. It also discusses some different theoretical approaches in studying regimes, and elaborates on how I will use the concept.

A short history

Regime theory dates back to the study of international law in medieval Europe. In modern international relations scholarship, it has an early expression in a belief in international institutions for promoting peace after World War I, which became known as the idealist school. In the 1930s, the failure of the League of Nations led to a debate be-

tween the idealists and a new generation of realists who wanted to distance themselves from the normative character of idealism.¹ The modern realism that grew out of this debate became the mainstream in international relations theory.

A key feature of realism is that sovereign states are the recognized actors and power the major analytical lens.² Another core theme is that the international system is fundamentally different from domestic structures in that each state is seen as sovereign and that the system, as such, lacks a central authority with rights to exercise power over states. This creates a system of anarchy. Whereas some realist scholars have placed the analytical focus on the state actors others have emphasized the structure of the international society through which the states act.³ For example, based on parallels to the market, Waltz writes that “states facing global problems are like individual consumers trapped by the ‘tyranny of small decisions.’”⁴ Up until the end of the Cold War, a focus on self-help led to an emphasis on military and strategic issues in realist analyses of international relations. Later, economic power was added to the analysis.

In the 1970s, some of the core themes of realism began to be challenged.⁵ Relations between the United States and the Soviet Union were thawing compared to the Cold War years, lessening the salience of military and strategic issues. A surge in oil prices, when oil-exporting countries in the Mid-East formed the OPEC cartel, made it clear that states may not be the independent entities as previously assumed. Economic cross-linkages between states became increasingly interesting to international relations scholars. The world was described as more interdependent.⁶

Interdependence was also becoming increasingly apparent in environmental politics. In Scandinavia, sulfur emissions caused acidification of lakes and fish death, and it soon became clear that local measures to limit emission were not sufficient.⁷ At the international level, UN Secretary General U. Thant delivered a report that raised a number of environmental issues that needed the attention of the United Nations. When the United Nations organized the Stockholm Conference on the Human Environment in 1972, the environment became a truly international issue.⁸ The theme of the conference – Only One Earth – illustrates the mood of the time and the interdependence theme in the environmental field. At the legal level, principle 21 from the Stockholm Declaration assured states the sovereign right to exploit their resources but also codified a responsibility to

¹ Fred Halliday, *Rethinking International Relations* (Hampshire: MacMillan, 1994) 10-11; Robert O. Keohane and Joseph S. Nye, *Power and Interdependence* (Harper Collins, 1994) xi; Tim Dunne and Brian C. Schmidt, "Realism," in *The Globalization of World Politics. An Introduction to International Relations*, eds. John Baylis and Steve Smith, 141-161 (Oxford: Oxford University Press, 2001), 142.

² Hans J. Morgenthau and Kenneth W. Thompson, *Politics Among Nations. The Struggle for Power and Peace* (New York: McGraw-Hill, 1993), 13.

³ Dunne and Schmidt, "Realism," 143, 149.

⁴ Kenneth N. Waltz, *Theory of International Politics* (New York: McGraw-Hill, 1979), 39, 110-111.

⁵ Richard Little, "International Regimes," in *The Globalization of World Politics*, eds. John Baylis and Steve Smith, 299-316 (Oxford: Oxford University Press, 2001).

⁶ Stephen D. Krasner, "Preface," in *International Regimes*, ed. Stephen D. Krasner, vii-ix (Ithaca and London: Cornell University Press, 1983); Keohane and Nye, *Power and Interdependence*, 3.

⁷ Lars J. Lundgren, *Acid Rain on the Agenda* (Lund: Lund University Press, 1997).

⁸ Henrik Selin and Björn-Ola Linnér, *The Quest for Global Sustainability: International Efforts on Linking Environment and Development*, Center for International Development at Harvard University, 2005).

ensure that such activities did not cause damage to the environment of other states or areas beyond the limits of national jurisdiction.⁹

The increasing interdependence called for new, or at least wider, theoretical approaches for international relations scholars. Power as a central concept was no longer defined only in military strategic terms but had to also include other resources.¹⁰ New issues, especially relating to the world economy, came into focus. The sharp boundary between national and international politics was questioned with calls for approaches that could bridge the theoretical gaps between the study of national and international politics.¹¹ Authors such as Rosenau raised questions about politics at the foreign-domestic frontier, including how people may redefine self-interest, favoring transnational or global standards and procedures rather than those limited by a state.¹² An exclusive interest in the activities and motives of sovereign states was no longer as useful, and there were calls for including new actors in the analysis, such as transnational corporations and non-governmental organizations.¹³

Among scholars who maintained a focus on states as the main actors, as in liberal institutionalism, there was a renewed interest in studying institutions and their role as mediators and means to achieve cooperation among states, especially in issue areas where states have mutual interests.¹⁴ International regimes and their role in the new interdependent world came into focus.¹⁵ Moreover, bureaucracies created by international institutions became new objects of interest.¹⁶ There was also a growing discussion about norms in international society.¹⁷ Accompanying all these changes, it became increasingly salient to focus on cooperation and finding common ground internationally. International governance became an issue for international relations scholars.¹⁸ Much of the scholarly debate was expressed as an interest in international regimes.

⁹ Stockholm Document, Principle 21

<http://www.unep.org/Documents.mutilingual/Default.asp?DocumentID=97&ArticleID=1503>

¹⁰ Keohane and Nye, *Power and Interdependence*, 11.

¹¹ Halliday, *Rethinking International Relations*, 13; Keohane and Nye, *Power and Interdependence*, 249.

¹² James N. Rosenau, *Along the Domestic-Foreign Frontier* (Cambridge: Cambridge University Press, 1997), 10, 446.

¹³ Keohane and Nye, *Power and Interdependence*, 446; Steven L. Lamy, "Neo-Realism and Neo-Liberalism," in *The Globalization of World Politics*, eds. John Baylis and Steve Smith, 182-199 (Oxford: Oxford University Press, 2001), 189.

¹⁴ Lamy, "Neo-Realism and Neo-Liberalism," 189.

¹⁵ Keohane and Nye, *Power and Interdependence*, 19, 38 ff.

¹⁶ Ronnie Hjort, *Building International Institutions for Environmental Protection. The Case of Baltic Sea Environmental Cooperation*, Diss. Department of Water and Environmental Studies, Linköping University, 1992) 61; Helmut Breitmeier, "International Organizations and the Creation of Environmental Regimes," in *Global Governance. Drawing Insight from the Environmental Experience*, ed. Oran R. Young, 87-114 (Cambridge, MA: MIT Press, 1993).

¹⁷ E.g. Hedley Bull, *The Anarchical Society. A Study of Order in World Politics* (New York: Palgrave, 1977).

¹⁸ Oran R. Young, "Rights, Rules, and Resources in World Affairs," in *Global Governance*, ed. Oran Young, 1-23 (Cambridge, MA: MIT Press, 1997).

A focus on regimes

International regimes are often defined as principles, norms, rules, and decision-making procedures around which actor expectations converge in a given issue area.¹⁹ In contrast to the realist focus on sovereign states seeking to maximize power through narrow calculations of interest, regime theory brought renewed attention to shared norms and principles as a guide for international activities.²⁰ Regime theory is not about a system of world government similar to national political systems. Rather, its emphasis is that independent actors can create systems of governance without creating a government.²¹ Regime theory is thus not necessarily a challenge to one of the basic premises of realism – that the international system is an anarchic system of sovereign states – but it allows for shifts in focus to issues of common interests, including global environmental questions.

An interest in governance and common norms rather than self-interest has parallels in studies of local governance systems, in particular the governance of common pool resources. Regime theory thus also has intellectual traditions connected to a discussion that started with Garrett Hardin's famous article "The Tragedy of the Commons," in which Hardin argues that an individual users' rational use of common resources will inevitably lead to a depletion of those resources, as each user will ignore costs to others in order to achieve maximum individual gains.²² The atmosphere could well be described as such a common resource, where each user (or state) will emit greenhouse gases in spite of long-term consequences. However, in the governance of common pool resources in small, stateless societies, it is well recognized that the tragedy of the commons is not inevitable. Rather, there are conditions under which regimes can solve this kind of collective-action problem.²³ A key question is what cultural norms and institutional settings help prevent a tragedy of the commons. For international relations theory, one focus has been on the conditions that can favor regime formation in a basically anarchic international society. Another issue has been what makes international regimes effective in such a setting.

The study of international regimes is a theoretically broad field. Some regime scholars retain the core assumptions in realism: even if states cooperate, the anarchical structure of international society is not challenged and the theoretical implication is mainly in recognizing that collaboration and coordination can sometimes be an efficient way to achieve an outcome that is in the self-interest of the state.²⁴ This approach to regime theory has generated analyses based on game theory in order to understand how regimes are negotiated. Several structural factors can affect the outcome of the game, or the negotiation of a regime, including the distribution of power among states and factors that

¹⁹ Krasner, "Structural Causes and Regime Consequences: Regimes As Intervening Variables," 1.

²⁰ Krasner, "Structural Causes and Regime Consequences: Regimes As Intervening Variables," 3.

²¹ Young, "Rights, Rules, and Resources in World Affairs," 5.

²² Garrett Hardin, "The Tragedy of the Commons," *Science* 162, no. 3859 (1968): 1243.

²³ Young, "Rights, Rules, and Resources in World Affairs," 5; Elinor Ostrom, Joanna Burger, Christopher B. Field, Richard B. Norgaard, and David Policansky, "Revisiting the Commons: Local Lessons, Global Challenges," *Science* 284, (1999): 278.

²⁴ Arthur A. Stein, "Coordination and Collaboration: Regimes in an Anarchic World," in *International Regimes*, ed. Stephen D. Krasner, 115-141 (Ithaca and London: Cornell University Press, 1981), 117, 127; Krasner, "Structural Causes and Regime Consequences: Regimes As Intervening Variables," 7.

affect the interest of each state, such as new knowledge or domestic changes that affects the national interest.²⁵ Another analogy used in this approach is the market, where regimes become a way to facilitate the making of specific agreements. Regimes are useful enough for coordinating decisions among actors, such that they are worth the extra transaction costs involved in creating a setting for joint decision making. Keohane emphasizes that there have to be political entrepreneurs who see a potential profit in organizing a collaboration in order to establish a regime.²⁶

Krasner, as well as Hasenclever, Mayer, and Rittberger have placed the structural or power-based approaches of regime theory in contrast to theories that put more emphasis on shared norms.²⁷ With shared norms as a focus, there is an emphasis on communication networks and rules that transcend national boundaries. In an increasingly globalized world, international regimes become almost inevitable – the normal state of international affairs – rather than an anomaly in an anarchical system. A definition of regimes used by Young mirrors this view: “Regimes are social institutions governing the actions of those interested in specific activities (or accepted sets of activities). Like all social institutions, they are recognized patterns of behavior or practices around which expectations converge.”²⁸ Regimes, using Young’s terminology, are thus not only formally negotiated agreements but also include spontaneous and imposed orders that govern expectations and behavior. To what extent sovereign states are key actors and whether military and economic power are important become empirical questions rather than *a priori* assumptions. Therefore, the answers can vary depending on the regime investigated.²⁹

This way of looking at regimes is similar to a movement in the social sciences known as new institutionalism. In contrast to previous studies of institutions, new institutionalism is not as interested in formal rules and legal frameworks but institutions as stable recurring patterns of behavior.³⁰ In the study of environmental issues, social institutions are seen as potent driving forces for the conditions of human-dominated ecosystems, globally as well as locally.³¹ This approach has, for example, been used in the Institutional Dimensions of Global Environmental Change (IDGEC), an international research program. IDGEC defines institutions as “sets of rules, decision-making procedures, and programs that define social practices, assign roles to participants in these practices, and

²⁵ Stein, “Coordination and Collaboration: Regimes in an Anarchic World,” 135-137.

²⁶ Robert O. Keohane, “The Demand for International Regimes,” in *International Regimes*, ed. Stephen D. Krasner, 141-171 (Ithaca and London: Cornell University Press, 1983), 151-155.

²⁷ Krasner, “Structural Causes and Regime Consequences: Regimes As Intervening Variables,” 8-9; Andreas Hasenclever, Peter Mayer, and Volker Rittberger, *Theories of International Regimes* (Cambridge: Cambridge University Press, 1997), chapter 1.

²⁸ Oran R. Young, “Regime Dynamics: the Rise and Fall of International Regimes,” in *International Regimes*, ed. Stephen D. Krasner, 93-113 (Ithaca and London: Cornell University Press, 1983), 93.

²⁹ For an example, see Oran R. Young, *Creating Regimes: Arctic Accords and International Governance* (Ithaca, NY: Cornell University Press, 1998).

³⁰ Vivien Lowndes, “Institutionalism,” in *Theory and Methods in Political Science*, eds. David Marsh and Garry Stoker, 90-108 (Houndsmills and New York: Palgrave Macmillan, 2002), 90-91.

³¹ Young, *The Institutional Dimensions of Environmental Change. Fit, Interplay, and Scale*, xi.

guide interactions among the occupants of individual roles.”³² Institutions that explicitly deal with environmental issues are often called environmental regimes.³³

The different ways of using the regime concept, including some diametrically opposed underlying assumptions about the nature of the international system, has raised question about whether the concept is useful at all. Criticisms also highlight the fact that regime theory has focused almost exclusively of states as actors and maintained many of the realist assumptions.³⁴ The many definitions of regimes, where some are narrow and others much broader, have added to the criticisms, as it can be difficult to know how a certain author uses the concept. I still find the regime concept useful, especially in relation to environmental governance where international cooperation is playing an increasing role. With its focus on how shared norms and decision-making procedures can affect the choices actors make, it is more specific than the more general term governance, even if a regime can also be seen as a governance system.

A working definition of regimes

My interest in international regimes in this dissertation follows a theoretical tradition that focuses on how shared norms guide the behavior of international actors. I take my starting point with the definition provided by Krasner, i.e. “regimes as principles, norms, rules, and decision-making procedures around which actor expectations converge in a given issue area.”³⁵ He defines principles as beliefs of fact, causation, and rectitude. Norms are standards of behavior defined in terms of rights and obligations. Rules are specific prescriptions and proscriptions for action. Decision-making procedures are prevailing practices for making and implementing collective choice.³⁶

The Arctic Council illustrates this definition. In this context, eight states have negotiated a founding document as well as Rules of Procedure. The founding document sets out certain *principles*, such as a commitment to protect the Arctic environment, to support sustainable development of the region, and to recognize both traditional knowledge and science.³⁷ I view them as principles in that the predecessor of the Arctic Council was created as a way to address the fact that degradation of the Arctic was becoming increasingly apparent. The *norms* are present in the rights and obligation to cooperate in the area of environmental protection. Examples of *rules* could be activities in terms of monitoring and assessing the Arctic environment that requires that the member states take measurements, share data, and allow their scientists to participate in assessment activities. The document also states that decisions are to be based on consensus, which indicates a certain norm but also points to the regime’s *decision-making procedures*. These are further elaborated in the Rules of Procedure, which specify who the partici-

³² Young, *The Institutional Dimensions of Environmental Change. Fit, Interplay, and Scale*, 5.

³³ Young, *The Institutional Dimensions of Environmental Change. Fit, Interplay, and Scale*, 5.

³⁴ Olav Schram Stokke, "Regimes As Governance Systems," in *Global Governance. Drawing Insights from the Environmental Experience*, ed. Oran R. Young, 27-63 (Cambridge, MA: MIT Press, 1997), 27.

³⁵ Krasner, "Structural Causes and Regime Consequences: Regimes As Intervening Variables," 1.

³⁶ Krasner, "Structural Causes and Regime Consequences: Regimes As Intervening Variables," 2.

³⁷ Declaration on the Establishment of the Arctic Council, 19 September 1996, preamble.

pants are, their status, who can come with proposals, etc.³⁸ A further discussion about the history and structure of the Arctic Council is presented in Chapter 4 of this dissertation.

In practice, it can be rather difficult to empirically separate principles, norms, rules, and decision-making procedures.³⁹ Moreover, the various aspects of a regime are not always explicit in documents, likewise not all norms that appear in documents are followed in practice. The common denominator that I am interested in is the way in which regimes refer to the structures that shape cooperation within a specific context. This is regardless of whether these structures are visible with formal definitions of participants' roles or informal codes of behavior that the members can only break at a certain cost. Unless these structures are renegotiated or challenged, they define the range of action available to the actors within the context of a specific regime.

Rules and decision-making procedures can also become increasingly formalized or renegotiated as regimes develop over time. An example is the Intergovernmental Panel on Climate Change (IPCC), where rules on peer-review have become increasingly explicit and where political sensitivities has made it important to pay attention to new issues, such as transparency of the process and participation by scientist from the different parts of the world.⁴⁰ I thus do not view structure in the regime concept as static. However, if a regime is to influence the behavior and expectations of various actors, there needs to be a certain degree of stability over time. A time-limited activity, such as the Arctic Climate Impact Assessment (ACIA) would, in my view, therefore not be a regime, in contrast to the structure that has evolved around the global assessments of climate change under auspices of the IPCC.

The focus on a specific issue area in Krasner's definition of regimes poses a problem. For one, with an increasing interlinking of international governance related to many different issues, it can become precarious to define the issue area. For example, what does the current global climate regime include when there are different parties and different norms when looking at the United Nations Framework Convention on Climate Change (UNFCCC) as a whole and the Kyoto Protocol? How do the structures of the IPCC relate to the political negotiations in the UNFCCC? There are also questions about how the climate regime (or the different parts of it) relates to the global trade regime?⁴¹ As issue areas are the results of how questions are framed and therefore are the result of social processes, I prefer to leave the question of issue area open to analysis. This also creates better opportunities for analyzing the interplay among regimes, includ-

³⁸ Arctic Council Rules of Procedure adopted at the First Arctic Council Ministerial Meeting Iqaluit, Canada September 17-18, 1998.

³⁹ Barry Buzan, *From International to World Society* (Cambridge: Cambridge University Press, 2004), 163.

⁴⁰ Bernd Siebenhüner, "Can Assessments Learn, and If So, How? A Study of the IPCC," in *Assessments of Regional and Global Environmental Risks. Designing Processes for the Effective Use of Science in Decisionmaking*, eds. Alexander E. Farrell and Jill Jäger, 166-186 (Washington, DC: Resources for the Future, 2006).

⁴¹ Mattias Hjerpe and Björn-Ola Linnér, "Mapping synergies between climate and synergetic issue areas. Synergies between sustainable development policies in WTO and UNFCCC," manuscript.

ing how they are embedded, or nested in each other.⁴² Although I sometimes refer to the global climate regime as one entity, I recognize that it has distinct regimes within it, with different purposes as well as different norms and decision-making procedures. Compare, for example, IPCC's aim of being policy relevant, but not policy prescriptive, with the UNFCCC's purpose of being a venue for negotiating policy. I also interpret "issue area" broadly. I take as its starting point that it can refer both to a geographically broad but functionally narrow governance arrangement (e.g. the UNFCCC) and to geographically more limited but functionally broader cooperation (e.g. the Arctic Council).⁴³

My working definition of regimes is very similar to the way the word *institutions* is used by the research program IDGEC, which defines institutions as "systems of rules, decision-making procedures, and programs that give rise to social practices, assign roles to the participants in these practices, and guide the interactions among the occupants of the relevant roles."⁴⁴ In referring to literature inspired by the IDGEC program, I therefore sometimes use the word institutions similarly with regime. A problem with the word institutions is that it is also used to refer to much more fundamental structures of international society, such as sovereignty and diplomacy. In a review how the words institutions and regimes are used in international relations literature, Buzan suggests the terminology of primary institutions for referring to fundamental structures of international society and secondary institutions for referring to more specific arrangements. His secondary institutions would thus be equivalent of regimes.⁴⁵ In discussing fundamental structures, I sometimes use Buzan's terminology of primary institutions, while the word institutions by itself can be read synonymously with regimes.

Young makes a clear distinction between organizations and institutions, and sees organizations as actors who can emerge as players whose activities are guided by the institutions' game rules.⁴⁶ The terms regime and organization are thus not synonymous. However, in many cases regimes will be accompanied by organizations or give rise to organizations that support them in various ways. These organizations can become actors independent of the states or other members of the regime. An example is the role played by the World Meteorological Organization (WMO) and United Nations Environment Programme (UNEP) in enhancing scientific knowledge about the causes and effects of stratospheric ozone depletion, where these organizations were more than mere agents of state interest.⁴⁷ However unlike the accompanying organizations, a regime is by definition not an actor.⁴⁸ I will try to follow this distinction between actor and structure and be clear when I refer to an organization and actor rather than the structures associated with a certain governance arrangement.

⁴² Young, "Rights, Rules, and Resources in World Affairs," 20; Oran R. Young, *Governance in World Affairs* (Ithaca and New York: Cornell University Press, 1999), 6; Young, *The Institutional Dimensions of Environmental Change. Fit, Interplay, and Scale*, chapter 5.

⁴³ Young, *Governance in World Affairs*, 5.

⁴⁴ Oran R. Young, *Institutional Dimensions of Global Environmental Change. Science Plan International Human Dimensions Programme*, 1998), 1.1.

⁴⁵ Buzan, *From International to World Society*, Chapter 6.

⁴⁶ Young, *The Institutional Dimensions of Environmental Change. Fit, Interplay, and Scale*, 5.

⁴⁷ Breitmeier, "International Organizations and the Creation of Environmental Regimes," 101-102.

⁴⁸ Hasenclever, et al. *Theories of International Regimes*, 11.

The role of knowledge

Since power remains an important analytical concept in regime theories that emphasize shared norms, there is a need to analyze its nature.⁴⁹ There has, for example, been an increasing emphasis on cognitive factors and learning – how actor interests change in response to new knowledge.⁵⁰ This development is by no means isolated to regime theory but can be described as part of a more general trend in international relations to widen the concept of power. Power can then influence the ideas of others as well as the connection between knowledge and economic power in an increasingly information-based society.⁵¹ An example of this emphasis on knowledge in international relations theory is the study of epistemic communities and their role in shaping environmental policy. These are networks of knowledge-based experts that have helped states identify their interests by articulating cause-effect relationships of complex problems.⁵² However, the epistemic community approach has been extensively criticized because it obscures the process by which scientific knowledge is produced and framed as well as the power relations in this process.⁵³

In addition to this critique, I emphasize that the epistemic community approach black-boxes the role of regimes in bringing together expertise around an issue and providing a science-policy nexus that members of the scientific community may not otherwise have. An example is how shared beliefs or norms are important to stabilizing coalitions of actors and for creating processes by which actors are influenced.⁵⁴ It is thus important to view a knowledge-regime nexus as a two-way street. In a similar vein, some scholars have pointed to how long-term iterative assessment and management structures are important for bringing scientific knowledge to decision makers.⁵⁵ In these cases regimes provide structures for the science-policy interface that can enhance the power of certain coalitions of actors. Moreover, in a summary of several case studies, Young has pointed out how institutions can frame research agendas by channeling resources to specific research areas, privileging certain types of knowledge claims and guiding the application of knowledge to specific policy concerns.⁵⁶ In general, however,

⁴⁹ Young, "Regime Dynamics: the Rise and Fall of International Regimes," 109-110.

⁵⁰ Ernst B. Haas, "Words Can Hurt You," in *International Regimes*, ed. Stephen D. Krasner, 23-59 (Ithaca and London: Cornell University Press, 1986), 57.

⁵¹ Susan Strange, *States and Markets* (London and New York: Pinter, 1994), chapter 6; Summaries of Susan Strange's thinking on the role of knowledge in Thomas C. Lawton, James N. Rosenau, and Amy C. Verdun, "Looking Beyond the Confines," in *Strange Power*, eds. Thomas C. Lawton, James N. Rosenau, and Amy C. Verdun, 3-18 (Aldershot: Ashgate, 2000) 3, 8; Lynn K. Mytelka, "Knowledge and Structural Power in the International Political Economy," in *Strange Power*, eds. Thomas C. Lawton, James N. Rosenau, and Amy C. Verdun, 39-56 (Aldershot: Ashgate, 2000), 39.

⁵² Peter M. Haas, "Introduction: Epistemic Communities and International Policy Coordination," *International Organization* 46, no. 1 (1992): 1.

⁵³ E.g. Jasanoff and Wynne, "Science and Decision Making," 50-53; Karin Bäckstrand, *What Can Nature Withstand? Science, Politics and Discourses in Transboundary Air Pollution Diplomacy*, Diss. (Lund: Department of Political Science, Lund University, 2001), 256-257.

⁵⁴ William C. Clark, Jill Jäger, and Josee van Eijndhoven, "Managing Global Environmental Change: An Introduction to the Volume," in *Learning to Manage Global Environmental Risk. Vol. 1*, ed. The Social Learning Group, 3-19 (Cambridge, MA: MIT Press, 2001), 12-15.

⁵⁵ David W. Cash and Susanne C. Moser, "Linking Global and Local Scales: Designing Dynamic Assessment and Management Processes," *Global Environmental Change* 10, (2000): 109.

⁵⁶ Young, "Institutions and the Growth of Knowledge."

regime theory has paid limited attention to the social construction of knowledge and scientific understanding. In the next section I will therefore turn to a school of thought that specifically addresses the social construction of knowledge.

2.2 Co-production of knowledge and political order

The increasing emphasis on cognitive factors in international relations, including the role of science, begs the question: what is knowledge? In international relations theory, knowledge itself is usually not analyzed and there has been limited interest in how knowledge is produced and by whom.⁵⁷ I will therefore turn to science and technology studies, where these questions have been major focal points.

The co-production of knowledge

The lesson from science and technology studies is that knowledge is not independent of politics in framing environmental issues. Rather, most global environmental issues have emerged from an interplay between science and policy. For example, Jasanoff and Wynne argue that environmental phenomena are constructed by a myriad of social interactions within scientific communities and with actors outside science who play a role in defining problems and endorsing solutions.⁵⁸ Climate science is no exception. In fact it is an unusually clear example of what Jasanoff and Wynne call co-production of knowledge and policy. According to their analysis “scientific knowledge and political order are *co-produced* at multiple stages in their joint evolution, from the stabilization of specialized factual findings in laboratory and field studies to national and international acceptance of causal explanations offered by science and their use in decision making.”⁵⁹ In this co-production, science and policy derive legitimacy from each other.⁶⁰ In relation to scientific assessment of climate change impacts, Long and Iles argue that “a scientific assessment can be thought of as ‘trading zone’ where questions over data, research priorities, participation and methodological approaches are negotiated among scientists, assessors, policy-makers, and other assessment users.”⁶¹ The term co-production is today used by an increasing number of authors who wish to emphasize the socially constructed nature of knowledge. There are also attempts to connect a previous focus on the micro-dynamics of how knowledge is constructed in science and technology studies to the more macro-oriented approaches that also look at the role of institutions.⁶²

Co-production suggests that knowledge about climate change should not only be investigated based on its connection to observations of nature, computer models, or other

⁵⁷ Bäckstrand, *What Can Nature Withstand?*, e.g. 54, 70.

⁵⁸ Jasanoff and Wynne, “Science and Decision Making,” 4.

⁵⁹ Jasanoff and Wynne, “Science and Decision Making,” 6.

⁶⁰ Jasanoff and Wynne, “Science and Decision Making,” 16.

⁶¹ Marybeth Long and Alastair Iles, *Assessing Climate Change Impacts: Co-Evolution of Knowledge, Communities, and Methodologies*, Kennedy School of Government, Harvard University, 1997), 2.

⁶² Sheila Jasanoff, “The Ideom of Co-Production,” in *States of Knowledge. The Co-production of Science and Social Order*, ed. Sheila Jasanoff, 1-12 (London and New York: Routledge, 2004), 4-5.

climate science tools. The analysis should also pay close attention to human agency, cultural discourses, and the social goals of climate science and policy. As climate change is often framed as a global environmental issue, a starting point for this dissertation is that it is also of interest to analyze what role international regimes might play in initiating and structuring knowledge production. Such work has previously highlighted how the framing of climate change as a global issue has involved the creation of credible global institutions.⁶³

As the concept itself suggests, the idea of co-production is relevant not only for understanding science but also for understanding science-intensive politics. In a study on the role of science in the Convention on Long-Range Transboundary Air Pollution, Lidskog and Sundqvist argue that co-production of knowledge is a prerequisite for effective regime formation and places this in contrast to theories that emphasize scientific knowledge per se (e.g. epistemic community thinking) or approaches that downplay the role of science in regime formation.⁶⁴

The interdependent relationship between science and policy is not necessarily acknowledged by the participants in the process. In fact, there is often a need to clearly demarcate the boundaries between science and other activities as a way of maintaining credibility and legitimacy in relation to different audiences. Gieryn defines such boundary work as the attribution of selected characteristics to the institution of science for purposes of constructing a social boundary that distinguishes some intellectual activities as non-science.⁶⁵ Long and Iles describe this as “dealing with activities of creating and maintaining ‘lines’ dividing research domains, knowledge, disciplines, expert jurisdiction, and institutional responsibilities.”⁶⁶ In practical terms, boundary work becomes apparent in efforts to affirm scientific responsibility over certain areas and policy initiative in others. In scientific assessments, the boundary between science and policy are porous. Nevertheless, there are often ambitions to uphold the demarcation. A focus on boundary work can be used to enhance our understanding of how the value of knowledge is decided in a regime and what knowledge is deemed credible and legitimate in relation to a specific policy issue.⁶⁷ To make it analytically usable, the focus should not be on the separation of science and policy as such but on the bargaining and tensions between the spheres and the consequences of where the boundaries become placed in a specific process. Empirically it becomes important to identify how, when, why, and by whom boundaries between science and policy are maintained or shifted and how this affects a process and its outcome.

The concept of co-production also requires a working definition of what is co-produced. For my purposes, the shorthand expressions *policy* and *science* are not always

⁶³ Clark A. Miller, "Climate Science and the Making of Global Political Order," in *States of Knowledge. The Co-production of Science and Social Order*, ed. Sheila Jasanoff, 46-66 (London and New York: Routledge, 2004).

⁶⁴ Rolf Lidskog and Göran Sundqvist, "The Roles of Science in Environmental Regimes: the Case of LRTAP," *European Journal of International Relations* 8, no. 1 (2002): 77, 94.

⁶⁵ T. F. Gieryn, "Boundaries of Science," in *Handbook of Science and Technology Studies*, eds. Sheila Jasanoff, Markle Gerlad E., James C. Petersen, and Pinch Trevor, 393-443 (Thousand Oaks: Sage, 1995), 405.

⁶⁶ Long and Iles, *Assessing Climate Change Impacts*, 4.

⁶⁷ Lidskog and Sundqvist, "The Roles of Science in Environmental Regimes: the Case of LRTAP," 184.

sufficient. Policy can be defined as “a collection of decisions regarding a question that are shaped in processes by actors based on their values and resources.”⁶⁸ This definition may be sufficient for discussing how science influences political decision making but it is not adequate for analyzing the other side of co-production. Consequently, Jasanoff and Wynne’s term *political order* is more appropriate as a concept that includes governance arrangements and other political structures rather than focusing only on political plans of actions and how they are shaped.⁶⁹ The word *science* is also too narrow for the purposes of this dissertation, as its common usage refers to western academic scientific disciplines.⁷⁰ I, therefore, often use the wider term knowledge production, which leaves open to analysis what knowledge is considered legitimate in each specific context and also emphasizes that knowledge is not static but is the result of on-going social activities. I will not enter into the philosophical debate of what can be known, but a broad, yet concise working definition of knowledge could be “what is known,” thus leaving it to empirical analyses to illustrate which knowledges get counted.⁷¹

Co-production in context: the co-construction of natures and cultures

Epistemologically, the idea of co-production has its basis in viewing science as a social activity and thus is the sociology of science.⁷² An example is a position statement by Callon, Law, and Rip in their book *Mapping the Dynamics of Science and Technology*, where they note that “there is no one real pattern of scientific development or of the structure of society ... waiting to be discovered. Rather there is a multitude of perspectives, each struggling to extend its scope and its influence.”⁷³ This is in contrast to a positivist tradition, where there is an assumption that any scientific representation of a phenomenon is the product of a real object.⁷⁴

The constructivist stance creates a critical relationship to knowledge – if there is no objective truth to be revealed – no essence – there can be no ranking of knowledges as being more or less truthful. This has spurred controversies and extended debates about relativism in the so-called Science Wars of the 1990s.⁷⁵ But as scholarship with a constructivist approach evolved, it created analytical space to focus attention on the social structures and processes that create our pictures of reality and the actors that participating in the creation.

⁶⁸ Elin Wihlborg, *En lösning som söker problem. Hur och varför lokala IT-policyer utvecklas i landsbygdskommuner*. Diss. Tema Teknik och social förändring, Linköpings universitet, 2000, 16-18, based on a review of definitions of policy. My translation from Swedish.

⁶⁹ Jasanoff and Wynne, "Science and Decision Making," 6.

⁷⁰ See e.g. ICSU and UNESCO, *Science, Traditional Knowledge and Sustainable Development* International Council for Science, (2002).

⁷¹ Wikipedia, <http://en.wikipedia.org/wiki/Knowledge>.

⁷² Mats Börjesson, *Diskurser och konstruktioner. En sorts metodbok* (Lund: Studentlitteratur, 2003), 45.

⁷³ Michel Callon, John Law, and Arie Rip, "Putting Texts in Their Place," in *Mapping the Dynamics of Science and Technology*, eds. Michel Callon, John Law, and Arie Rip, 221-230 (London: MacMillan Press, 1986), 227.

⁷⁴ Börjesson, *Diskurser och konstruktioner*, 21.

⁷⁵ Sarah Franklin, "Science As Culture, Cultures As Science," *Annu. Rev. Anthropol.* 24, (1995): 163; Keith Parsons, ed. *The Science Wars: Debating Scientific Knowledge and Technology* (Amherst, NY: Prometheus Books, 2003); Alan D. Sokal, *Intellectual Impostures: Postmodern Philosophers' Abuse of Science/Alan Sokal and Jean Bricmont* (London: Profile, 2007).

Social constructivism does not necessarily assume that there is no physical reality, but nature's role is seen as less deterministic in controlling the production of scientific knowledge, and the analytical focus is shifted towards the social processes that create our understanding.⁷⁶ A constructivist approach that explicitly takes material matters into account is summarized by the notion of co-construction. Harding, for example, argues that the old duality of realism versus constructivism has become obsolete. Instead she proposes that "[w]e can retain the best of both realism and constructionism understandings of the relations between our social worlds, our representations, and the realities our representations are intended to represent by thinking of co-evolving, or co-constructing, cultures and their knowledge projects."⁷⁷ A similar theme runs through much of the writing of Haraway, who writes about how nature is made not entirely by humans; it is a co-construction among humans and non-humans.⁷⁸ Other writers who have explored this intertwined relationship between nature and culture are Lefebvre in his discussion of the production of space and Steiner with his human ecological triangle that describes the recursive interdependence between the person, the society, and the environment.⁷⁹ One way to summarize the role of nature in relation to the social construction of reality is to see nature as a product of a culture that rests on existing physical circumstances and that the physical realities impose limits or create resistances in relation to how human actors or social structures may want to frame an issue.⁸⁰

Latour has traced the historical developments that caused the separation of nature and culture in the first place. Or as he phrases it: a situation where social sciences and humanities have become devoted to the study of "humans among themselves" and the natural sciences to "things among themselves."⁸¹ He uses Shapin and Schaffer's study of the natural philosopher Robert Boyle and the political philosopher of Thomas Hobbes, who by their respective work in the 17th century created a demarcation between scientific and political power. Latour calls this demarcation "The Modern Constitution," which can be seen as the ultimate boundary work to separate science and policy.⁸² In spite of the "work of purification" according to the Modern Constitution, there has been a proliferation of events and phenomena that can neither be described as entirely cultural nor as entirely natural. His main example is the ozone hole but the logic would be very similar for climate change. Based on this proliferation of hybrids, he argues that it is time to retie the Gordian knot of nature, politics, and discourse and to start studying what modernity (including academia) has tried to separate.

⁷⁶ Jasanoff and Wynne, "Science and Decision Making," 17-20.

⁷⁷ Sandra Harding, *Is Science Multicultural? Postcolonialism, Feminism, and Epistemologies* (Bloomington and Indianapolis: Indiana University Press, 1998), 20.

⁷⁸ Donna J. Haraway, "The Promises of Monster: a Regenerative Politics for Inappropriate/d Others," in *Cultural Studies*, eds. Lawrence Grossberg, Cary Nelson, and Paula A. Treichler, 295-337 (New York, London: Routledge, 1992), 313.

⁷⁹ Henri Lefebvre, *The Production of Space* (Oxford: Blackwell, 1991); Dieter Steiner, "Human Ecology As Transdisciplinary Science, and Science As Part of Human Ecology," in *Human Ecology. Fragments of Antifragmentary World Views*, eds. Dieter Steiner and Markus Nausner, 47-76 (London and New York: Routledge, 1993), 56.

⁸⁰ Björn-Ola Linnér, "Produktionen av ett nytt landskap," in *Naturen som brytpunkt*, ed. Johan Hedrén, (Stockholm: Brutus Östling Bokförlag, 2002), 288.

⁸¹ Latour, *We Have Never Been Modern*, 5.

⁸² Latour, *We Have Never Been Modern*, 13.

Latour's methodological approach is to study the networks that connect the spheres that the Modern Constitution has separated. A key concept Latour developed together with Callon is actor-networks, where the actors (or actants) are both human and non-human entities. The actor world is built via translations, in which each entity receives an identity and role to play. With the term translation, they try to capture all "the negotiations, intrigues, calculations, acts of persuasion and violence, thanks to which an actor or force takes, or causes to be conferred on itself, authority to speak on behalf of another actor or force."⁸³ The role of a particular actor or actant is thus neither pre-given nor an external reality. The actor world is structured as a network. An actor-network then makes it possible to describe the dynamics and internal structure of the actor-world.⁸⁴ When first conceived, the idea of actor-networks was a way of bypassing the structure-agency contradiction by concentrating on the movement or summing up of the local encounters because of a wish to learn about the actors' own motives for their actions. It was to be a systematic recording of the world-building activities, a kind of bottom-up approach.⁸⁵ A key point was also that the actor focus was not one of looking at intentions of actors but how their interactions with other actors provided them with actoriality. As Latour points out, there is nothing especially human in such interactions, which makes it possible to also look at non-humans as actors. He discusses interobjectivity as a way of phrasing the new position of the actors.⁸⁶

I find the actor concept in actor-network theory useful because it opens up for analysis the relationships between physical phenomena and the social world. In a study of Arctic climate change, an actor-network perspective could, for example, imply investigating how increases in temperature or melting sea ice are translated by different actors in a network and thus how certain aspects of nature are used to strengthen the power of some actors. One could see it as scientists, within a certain scientific discipline, taking on the authority to translate and give these aspects of nature a role, or likewise other actors using the authority of science, who in turn rely on the authority of nature, to strengthen their position in a specific issue area. I argue that it also suggests analyzing how some actor networks become stabilized by governance arrangements and thereby have a greater potential to influence policy while other actor networks remain less connected to international environmental governance. I will not apply a "pure" actor network approach in this dissertation as it would require studies of how the networks are constructed in practices, starting at the micro-level of science. I will, however, borrow the broad view of actors from actor-network theory when I use the term actor as a counterpoint to the focus on structure in regime thinking.

What are the implications of these various co-constructivist approaches to the study of international relations? First, they make it clear that studies of the interface between

⁸³ Michel Callon and Bruno Latour, "Unscrewing the Big Leviathan," in *Advances in Social Theory and Methodology*, eds. Karin D. Knorr-Cetina and Aaron Victor Cicourel, 277-303 (Boston: Routledge, 1981), 279.

⁸⁴ Michel Callon, "The Sociology of an Actor-Network: The Case of the Electric Vehicle," in *Mapping the Dynamics of Science and Technology*, eds. Michel Callon, John Law, and Arie Rip, 19-34 (London: MacMillan Press, 1986).

⁸⁵ Bruno Latour, "On Recalling ANT," in *Actor Network Theory and After*, eds. John Law and John Hassard, 15-25 (Oxford: Blackwell, 1999).

⁸⁶ Latour, "On Recalling ANT," 18.

knowledge production and political order are essential if we want to understand the role of science in international politics. This is especially true where scientific issues take center stage, such as in global environmental change. Moreover, the science side of this nexus should not be black-boxed. Rather, its dynamics should become part of the analysis of power. More specifically, actor-network thinking provides an analytical tool for studying the role of scientists and their equipment in relation to actors who we usually conceive of as part of the political sphere. Questions for the study of the ACIA include what technologies have been important in translating changes in nature into images of climate change, and what political structures have supported the developments of these technologies. And vice versa: What aspects of nature have not been as extensively translated and why? How would translations or lack thereof relate to the power positions of various political actors?

The notion that knowledge and political order are co-produced also has an intellectual base in discourse analysis and its more explicit focus on the role of power, including the normative and cultural elements in quests for power.⁸⁷ It thus also goes back to Foucault's thinking about the rules that determine why some statements become accepted as true, or what can be legitimately articulated in certain historic times, and "how one or another object could take the place as possible objects of knowledge."⁸⁸ This part of the intellectual base of the co-production ideom makes it more useful from an international relations perspective in general and a regime perspective in particular than actor-network theory on its own. Not only does it highlight a historical shift from sovereign power to a more discursive or disciplinary form of power typical of modernity.⁸⁹ Co-production also focuses attention on the processes by which scientific knowledge is synthesized, framed, and how the creation of authoritative narratives can play a key role for the policy impact of scientific knowledge.⁹⁰

2.3 An analytical framework

The literature reviewed in this chapter reveals two major tensions. Analytically, different theories tend to focus on either structure or agency. In addition, two fields of activity that relate to each other have been identified: politics and knowledge production. This section elaborates on those two tensions and introduces some analytical concepts that will be used to study them.

⁸⁷ Sheila Jasanoff, "Ordering Knowledge, Ordering Society," in *States of Knowledge. The Co-production of Science and Social Order*, ed. Sheila Jasanoff, 13-45 (London and New York: Routledge, 2004).

⁸⁸ Lawrence D. Kritzman, *Michel Foucault: Politics, Philosophy, Culture - Interviews and Other Writings 1977-1984* (New York: Routledge, 1988), 31; Marianne Winther Jørgensen and Louise Phillips, *Diskursanalys som teori och metod* (Lund: Studentlitteratur, 1999), 19.

⁸⁹ Michel Foucault, "Afterword. The Subject and Power," in *Michel Foucault: Beyond Structuralism and Hermeneutics*, eds. Hubert L. Dreyfus and Paul Rabinov, 208-226 (Hemel Hempstead: Harvester Wheatsheaf, 1982); Karen T. Litfin, *Ozone Discourses. Science and Politics in Global Environmental Cooperation* (New York: Colombia University Press, 1994), 21.

⁹⁰ Bäckstrand, *What Can Nature Withstand?*, 244.

Two tension fields

An issue that is common to both international relations theory and various approaches to understanding the nexus of power and knowledge is the relationship between structure and agency. This debate concerns the extent to which various actors shape a situation or if their actions are determined by a context or structure.⁹¹ For example, scholars using the regime concept tend to focus either on the various actors and their preferences, or the common structures that guide their behavior. Within the literature on the relationship between power and knowledge, discourse-inspired analyses focus mainly on structure, especially the structure of language, in determining our thinking and thus our understanding of the world. The actors that participate in creating a discourse tend to become hidden from view.⁹² Since international relations scholars started to look at the role of knowledge in the environmental governance, there has been a shift in academic interest from focusing on epistemic communities as agents of policy change to epistems or discourses.⁹³ As a contrast to a structural focus, actor-network theory pays specific attention to the actors, their actions, and how different actors can gather power but does not highlight the power structures within which they act. There is no simple solution to the apparent contradiction between focusing on structure or agency other than to acknowledge that both approaches should be kept in mind throughout the analysis.⁹⁴ One can also see the structure-agency dichotomy as part of a larger war of paradigms within social science, where one school of thought places the focus on the epistemological significance of individual agents and their choices whereas the other focuses on the structures that define the positions, roles, and identities of the individual agents.⁹⁵

I want to retain foci on both structure and agency, leaving it open to empirically investigate the tensions between them. In what situations do the structures of international cooperation, for example international regimes, play a role in shaping the framing of Arctic climate change? What other structures in international society may be important, including historic East-West tensions and core-periphery relations? And as counterpoint: in what situations do actions of specific states or non-state actors have a major influence on events? And combining the two analytical perspectives: To what extent are actors constrained or not constrained by specific regimes or other structures? Do the dynamics differ depending on the issue in focus?

The second tension is between political order and knowledge production, or policy and science. As identified by the concept of co-production, they are closely interlinked. Yet, many actors want to keep them separate. At other times, policy and science are brought closer together, often in an attempt to make policy makers aware of a scientific view of a specific problem or to use science to legitimize policy actions. It is a tension

⁹¹ Definition adapted from McAnulla, "Structure and Agency," 271.

⁹² Marianne Winther Jørgensen, "Den diskursive distribution af struktur og agens. En analyse af humanvetenskabelige subjektpositioner," *Dansk Sociologi* 14, no. 1 (2003): 71.

⁹³ Peter M. Haas, "Do Regimes Matter? Epistemic Communities and Mediterranean Pollution Control," *International Organization* 43, no. 3 (1989): 377; Haas, "Introduction: Epistemic Communities and International Policy Coordination"; Litfin, *Ozone Discourses*; Bäckstrand, *What Can Nature Withstand?*, 257.

⁹⁴ McAnulla, "Structure and Agency," 273.

⁹⁵ Rudra Sil, "The Foundations of Eclecticism. The Epistemological Status of Agency, Culture, and Structure in Social Theory," *Journal of Theoretical Politics* 12, no. 3 (2000): 353, 354.

that could be described as a tango by two unwilling partners: they are interlinked but still have to assert their independence in various kinds of boundary work. While recognizing their interdependence, I argue that there are advantages to keeping them analytically separate. A key point is that this creates a window where their interactions form an empirical question that can potentially illuminate the dynamics of co-production of science and policy. What are the factors that influence when and how science has an impact on policy choices? What factors play a role for politics driving knowledge production?

These two tensions are not independent of each other. For example, both regime structure and the actions of specific actors can affect the relationship between knowledge production and political order. I therefore suggest placing both of them in the same analytical framework. The following figure is an attempt to capture such a framework in a simple graphical form.

Figure 1.1. The analytical framework highlights the interactions between political order and knowledge production and how this intersects with analytical tensions between structure and agency. Structures refer to the contexts that define the range of actions available to various actors. It includes regimes but also more basic structures of international society, such as East-West and core-periphery relations. Actors include individuals as well as collectives, such as states and organizations. It also includes non-human entities that influence their environments through networks of connections. The relationships between the different parts of the framework are likely to vary depending on the situation that is being analyzed.

Empirically, this dissertation analyzes different types and sources of knowledge integrated into the ACIA and why they are integrated. A major question is how different framings of Arctic climate change relate to structures of international cooperation, e.g. regimes. The analytical framework presented here allows me to do this analysis without losing sight of the tension between structure and agency, i.e. between regimes and other structures of international society on one side and various actors on the other. Moreover, it creates an analytical window for looking at structure-agency interdependent interactions within the tension between policy and knowledge production.

As a complement to the overall framework, there is a need to define more specifically the analytical tools used to understand the history, process, and content of the ACIA. Based on the literature on environmental governance, two sets of analytical concepts appear specifically appropriate for this study. The first one borrows from the literature of scientific assessments and their influence on policy and the second from the literature on institutional dimension of environmental change.

Relating to actors

The Global Environmental Assessment Project (GEA) provides a systematic analysis of how and why scientific assessments influence policy.⁹⁶ In spite of the fact that the very idea of scientific assessments is usually to have a policy impact, this is far from always being the case. The GEA project has identified three crucial factors for influence: *salience*, *credibility*, and *legitimacy*. Salience refers to whether the assessment is seen as relevant. Credibility deals with whether it is judged to be reliable and legitimacy refers to if the assessment is deemed respectful to the relevant audiences. Scientific and political legitimacy do not always go hand in hand, especially in controversial areas such as climate change where the policy stakes are high and science is often called into question. Rather, the GEA emphasizes the importance of recognizing the tensions and trade-offs among salience, credibility, and legitimacy for different actors. The concepts of salience, legitimacy, and credibility address the relationship between an assessment and various actors. The key analytical question becomes: to whom is the assessment salient, credible and legitimate?

Relating to structures

The concepts salience, legitimacy, and credibility do not address how actors or actor networks might use regimes to influence knowledge production and how norms, structures, and decision-making procedures may influence their role. To investigate the role of regimes, I will therefore also use another set of analytical concepts, from the literature on institutional dimensions of environmental change: *fit*, *interplay*, and *scale*. The purpose for introducing these concepts is to investigate their analytical value when applied to the question of how political structures might influence knowledge production. They are also used for highlighting the role of regimes in relation to salience, legitimacy and credibility.

The problem of fit is about the congruence or compatibility between an institutional arrangement and the issue area which it attempts to manage, for example, the congruency between an ecosystem and the institution created to manage that ecosystem.⁹⁷ Fit is relevant in studying science-policy interactions in that it is not always self-evident how

⁹⁶ Ronald B. Mitchell, William C. Clark, David W. Cash, and Nancy M. Dickson, "Evaluating the Influence of Global Environmental Assessments," in *Global Environmental Assessments: Information and Influence*, Global Environmental Assessments: Information and Influence, 1-28 (Cambridge, MA: MIT Press, 2006).

⁹⁷ Carl Folke, Lowell Prichard, Fikret Berkes, Johan Colding, and Uno Svedin, *The Problem of Fit Between Ecosystems and Institutions* (Bonn: International Human Dimensions Programme, 1998); Young, *The Institutional Dimensions of Environmental Change. Fit, Interplay, and Scale*, 20.

the system that is to be managed should be defined. Climate change is a prime example. From an atmospheric science point of view, the climate system is viewed as global. However, developing countries have challenged this global perspective, especially for looking at emissions of greenhouse gases, arguing that a global view obscures the fact that the industrialized North is responsible for most of the current emissions. A key question is thus what attributes of an environmental problem are the most important to consider in analyzing fit.⁹⁸ In studying knowledge production, the concept of fit needs to be scrutinized and attention placed on how the way in which knowledge production is structured plays a role in defining what we understand as the boundaries of a particular environmental issue. Knowledge production on climate change has historically been focused primarily at the global level, and that may well be a major reason why we primarily define it as a global political issue, but what are the drivers or circumstances that have led to this global focus in climate research? And what happens to our understanding of climate change when the focus is shifted to local, regional, or national levels?

Closely related to the issue of fit is how environmental problems can be understood in dimensions of time and space. This is often summarized as the problem of scale. Another term used to pinpoint the same issue is level of analysis.⁹⁹ Some authors differentiate the term *scale*, using it to refer to the type of scale, e.g. spatial scale or temporal scale, from the term *level*, which is used to speak about a position within a certain scale, e.g. global, regional, or local on a spatial scale and international, national, or community on a governance scale.¹⁰⁰ However this distinction is not consistent in the literature. Gibson et al. point out that all scientific inquiry incorporates scale and level choices into the process of identifying research objects. These choices, therefore, critically affect what we observe and the patterns that become visible. Moreover, the explanation for a given phenomena can change depending on the scale at which it is studied.¹⁰¹ There has also been an increasing focus on cross-scale and cross-level interactions.¹⁰²

Neither the spatial scale at which to conduct a study nor the procedures for integrating knowledge across spatial scales are chosen in a vacuum. Disciplinary structures and allegiances within scientific communities can play a role, as can funding opportunities and institutional settings that may facilitate or hinder collaborations among people focusing on different scales or levels. Scale is thus an issue that should be probed in trying to understand knowledge production that influences how we frame environmental problems. From an international relations point of view, it would be especially interesting to

⁹⁸ Young, *The Institutional Dimensions of Environmental Change. Fit, Interplay, and Scale*, 21.

⁹⁹ Clark C. Gibson, Elinor Ostrom, and T. K. Ahn, "The Concept of Scale and the Human Dimensions of Global Change: a Survey," *Ecological Economics* 32, (2000): 217; Young, *The Institutional Dimensions of Environmental Change. Fit, Interplay, and Scale*, 26.

¹⁰⁰ David Cash, W. N. Adger, Fikret Berkes, Po Garden, Louis Lebel, Per Olsson, and Oran R. Young, "Scale and Cross-Scale Dynamics: Governance and Information in a Multilevel World," *Ecology and Society* 10, no. 2 (2005): 8.

¹⁰¹ Gibson, et al., "The Concept of Scale and the Human Dimensions of Global Change: A Survey," 121, 126; Young, *The Institutional Dimensions of Environmental Change. Fit, Interplay, and Scale*, 26-27, 139 ff.

¹⁰² E.g. Cash and Moser, "Linking Global and Local Scales"; Folke, et al. "Synthesis: Building Resilience and Adaptive Capacity in Social-Ecological Systems," 378; Doris Capistrano, Cristian K. Samper, Marcus J. Lee, and Ciara Raudsepp-Hearne, eds. *Ecosystems and Human Well-Being. Multiscale Assessments Vol. 4* (Washington, Covelo, London: Island Press, 2006).

analyze how international regimes influence these processes. What happens when new regimes and actors, concerned with different spatial scales, get involved in an issue? Are dynamics at the international regional level governed by different structures compared to the global level?

There are a rising number of international institutions that are concerned with environmental issues and this increasing density is likely to lead to a growing interaction among institutions.¹⁰³ This is referred to as interplay.¹⁰⁴ Interplay can be horizontal when institutions working at the same governance level deal with similar matters. The global regime for protecting the ozone layer – the Vienna Convention with its various protocols – thus interacts with the UNFCCC on several issues, for example in the control of substances that affect both climate and the ozone layer. Interplay can also be vertical. This is when institutions working at different levels are involved in the same issue.¹⁰⁵ An example is that climate change is of concern globally in the UNFCCC, but also at the regional level in the Arctic Council, nationally within the different Arctic states, and locally in some Arctic communities. Both vertical and horizontal interplay are relevant in a study of knowledge production in that they provide analytical lenses for specifically looking at how dynamics between institutions at different levels of governance affect the framing of climate change.¹⁰⁶

2.4 Chapter summary

This chapter attempts to deepen the discussion on knowledge production in international relations in general and the study of international environmental regimes in particular. It explores ways to analyze scientific activities, not as inputs to policy processes, but in their own right. Based on insights from science and technology studies, the analytical lens is that knowledge and political order are co-produced and that it is therefore of interest to understand how political order can influence knowledge production. The basic epistemological premise is that scientific knowledge is socially constructed, and that this process can be best understood as co-construction between nature and culture/society.

The chapter highlights the basic analytical tension between structure and agency. By combining it with the tension expressed by the idea of co-production of science and policy, a framework is created that should facilitate the analysis of how and when international regimes influence knowledge production. In addition, the chapter presents in more detail some analytical concepts that are used throughout the dissertation. They include the concepts *fit*, *interplay*, and *scale* from the study of institutional dimension of environmental change, and *salience*, *legitimacy*, and *credibility* from the study of global environmental assessments.

¹⁰³ Young, *The Institutional Dimensions of Environmental Change. Fit, Interplay, and Scale*, 8.

¹⁰⁴ Young, *The Institutional Dimensions of Environmental Change. Fit, Interplay, and Scale*, 23.

¹⁰⁵ Young, *The Institutional Dimensions of Environmental Change. Fit, Interplay, and Scale*, 24.

¹⁰⁶ Young, *The Institutional Dimensions of Environmental Change. Fit, Interplay, and Scale*, 113-115.

Chapter 3

Research Approach

This chapter lays out the research approach that will be used to further understand how the political dynamics might affect the framing of Arctic climate change. It includes a rationale for focusing on Arctic climate change and presents some comments on using a case study approach, including a discussion of its potential value for understanding and explaining science-policy dynamics. The chapter also presents the methods used for gathering empirical material, an ethical analysis of the project, some notes on my role as a researcher in terms of situated knowledge, and some comments on language and word use choices.

3.1 Focus

This study focuses on Arctic climate change. Choosing climate change as the issue to highlight was motivated by two factors. First, this is an area in which science and policy has been closely intertwined for some time and second there is a growing scholarship exploring this relationship. Moreover, it is an area where the core of knowledge production has been an important part of the global political debate. There is thus a larger research context in which to situate this specific study.

There are two rationales for choosing to focus on the Arctic. One is the increasing interest at the regional scale in climate impact assessment, thus it is especially pertinent to follow the first international regional climate impact assessment. What can it tell us about the potential and limitations of future regional climate impact assessments in relation to the global science and policy dynamics? In addition, the global-regional dimension connects to a growing discussion about the tensions between local and global perspectives in environmental governance and analytical themes focusing on the vertical interplay among environmental regimes.¹ The second reason for choosing the Arctic is that it is increasingly described as a testing ground for innovative approaches to environmental governance. Moreover, the Arctic intergovernmental cooperation has a his-

¹ E.g. Cash and Moser, "Linking Global and Local Scales"; Young, *The Institutional Dimensions of Environmental Change. Fit, Interplay, and Scale*; Jasanoff and Long Martello, *Earthly Politics: Local and Global in Environmental Governance*.

tory of emphasizing knowledge production as a way of influencing policy.² In addition, the unique features of the Arctic give the region a high symbolic value, which has previously played a role in relation to global environmental governance.³ From a climate science point of view, the Arctic is of interest because physical and biological processes in the region have a key role in understanding global climate dynamics. As well, climate change is expected to be more significant and more rapid here than in many other parts of the world.

In addition to these various circumstances that made Arctic climate change a fruitful case study, the choice was based on an opportunity to follow part of the Arctic Climate Impact Assessment (ACIA) in real time. Furthermore, there was keen interest from the ACIA leadership to my initial query and their decision to allow me to participate in the process. Finally, choosing to focus on this region was connected to the fact that my own curiosity about the interplay between science and policy had been tweaked by my previous work in the Arctic.

3.2 A case study approach

The research approach is a single in-depth case study, with the ACIA history, process, and content as its empirical base. A case study can be seen as social-science's equivalent to a microscope. It is limited in scope but allows for a thick, context-sensitive description of the process that is in focus.⁴ Case studies can be used in a number of different ways.⁵ This study is based on an inductive approach: it started with a general aim and remained open to new relations, concepts, and understandings as the study progressed, similar to the case-study philosophy described by Merriam and Stake.⁶ The analytical framework presented in the previous chapter was thus not pre-defined and used for coding observations, interviews, or documents. Rather the analytical lenses grew out of initial observations and interviews and were refined throughout the process in an iterative interaction between the empirical material and the theoretical perspectives taken from the available literature.⁷

² Oran. R. Young, *Arctic Politics. Conflict and Cooperation in the Circumpolar North* (Hanover: Dartmouth College University Press of New England, 1992); Young, *Creating Regimes: Arctic Accords and International Governance*; Schram Stokke, "International Institutions and Arctic Governance."

³ Downie and Fenge, *Northern Lights Against POPs*.

⁴ Catherine Hakim, *Research Design. Strategies and Choices in the Design of Social Research* (London: Allen & Unwin, 1987), 619.

⁵ Robert K. Yin, *Case Study Research. Design and Methods* (Thousand Oaks, California: Sage Publications, 1994).

⁶ Sharon B. Merriam, *Fallstudien som forskningsmetod* (Lund: Studentlitteratur, 1994); Robert E. Stake, *The Art of Case Study Research* (Thousand Oaks: Sage Publications, 1995).

⁷ Evert Gummesson, "Fallstudiebaserad forskning," in *Kunskapande metoder inom samhällsvetenskapen*, ed. Bengt Gustavsson, 115-144 (Lund: Studentlitteratur, 2003), 120.

Explaining and understanding

A central theoretical debate within studies of international relations has been between *understanding* and *explaining*. The basic idea of seeking to *explain* has been to find causal mechanisms and relationships in a positivist tradition, while *understanding* follows a post-positivist tradition with a goal of recovering the shared meanings and interests that have motivated social actors.⁸ With such terminology, this dissertation project is best described as an effort to understand the ACIA. However, I argue that all efforts to explain do not have to adhere to positivist assumptions and methodology and that all explanations are not causal. As laid out by Wendt, attention to structural circumstances and constitutive theories can also provide explanations in that they highlight essential features of a system. Concepts that capture structural characteristics, such as regime, are thus partly descriptive but also seek to explain by making visible dispositions and propensities to behave in certain ways under certain conditions.⁹ My usage of the word *explain* and any ambitions to explain knowledge production in relation to structures in international society stem from this latter view.

My understanding of *explaining* is also linked to a constructivist tradition in international relations that highlights reasons why people act certain ways as potential causes.¹⁰ Norms and rules can thus cause an event by providing actors with direction and goals. To establish causality in this context is quite a different endeavor than the hypothesis testing that is common in many natural sciences and other fields working in a positivist tradition. As Adler lays out, it relies heavily on detailed historical narratives that can be used to specify time-bounded sequences and relationships between circumstances and the phenomena we want to explain.¹¹ This theoretical underpinning fits well with using a single case study as the empirical basis for my analysis.

When explanations and causes are context specific, they can not à priori be expected to apply to other cases. My ambition to draw conclusions about the potential for other regional climate impact assessments should therefore not be interpreted as an attempt to predict, but as a way to highlight mechanisms that might also be important in other cases. To what extent that these mechanisms are general needs to be judged against the available literature and future case studies.

3.3 A multitude of methods

A case study approach allows for a multitude of methods to be used in gathering and analyzing information. The creation of multiple sources of data that can be evaluated in relation to each other has the advantage in that it allows for a triangulation or testing of ideas generated from one part of the study in relation to patterns revealed by a different

⁸ Alexander Wendt, "On Constitution and Causation in International Relations," *Review of International Studies* 24, (1998): 101.

⁹ Wendt, "On Constitution and Causation in International Relations," 111.

¹⁰ Emanuel Adler, "Seizing the Middle Ground: Constructivism in World Politics," *European Journal of International Relations* 3, no. 3 (1997): 319.

¹¹ Adler, "Seizing the Middle Ground: Constructivism in World Politics," 330.

method or data source.¹² This study has used four major lines of investigation: analysis of process documentation, observations, interviews, and content analysis of the ACIA reports. In addition, literature review has been used to provide background.

Analysis of process documentation

Formal process documentation includes meeting minutes of the Arctic Council and its working groups along with protocols and reports from ACIA's Assessment Steering Committee. This material was downloaded from websites run by the Arctic Council, the Arctic Monitoring and Assessment Programme (AMAP), Conservation of Arctic Flora and Fauna (CAFF), and the ACIA. Neither the Arctic Council nor the ACIA have any organized archives other than the material posted on its website. The method to ensure that the material was reasonably complete was to follow up on numbers and dates of meetings. Additional material was gathered by direct contact with the secretariats of the International Arctic Science Committee (IASC) and AMAP. This included older reports that were important for understanding the history of the process. The selection was based on suggestions from persons interviewed and references in more recent material. The documents used in the analysis are listed in Appendix I.

A major advantage of working with documents is that they have been recorded without direct intervention from me as a researcher, and thus provide an independent source of information in comparison to interviews and observations.¹³ Moreover documents, such as printed reports and official meeting minutes, provide a picture of how the participants want to present a process and its results to the world.¹⁴ The process documentation has been especially critical for analyzing the early parts of the ACIA process, where I have not been able to make direct observations and where people may have forgotten or changed their perceptions of what happened as time has passed. In the later part of the ACIA process, formal documentation is scarce. In the scientific assessment, much of the executive responsibility moved to the Assessment Integration Team and the Executive Committee, neither of which kept official written records of its meetings. In the policy process, discussions were held in closed meetings. Written material has therefore mainly been gathered ad hoc in connection with informal circulation of drafts or by asking participants in the process to share copies of relevant correspondence. This type of material is generally not publicly accessible and it has therefore not been possible to make any systematic archive searches.

Observations

After approval of ACIA's Executive Committee, I was able to attend the final of ten meetings of the Assessment Steering Committee and two meetings of the Assessment Integrations Team towards the end of the process. My role in these meeting was an observer participant. After an initial presentation round, which provided me an opportunity

¹² Yin, *Case Study Research. Design and Methods*, 13; Stake, *The Art of Case Study Research*, chapter 7.

¹³ David Silverman, *Interpreting Qualitative Data* (London: Sage Publications Ltd, 2001), 119.

¹⁴ Merriam, *Fallstudien Som Forskningsmetod*, 117.

to present my research and purpose for being there, I did not take part in the discussions during the meeting.

Gaining access for making field observations in a closed social setting is not straightforward.¹⁵ Several factors probably contributed to my being able to gain access. From the participants' perspective, a key element may have been shared norms about the importance of research. In connection with previous professional activities, I was known to several people at the meetings. It was therefore important to define my specific role as an observer rather than as a colleague. The major strategy for doing this was in personal conversations and by distributing written information about the research project. To avoid being seen as more connected to some people in the process, a special effort was made to connect with people with whom I had not had previous contact, if not at the first meeting at least at some time during the process.

The Assessment Integration Team and the Assessment Steering Committee meetings held in London in October 2003 were the first ACIA meetings I attended. The major purpose of these meetings was to discuss the review comments on the scientific report. Observations were also made at an Assessment Integration Team meeting in Copenhagen March 2004, where the key item on the agenda was to review comments on the overview document.

To cover the ACIA process in the policy arena, observations were made at a joint meeting of the working groups of AMAP and CAFF, who were given the mandate by the Arctic Council to see that the assessment was carried out. This meeting was to "sign off" on the documents from the ACIA before they were presented to the Arctic Council. In relation to AMAP, I participated as part of the delegation from IASC, which has observer status. In relation to CAFF, I participated by invitation of CAFF's executive secretary.

I have also made observations at two Arctic Council meetings, one in May 2004 and one in November 2004. The November meeting was the the Reykjavik ministerial meeting at which the ACIA results were presented to the Arctic ministers and thus represented the formal conclusion of the ACIA process. The primary purpose of these observations was to learn about Arctic Council meeting dynamics and to see how the ACIA was treated at the highest policy level. My attendance at the Arctic Council meetings was as part of the delegation from the University of the Arctic, which has observer status in the Arctic Council. It should properly be described as participatory observation, as I was also there in the capacity of science editor of the Arctic Human Development Report. The Arctic Council meetings provided a venue for arranging interviews with participants in the policy process.

Regardless of the level of formality of each meeting, there is a social component to them, including coffee breaks and meals. In general, I took part in these social activities, which provided many opportunities for informal discussions with different participants and was important in building trust with people that I had not had previous contact with.

In addition to the formal meetings, I attended a scientific conference in November 2004 that was arranged to present ACIA's scientific results. Besides being an opportunity for observing presentations and discussions, this meeting provided a venue for conducting interviews with the lead authors of the ACIA scientific report.

¹⁵ Silverman, *Interpreting Qualitative Data*, 57.

The purpose of making observations was mainly to get a first-hand feeling for how discussions progressed in relation to my specific research questions, which were concerned with the knowledge base of the ACIA, i.e. the process behind what would later become printed reports. The observations were used to refine the analytical themes for the content analysis of the ACIA reports, to identify issues that would need attention in the analysis of the process documentation and the reports, and to identify actors that should be interviewed because of their role in or insights into specific aspects of the process.

The limited scope of the observations had both advantages and disadvantages. A major disadvantage is that I did not have any opportunity to capture the dynamics at the beginning of the ACIA process. For these parts I have, therefore, been limited to information from formal documentation, which is not likely to have covered all relevant aspects, and also to interviews, where the individual's recall of earlier events is likely to be less detailed than observation and also colored by later process dynamics and personal interests. Additionally, I was not observing the work occurring in smaller meetings, including those among people collaborating on chapters in the ACIA reports or ACIA's Executive Committee meetings. This means the micro-dynamics of writing an assessment chapter is not well covered in the empirical material and that the picture I have is only through the eyes of the lead authors. It is also only through the eyes of the people who stayed active in the process towards the end, and leaves out perceptions by people who only took part in some of the initial discussions about the ACIA.

The meetings I did observe all had a certain level of formality to them, and that level of formality clearly affected what issues were brought to the table and what issues were kept to private discussions to which I did not have access. However, it was an advantage in that I could avoid, or at least buffer, some weaknesses of observations studies, such as being so integrated into the social setting that the observer affects its dynamics or by being so immersed that one loses the role as observer.¹⁶

A major advantage with the observations method, in comparison to interviews and/or text analysis, is that it gives the researcher first hand knowledge of processes rather than a version filtered by interviewees or meeting secretaries. Also, processes are recorded as they happen.¹⁷ Recording of observations was done by taking written notes during the meeting along with diary notes at the end of the day. The notes taken during the meeting focused on recording direct discussion. No analysis or coding of events were done on the spot. In several cases, I also conducted shorter interviews in direct connection with the meeting to follow up on points that had been raised by the participants.

During the policy process, I was not able to gain access to meetings to make observations. In the early part of the policy process, I approached one of my contacts with an informal inquiry to be an observer. In spite of some support, objections were raised on grounds that these meeting were closed negotiations and concerns that both the dynamics and outcome could be hurt by the presence of an outside observer.¹⁸ As it turned out, the policy process became very contentious and no further attempts were made to gain access to any of its meetings.

¹⁶ Yin, *Case Study Research. Design and Methods*, 86; Silverman, *Interpreting Qualitative Data*, 58.

¹⁷ Yin, *Case Study Research. Design and Methods*, 87; Merriam, *Fallstudien som forskningsmetod*, 102.

¹⁸ Interview Magdalena Muir, March 24, 2004.

Interviews

Approximately 70 semi-structured interviews with people participating in the ACIA process were conducted. This included meetings with participants in the Assessment Integration Team, lead authors, and representatives of national delegations to the Arctic Council. A list of interviewees is presented in Appendix II. Some people were interviewed several times and, in total, the group that I talked to at one time or another included 56 people. The purpose of the interviews was to gather information that was not likely to have been elaborated in written documents and to gather information on the participants' own analysis of the process. As Stake expresses, the interview is the main road to multiple realities.¹⁹ Interviews can thus be a way to facilitate triangulation, especially in establishing a description of events. As noted previously in the discussion on observations, interviews were also used to probe some issues noted during observations. In addition, interviews gave participants in the ACIA process an opportunity to discuss the process from their particular perspective in a way that they may not have been able to do in the social setting of a formal meeting. Moreover, keeping in line with the view of interviews as conversations and a situation in which the interviewer and the interviewee co-create a description, interviews were also used to gather reactions on my own observations and preliminary interpretations.²⁰

The co-creation of description and analysis with interviewees entails the risk of imposing a picture on the person interviewed rather than letting him or her speak their own mind. To reduce the introduction of such potential bias into the material, the interviews generally started by asking open-ended questions that urged people to describe events or processes as they saw them. For example, lead authors were asked questions regarding the task for the chapter for which they were responsible and/or what types and sources of information had been most important in writing the chapter. Interviewees were generally well articulated speakers. My perception was that they were likely to let me know if they did not share a suggested interpretation thus lessening the risk of introducing bias into the observations.

One group of interviewees were selected based on whether they have a central role in the ACIA process (e.g. chair of the Assessment Steering Committee and chair of the Policy Drafting Team), whether they are especially well informed on specific issues (e.g. the liaison between specific chapters and the Assessment Integration Team), and if they presented a unique perspective on some part of the process (e.g. a specific country representative or indigenous peoples' representative). These interviews generally did not use a specific interview guide, but relied more on giving interviewees a chance to elaborate either on specific issues or developments during the ACIA process or to elaborate on their perceptions of the process as a whole. Most of these interviews were done in connection with formal meetings, however eleven interviews were done over the phone.

The second group of interviewees were the ACIA lead authors, with whom I specifically discussed the content and process for their respective chapters according to an interview guide, see Appendix III. The purpose was to get the scientists' own perspec-

¹⁹ Stake, *The Art of Case Study Research*, 64.

²⁰ Steinar Kvale, *InterViews* (Thousand Oaks: Sage Publishers, 1996).

tive on what knowledge had been integrated in the ACIA process and why. Other questions focused on how participating in this activity had affected their own picture of climate change in the Arctic and their perceptions of science-policy interactions. Such semi-structured interviews were carried out with 23 of the 26 lead authors. All lead authors were contacted via e-mail to arrange the interviews. Most of the interviews were conducted in connection with the ACIA Scientific Conference in Reykjavik in November 2004. Two people, who were not at the conference, were interviewed via the phone. Follow-up attempts were made to cover all chapters of ACIA's scientific report, but one chapter is unfortunately lacking in interview material.²¹

The lead author interviews ranged from a little more than half an hour to over an hour in time. Circumstances varied but many of the interviews were carried out in a lobby where other activities were going on and where we were sometimes interrupted. Some of the other interviews were more time pressed. In a few cases we deliberately sought out places to talk where we would not be disturbed.

The basic agreement with lead authors was that the interview was "on-the-record," which would allow me to quote by name. However, to give them a chance to discuss sensitive issues with a promise of confidentiality, they also had the opportunity to add comments "off-the-record," which several of interviewees used for specific comments. For other participants in the process, the nature of the interview and the way I was allowed to use the material was generally agreed upon at the beginning of the conversation. For many participants in the policy process, the agreement was that I could use their comments as background and list their name in a general list of people whom I had talked to but not to quote them by name.

All interviews were recorded with a digital tape recorder and most of them were transcribed. As I did transcriptions myself, the transcription process went hand in hand with the analysis.

A major advantage of interviews as a method in this study was that they provided a window into parts of the ACIA process that were neither formally documented nor accessible for observations. Without the interviews, it would have been impossible to analyze ACIA's policy process. Capturing the dynamics of producing the scientific and overview documents would also have been very difficult otherwise. The interviews also provided an opportunity to build trust with participants in the ACIA process, without which it would have been difficult to provide an account that the participants could see as legitimate. As part of this trust building, an effort was made to interview people who might have different perspectives on contentious issues, e.g. representatives from different member states and Permanent Participants in the policy process.

Interviews as method also have weaknesses, including introducing bias by leading questions or being vulnerable to the interviewee's bias or poor recall of events.²² The major way to guard against interviewee bias in description of events has been to rely on more than one interview or if possible corroborate accounts with written documentation.

²¹ Chapter 12 is not covered despite repeated attempts to reach the lead author. Of the other two lead authors who were not interviewed, one deferred to his co-lead and the other did not respond to the initial request. Because the chapter was already covered by two lead authors, no follow-up attempt was made.

²² Yin, *Case Study Research. Design and Methods*, 86.

Interviewer bias is more difficult to control, but as discussed previously, interviewees' senior academic or political positions made it less likely that they would place themselves in an accommodating role in relation to me as an interviewer. Several of the interviewees also had experience in dealing with the media.

Content analysis

The fourth line of inquiry into the ACIA process was the analyses of the ACIA reports. For the scientific and overview document, the purpose was to capture different issues as they appeared in the final product of the scientific assessment and thus how the assessment itself had chosen to present its results to a wider audience. This relates back to process documentation, observations, and interviews in that these sources of information are used to understand the drivers behind patterns that become apparent in the content analysis. The content analysis also provides a control of how strong the influence of various drivers has been among those identified during the process. In other words, to what extent do issues come to the fore in the final product compared to animated discussions that were underway? What solutions appeared to problems that were identified? Together with interviews with the lead authors, the content analysis also captures some of the dynamics in writing a chapter of a scientific assessment that did not come out in discussions of the reports as a whole.

The methodological details of the analysis are discussed in Chapter 6 of this dissertation. In general, the approach was to combine qualitative and quantitative methods. The qualitative analysis focused on answering key questions about major framings and the knowledge bases for each of the chapters in the scientific report and to identify possible drivers as they were visible in the reports. The quantitative analysis was based on counting how often certain words were used in the various chapters. For the quantitative analysis, some comparisons were also made with the third assessment reports from the Intergovernmental Panel on Climate Change (IPCC).

The qualitative content analysis of the policy document was guided by discourse analysis laid out by Fairclough, with a range of questions about what characterizes the text.²³ This includes questions about the social event and genre in which the text is positioned. It also includes asking how the text can be characterized in how it approaches differences, what assumptions it makes, the mood of the text, what discourses and styles it draws from, and what social events are included or excluded. The original purpose of the methodology is to provide a tool for critical social research that highlights how societies work and produce both beneficial and detrimental effects.²⁴ My use of this methodology is more limited and can more be described as a guided systematic reading of a specific document, where the text in focus is only one component of the empirical material. The method is relevant in that it illuminates the connection between knowledge and discourses, which fits well into the role of the policy document as the device by which ACIA's knowledge base (the scientific report) became connected to the policy sphere.

²³ Norman Fairclough, *Analyzing Discourse. Textual Analysis for Social Research* (London: Routledge, 2003), 191-194.

²⁴ Fairclough, *Analyzing Discourse*, 203.

Literature review

To provide an historical context for the ACIA, Chapter 4 of this dissertation presents a review of the development of climate science in relation to the Arctic. This is based on published literature, including reviews, selected based on relevance to the historical context of the ACIA. The ambition has not been to provide historical accounts based on new research and consequently there was no effort to go back to primary documents. In a few places, new interview material has been used to complement pictures from the literature.

3.4 Finding ways through the empirical material

A case study based on an inductive approach leaves open the question of how to best organize the empirical data so that it can provide a meaningful basis for analysis and conclusions. This study follows two basic approaches.

The first approach attempts to reconstruct a chronology of events, with specific attention to the research questions about how climate change is framed and the knowledge base that comes to the fore. In practice the analysis was carried out by systematic reading of the process documentation. The analysis of the interviews was mainly carried out in direct connection with transcribing them. There was no attempt to code the material to identify all possible themes. Rather, the analysis focused on issues related to the research questions. Quotes have thus been selected to represent major themes in the material insofar that they were relevant to the research questions and analytical issues. Chronology is used as the organizing principle for Chapter 5 of this dissertation, where a major goal is to provide a substantial body of description that anyone who had observed the ACIA process could have noticed or recorded. Phrased another way, the purpose is to provide a description that is as valid as possible of the process by triangulating the empirical data.²⁵ The time period covered has an emphasis on events between 1999 and 2004, which coincides with the formal part of the ACIA process. Some reports and protocols go back to the beginning of the current circumpolar cooperation in the early 1990s.

The second approach takes its starting point in the formal outcome of the ACIA process (i.e. the ACIA reports) and reflects on the process and history for potential explanations. The methodology is described under content analysis earlier in this chapter and in more detail in Chapter 6 of this dissertation. This approach also entailed a re-evaluation of parts of the analysis in Chapter 5 with attention to consistency and to potential alternative explanations. This approach is the guiding principle for Chapter 6 of this dissertation, where the goal is to provide a description of the major messages found in the ACIA scientific and overview reports by investigating what issues are highlighted and backgrounded. How is Arctic climate change framed? What persistent patterns of interpretation and presentation are visible in the texts? The focus is thus on the end result of the process, in contrast to the process focus used in Chapter 5, even if the discussion of potential drivers connects to the process description. To facilitate for the reader,

²⁵ Stake, *The Art of Case Study Research*, 109-110.

some material from the initial process analysis is presented in Chapter 6. The analysis of the policy document was carried out as a separate exercise and its results included in Chapter 5, in connection with discussion of the policy process.

The two approaches – one documenting the chronology of events and one examining the end results of the process – complement each other and should together provide a solid base for analyzing the influence of regimes and actors, including how and when their influence is exerted in this specific case.

3.5 Ethical considerations

Ethical considerations need to be made at a number of points in the research process, from defining a research question to reporting the results. Following an analytical matrix developed by Peterson, this section highlights ethical issues that are particularly pertinent for this project.²⁶ The matrix identifies individuals or groups of people to whom considerations need to be made (e.g. scientific community, society, research participants) and prompts the investigator to highlight potential conflicts of interest.

With a keen interest in my study from key participants, there were no apparent conflicts between the participants in the study and me as a scientist considering the focus of the project. During the research process, the main ethical issue regards the participants. Informed consent is a major guiding principle when working with people.²⁷ In this case, people participated in their professional capacities and the material did not include sensitive personal information. Therefore, I considered it sufficient to orally inform participants about the purpose of the project before interviews and relied on their own initiative to deny an interview if they did not feel comfortable with the situation. No one did this explicitly but on several occasions we had discussions beforehand about the nature of the interview and how the material would be used, including possibilities to check on quotes before anything went into print. In some interviews, the recording was turned off during a specific point at the request of the interviewee. People who have been interviewed were sent a draft version of this dissertation, with an invitation to comment not only on how I have used quotes from them but also on my overall interpretation.²⁸ Such cross-checking also has a methodological value in relation to the triangulation of data as it can both help correct factual errors and provide alternative perceptions and interpretations that create a more nuanced analysis of events.²⁹ As long as I stand by the final analysis and can support it empirically, ethical considerations here go hand in hand with quality control of the analysis.

When making observations, informed consent was not gathered on an individual basis. Instead, it was based on a decision by ACIA's Executive Committee. The ethical guidelines consider such consent via proxy sufficient in cases where the information is

²⁶ Bo Peterson, *Forskning och etiska koder* (Nora: Nya Doxa, 1994).

²⁷ Forskningsetiska principer inom humanistisk-samhällsvetenskaplig forskning ("Research Ethical Principles within Humanities and Social Science"). Swedish Research Council 2002.

²⁸ A few people were not reached via the e-mail address I had received. The draft text was also sent to a few people who had not have an opportunity to interview.

²⁹ R. E. Stake, *Case Study Methodology in Education Evaluation*, (Minneapolis: Minnesota Research and Evaluation Center, 1981).

not of private or ethically sensitive character. During formal AMAP, CAFF and Arctic Council meetings, the chairs were informed but without any explicit request for consent. As I was part of observer delegations, it may in fact have been difficult to formally deny me being present. I believe that the procedure can be ethically justified based on the fact that the meetings did not discuss ethically sensitive personal matters and people were present in professional capacities as representatives of countries or organizations. Their possible sensitivities should therefore be weighed against societal interest of insights into policy processes. I believe societal and scientific interests weigh heavier than the integrity of individual states or organizations. However, since I know that several participants view such meetings as negotiations, where only the final outcome should be known, I have chosen not to report on specific positions during the meetings, unless verified by separate interviews or formal protocols. Moreover, no reporting was done while the ACIA process was still on-going.

Most of the written material consists of official protocols and reports and their use in this study presents no ethical issues. Some material used was circulated during the meetings and did not appear in the official records. This material could be more ethically sensitive. However, as long as it reflects on the process rather than individual actors, I judged that societal and scientific interests weigh heavier than participants' interests and that it is therefore justified to use them for this study.

Publication of this study could present an ethical problem if it reveals information sources who want to be anonymous. To protect the identities of those who offered information off-the-record, a choice was made to refer to interview number rather than indicating the name of the interviewee. Names have, however, been used for the interviews with the lead authors, where it would have been difficult to make statements anonymous and where the interview statements were made explicitly on record, unless the interviewee indicated otherwise.

Ethical dilemmas can also come up in how research is used, regardless of the original purpose of the project. In this case, one cannot discount the risk that a study of science policy interaction in the arena of climate change will be used to discredit climate science in general or the ACIA process in particular. This is not the intention of this study. Neither is it an effort to evaluate the science or the policy or to judge what is correct from either a factual or normative point of view. Rather, the study aims to better understand the science-policy interface in order to improve knowledge production and its interactions within the policy arena with the overall goal of finding effective ways for society to face the challenges of a rapidly changing environment. The analysis, including my ways of presenting the participants' different perspectives, should thus ideally be used as one of the many inputs for further discussions on how scientific assessments, knowledge production, and science-policy interactions could improve.

3.6 Situated knowledge

One of the Mertonian norms of science is disinterestedness. In short this refers to being objective and unbiased. Such a norm assumes that objectivity in science is possible or at least desirable. This position has been increasingly criticized, not least within science and technology studies, with authors such as Haraway pointing to the situatedness of all

knowledge.³⁰ This highlights the role of the researcher's own position and perspectives in relation to the issues, processes, and people under study.

My position is one of living outside the Arctic but with a keen interest in the region and with professional and friendship ties to people who have worked at the science-policy interface of Arctic international collaboration.³¹ In relation to the issue of global climate change, I have a long professional interest as a science journalist covering both scientific and political aspects as the discussions have developed since the early 1990s. I thus approach the question of Arctic climate change with many pre-understandings. This has created some advantages for the research, such as helping me gain access to meetings and people as well as knowing from first-hand experience some of the issues that came up in the Arctic Council. My previous involvement with Arctic Council work includes the role of science writer for two assessments of pollution issues in the Arctic.³² While I was doing my research on the ACIA, I was involved as scientific editor for an assessment on Arctic human development.³³ At the time of analyzing the data and writing this dissertation, I had no formal ties to the Arctic Council or any of its working groups.

This history creates a disadvantage in that I am probably not completely objective in my observations and analysis. To the extent that objectivity is a norm to be striving towards, this disadvantage should be weighed against the incentive of putting my research into a context where the results can be useful to my sources of information. I argue that the potential for a more reciprocal relationship than being an observer who leaves when the research is complete, may, in fact, be more important than a lack of un-reflected disinterestedness. This creates an incentive to provide accounts of the process and analysis that the participants can consider reasonably fair, even if they may themselves have alternative interpretations. It should, however, be clear that my loyalties are not with specific participants in the process at the expense of others or lay with specific governance arrangements. It lies with the ideals of cooperation and knowledge sharing about climate change.

3.7 Notes on language and word choices

In writing about the Arctic and about climate, one makes choices not only about what to include but also what words to use and how to write them.

³⁰ Donna J. Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," in *Simians, Cyborgs, and Women*, ed. Donna Haraway, (London: Free Association Books, 1991).

³¹ This includes being married to the Swedish representative on the Working Group of the Arctic Monitoring and Assessment Programme (AMAP). During this time AMAP had formal responsibility for the ACIA in relation to the Arctic Council. However, her engagement with ACIA was limited and our discussions have not been used as primary source material for the study unless corroborated by formal documents, recorded interviews, or by my own observations.

³² AMAP, *Arctic Pollution Issues: A State of the Arctic Environment Report* (Oslo: Arctic Monitoring and Assessment Programme, 1997); AMAP, *Arctic Pollution Issues 2002* (Oslo: Arctic Monitoring and Assessment Programme, 2002).

³³ AHDR, *Arctic Human Development Report* (Akureyri: Stefansson Arctic Institute, 2004).

I uppercase the word *Arctic*, also when it is used as an adjective, such as in Arctic climate change. This choice is based on the fact that the word Arctic has taken on a different significance than the word *polar*, which is an alternative way to describe the characteristics of the region. It recognizes the Arctic as a region with its own regional identity.³⁴ I therefore treat it grammatically the same way as I would write African or Asian.

In referring to the indigenous peoples, I use the plural form in referring to their status as peoples rather than just anyone living in the Arctic. I generally do not uppercase the words indigenous and peoples (i.e. Indigenous Peoples), which is often done in writing on this issue. I reserve the uppercasing for the names of the various peoples, i.e. Saami, Inuit, Athabaskan, etc. One could argue that their international collaboration is increasingly creating a circumpolar indigenous peoples' identity. However, their representation as different and independent indigenous peoples in the Arctic Council suggests that the uppercasing should still be reserved for the proper names of the different peoples.

I use the term climate change as a generic expression for the various changes in Earth's climate system that the IPCC has analyzed and concluded are changing more compared to what can be expected based on natural variability.³⁵ It does not imply any uniform change in climate or any specific framing of its causes and impact. However, in analyzing the climate change debate from social science perspective, it has not been my role to scrutinize the scientific evidence for particular ways of presenting climate change. I, therefore, had to choose some frame of reference. Unless otherwise specified, this frame of reference is the scientific reports from the various working groups of the IPCC and the 2007 summaries for policymakers from Working Group I and II. There are some problems with this choice, for instance IPCC has been challenged on many accounts, but nevertheless its scientific reports provide summaries of climate science that have been more thoroughly reviewed in a reasonably transparent process than any other material available.

As discussed in detail in Chapter 2 of this dissertation, I use the term *regime* similarly with how many authors use the word *institution* when discussing the structure of cooperation in relation to environmental issues.³⁶ There is nothing self evident about my choice, but there are some advantages. One is that it creates a distinction between specific governance arrangements and more fundamental, primary institutions of international society, including such features as sovereignty and diplomacy. Another advantage, especially in an interdisciplinary dissertation, is that the word regime is not as exclusively connected to the social world but has similarities to how the word regime is used within the natural sciences, i.e. structures that are relatively stable but also have the potential to change. One example would be a semi-stable, well-defined ecosystem. Another example is the ocean currents that transport warm water to the Arctic and provide a relatively mild climate in northern Scandinavia. A final example could be the climatologically relatively stable geological era in which human civilization emerges, and

³⁴ E.g. Oran R. Young and Niels Einarsson, "Introduction," in *Arctic Human Development Report*, ed. AHDR, 15-26 (Akureyri: Stefansson Arctic Institute, 2004).

³⁵ IPCC, *Climate Change 2007: The Physical Science Basis. Summary for Policymakers*.

³⁶ E.g. Young, *Institutional Dimensions of Global Environmental Change. Science Plan*, Sect 1.1.1. defines institutions as "systems of rules, decision-making procedures, and programs that give rise to social practices, assign roles to participants in these practices, and guide interactions among the occupants of the relevant roles."

where we now see signs that the climatological regime is changing because of emissions of greenhouse gases entering us into a new geological era – the Anthropocene.³⁷ The connections between social regimes and regimes in biogeophysical systems are not explored in this dissertation, but the choice of the word regime creates a potential for making such analytical connections in the future.

3.8 An interdisciplinary approach

This is an interdisciplinary dissertation that emerged in an interdisciplinary research environment with input from a range of different perspectives. In addition, my personal background features a mixture of perspectives, including undergraduate training in biology and science journalism, professional experience as a science journalist, and a PhD education focusing on social science theory and methods. There are some weaknesses to such an interdisciplinary approach. For one, it is impossible to cover all literature equally well and to be equally well versed in all aspects of methodology. Some opportunities may be lost because there was not sufficient time to learn enough about some relevant aspects, be they methodological or theoretical. There is also a risk of trying to span too broad a field, making the study less relevant to each particular academic audience. Personally I think that the advantages outweigh these risks. They include the possibility to contribute to bridging of the gap between social sciences and natural sciences. Moreover, the science-policy interface that this dissertation explores is not itself structured along academic disciplinary boundaries. Rather, the frequent references to concepts such as sustainable development attest to the need to integrate many different concerns, where the biogeophysical aspect of the environment only captures one part of the concern as do studies focusing solely on social or cultural systems. Lastly, I believe that interdisciplinary approaches can provide quality controls that go beyond common scientific quality-control procedures because even basic assumptions are constantly evaluated and open for critique.

³⁷ A search for the term *regime* in Google Scholar actually gives more hits in the natural science context. Just to mention one example that is relevant for the Arctic, the concept “regime shift” is used in the title of an article on large-scale shifts in climatic and oceanic conditions in the Bering Sea and how this affects the mix and abundance of coexisting species: Ashleen J. Benson and Andrew W. Trites, “Ecological Effects of a Regime Shift in the Bering Sea and Eastern North Pacific Ocean,” *Fish and Fisheries* 3, no. 2 (2002): 95.

II. Context

Chapter 4

From Ice Ages to Bellwether for Global Warming: The Arctic in Climate Science and Policy

In the past 150 years, the scientific image of the Arctic climate has shifted dramatically. From an initial interest in what caused the coming and going of ice ages in Earth's history, the Arctic is increasingly depicted as a bellwether for global warming. The change is linked not only to the internal development of science but also to the international dynamics that have affected both knowledge production and political order. The purpose of this chapter is to provide a historical backdrop for today's discussion of Arctic climate change by outlining the development of climate science since the mid-1800s up until the late 1990s. It is mainly based on a review of published literature and highlights dynamics of when and why the Arctic becomes a region of special interest for climate science and policy. The analytical frame, as developed in Chapter 2 of this dissertation, focuses on the co-production of knowledge and political order with specific attention to structures of international cooperation, actor networks, and the relations between them.

4.1 Early developments

Glacial theory and early global climate models

The connection between global warming and an interest in the Arctic goes back to a major scientific controversy in the mid-1800s: the riddle of the ice ages.¹ The key question then was what could have caused the ice sheet that have left scraped bedrock and landscape features that resembled those seen close to glaciers in the Alps. Could changes in the atmosphere possibly lead to such cooling that the ice could begin to grow and later melt again? A French physicist – Joseph Fourier – had already shown that the atmosphere could trap heat much like a “hot house” or what later became labeled the

¹ Spencer R Weart, *The Discovery of Global Warming* (Cambridge, MA: Harvard University Press, 2003), 5.

greenhouse effect, and the British scientist John Tyndall was trying to figure out how this actually worked. At the time, most scientists believed that the gases in the atmosphere were transparent, but in his laboratory he had shown that carbon dioxide was, in fact, opaque. It could thus help the atmosphere keep solar energy that would otherwise reflect back into space. There is very little carbon dioxide in the atmosphere, and Tyndall did not think change in its concentration would be sufficient to cause an ice age. Water vapor was another matter and if something dried up the atmosphere then that could be the explanation: "Remove for a single summer-night the aqueous vapour from the air ... and the sun would rise upon an island held fast in the iron grip of frost," he wrote about England in a paper in 1863.² The scientific community involved in the 19th century ice-age debate was also aware that snow and ice covering a region during an ice age would reflect sunlight back into space and keep it cool, which in turn could change wind patterns and ocean currents in ways that would cool the region even further.³

The question of what could have caused the ice ages was high on the agenda in scientific discussion in Stockholm, Sweden, in the 1890s at the time, Svante Arrhenius created the Stockholm Physical Society to discuss "cosmic physics." Arrhenius is most known for his 1896 paper on the influence of carbon dioxide on Earth's temperature, which links the burning of fossil fuels to global warming, but in the historical context he was working the key question was cooling.⁴ His Physical Society was an interdisciplinary environment, which Crawford has described as "an effort to bring together the phenomena of the seas, atmosphere, and solid earth into the domain on the physical sciences and to produce new theories taking into account the interrelatedness of terrestrial, atmospheric and cosmic events."⁵ Parts of the discussion concerned geological findings showing that ice had played a major role in shaping Sweden's recent past.

The glacial theory – that the northern hemisphere had been covered by ice – was also a major inspiration for early Swedish polar research and the first Swedish polar expeditions in 1858 and 1861.⁶ An example is an account of the how "the discovery of the ice age" had had a critical role in "research desire" concerning the Arctic.⁷ People who were active in polar research were also part of the Stockholm Physical Society.⁸ It is easy to imagine an intellectual environment where it was natural to make connections between the knowledge gained from the emerging Swedish polar research and the theo-

² John Tyndall, "On Radiation Through the Earth's Atmosphere," *Philosophical Magazine* ser. 4, no. 25 (1863): 204 cited in Weart, *The Discovery of Global Warming*, 4.

³ Weart, *The Discovery of Global Warming*, 5.

⁴ As elaborated by Elisabeth Crawford, "Arrhenius' 1896 Model of the Greenhouse Effects in Context," in *The Legacy of Svante Arrhenius Understanding of the Greenhouse Effect*, eds. Henning Rodhe and Robert Charlson, 21-32 (Stockholm: Royal Academy of Sciences and Stockholm University, 1998); Svante Arrhenius, "On the Influence of Carbonic Acid in the Air upon the Temperature of the Ground," *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science* 41 (1896): 237-276.

⁵ Crawford, "Arrhenius' 1896 Model of the Greenhouse Effects in Context," 22.

⁶ Tore Frängsmyr, "Polarforskning - från hjälte till vetenskapsman," in *Polarforskning. Förr, nu och i framtiden*, ed. Swedish Royal Academy of Sciences, 34-39 (Stockholm: Swedish Royal Academy of Sciences, 1982).

⁷ Karl Chydenius' account of the Swedish polar expedition in 1861 as cited in Frängsmyr, "Polarforskning - från hjälte till vetenskapsman," 37.

⁸ Crawford, "Arrhenius' 1896 Model of the Greenhouse Effects in Context," 23.

retical models of how the composition of the atmosphere could affect Earth's climate. And this is what Arrhenius did. From the international scientific scene, he drew on Fourier's theories about the heat-absorbing capacity of the atmosphere, Tyndall's recognition that carbon dioxide played an important role in this process, and observations by the American astronomer and physicist Samuel P. Langley of "dark heat" from the moon. In the intellectual environment of the scientific network that he had created in the Stockholm Physical Society, he connected this to knowledge on the carbon cycle developed by his Stockholm colleague Arvid Gustaf Högbom to the hotly debated question regarding the causes of the ice ages and the ice masses that had shaped the geology of Scandinavia.

The riddle of the ice ages remained a major scientific challenge and scientists continued to make observations that have become significant in the light of today's understanding of climate change. Oceanographers, for example, started to understand the role of ocean currents, not least the fact that water sinks in the Arctic regions and flows towards the equators along the bottom of the sea. Already at the turn of the century, the American scientist T. C. Chamberlin speculated that this helped maintain "uniform global warmth" in the distant past.⁹ In 1942, these currents had been mapped, and the Norwegian oceanographer Harald Sverdrup wrote about how cold dense water sinks near Iceland and Greenland, a topic that has increased in importance with today's discussion on potential shifts in the North Atlantic Current.¹⁰ Sverdrup had a keen interest in the Arctic and had been in charge of the scientific work of an Arctic expedition in 1917-25.¹¹ Arrhenius' idea about global warming as a result of rising levels of carbon dioxide resurfaced in 1938 when the engineer Stewart Callendar presented calculations before the Royal Meteorological Society in London that indicated some global warming that may be connected to increasing levels of carbon dioxide in the atmosphere.¹²

The early work on climate change research appears to be driven more by scientific curiosity than societal need. It was based on ideas by individuals who connected with each other in scientific networks. One of the local networks was the Stockholm Physical Society, created at a young university, with an outspoken interdisciplinary focus aimed at producing new theories. This may have played a role in Arrhenius' theoretical contribution on the role of carbon dioxide in global climate change, but the issue was one of scientific rather than political importance. In 1896, the question of global warming due to carbon dioxide went against a common notion at the time, that nature was in balance and the magnitude of human actions were "puny" in relation to the vast natural powers that governed the planet as a whole.¹³ According to Crawford, much of the current picture of Arrhenius' work is a result of a recontextualization of his 1896 paper revisited in emerging discussion about global warming in the 1970s.

In relation to polar research, intellectual centers, such as that in Stockholm, can be described using Latour's term, from actor-network theory, as "centers of calculation" of a national colonial science. Images of the Arctic were brought from the colonial periph-

⁹ Weart, *The Discovery of Global Warming*, 13.

¹⁰ Weart, *The Discovery of Global Warming*, 14.

¹¹ "Sverdrup, H.U." Encyclopædia Britannica. 2006. Encyclopædia Britannica Premium Service. 9 Jan. 2006, www.britannica.com/eb/article?tocId=9070555.

¹² Weart, *The Discovery of Global Warming*, 2, 18.

¹³ Weart, *The Discovery of Global Warming*, 8.

eries to be presented in the metropolis by these centers.¹⁴ The political context then was one of nationalism, through which interests in the Arctic were part of the colonial history of the region, and the use of northern imagery bolstered a national identity. In contrast to the present, early climate science was thus not part of any internationally coordinated effort to understand Earth as a system. The impetus for international coordination became apparent based on more immediate concerns, namely how to predict weather, rather than issues of climate change.

Weather observations and early international coordination

Instruments for scientific observation of the weather became available in the early 1700s, with the barometer and thermometer. At the Stockholm Observatory, there is an unbroken temperature record since 1756. There was also an increasing theoretical understanding about the connections between temperature and the atmospheric movements.

International collaboration came early to meteorology. As early as 1657, King Ferdinand II of Tuscany established an international meteorological network where human observers at eleven locations throughout Europe observed and reported twice daily the temperature, pressure, humidity, state of the sky, and force and direction of the wind.¹⁵ In 1780, the meteorological society of Mannheim had a network of 39 stations making observations by calibrated instruments and recording them in yearbooks.¹⁶ However, the lack of simultaneous observations at several places made it difficult to make any predictions about the weather. The breakthrough for the practical application of meteorology for weather prediction came with the development of the telegraph. It could be used to share data and also to distribute forecasts. Realizing this new potential, several European countries established central meteorological offices.¹⁷ Again, one could use the notion of centers of calculation for describing how the networks connect. In Sweden, one of Arrhenius' colleagues at the Swedish Physical Society used the development in Europe as an argument to reform the Swedish meteorological central office. It had, according to him, not followed the times and development meteorology into a practical issue for fisheries and shipping.¹⁸

Establishing some kind of international coordination of measurements was a prerequisite for the new weather-forecasting activity. Thus, in 1853 a US navy lieutenant convened the first international meteorological conference in Brussels. One of the results was a standard instruction for meteorological observations at sea and a system for the collection of sea logs. This is the type of data that later became important in analyzing global temperature trends and thus in establishing whether Earth's climate is chang-

¹⁴ Michael T. Bravo and Sverker Sörlin, "Narrative and Practice - an Introduction," in *Narrating the Arctic. A Cultural History of Nordic Scientific Practices*, eds. Michael T. Bravo and Sverker Sörlin, 3-32 (Canton, MA: Science History Publications, 2002), 12-13.

¹⁵ Robert Serafin, "How Did Our Weather Measurement Systems Evolve?," *Science Now* 3, no. 2 (1996).

¹⁶ WMO, "The Historical Roots of WMO," www.wmo.ch/wmo50/e/history_e.html (Accessed 18 Oct. 2005).

¹⁷ Nationalencyklopedin, Band 13, Stockholm: Bra Böcker 1994.

¹⁸ Gustav Holmberg, "Nils Ekholm, stormvarningarna och allmänheten," in *Den mediala vetenskapen*, ed. Anders Ekström, 91-105 (Nora: Nya Doxa, 2004).

ing.¹⁹ The Brussels conference became a starting point for further international collaboration, and at the First International Meteorological Congress in Geneva 1873, the International Meteorological Organization (IMO) was created. This brief look at the history of meteorology shows how the practical needs of weather forecasting were an important driver in making formal connections among actors in different countries, with the actors being the meteorological offices. The initially fragile actor networks became increasingly formal structures. The IMO was a non-governmental organization and active until the end of World War II, when its role was taken over by the World Meteorological Organization (WMO) as a special agency of the United Nations. The IMO can thus be seen as a model for the norms of international coordination and sharing of data, which later became central for structuring global climate science under the auspices of the WMO.

The First International Polar Year

The IMO was involved not only in coordinating the meteorological services but also in international polar research, specifically in the organizing of the First International Polar Year 1881-1884.²⁰

The First International Polar Year was the initiative of the Austrian explorer Carl Weyprecht, who thought that the fundamental problems of meteorology and geophysics were to be found near the poles and that a coordinated scientific expedition could provide the decisive results.²¹ Moreover, he had decided it was time to collaborate internationally in polar research rather than continue the independent expeditions aimed at geographical exploration but with limited scientific value.²² Initially, he tried to raise support from scientific academies and other learned societies but the lack of concrete plans and the fact that Russia was at war with Turkey delayed the start of the project. It was clear that Russia had to be part of such a venture to succeed.²³ Finally in the spring of 1879, Weyprecht presented his plans to the IMO. This led to the first international polar conference in the fall of 1879, which decided on a common coordinated effort in the polar regions with instrumental measurements.²⁴ By the time enough financial support for the project had been gathered, Weyprecht had died. When the project was launched in 1882-83, eleven countries participated: Austria-Hungary, Denmark, Finland, France, Germany, Great Britain, Holland, Norway, Russia, Sweden, and the United States. Twelve different research stations were located in the Arctic with at least 13 auxiliary stations. There were close connections between meteorology and polar research in several countries. In Denmark and Finland, the central meteorological offices

¹⁹ WMO, "The Historical Roots of WMO."

²⁰ WMO, "IMO: The Origin of WMO," www.wmo.ch/wmo50/e/wmo/history_pages/origin_e.html (Accessed 18 Oct. 2005).

²¹ NOAA Arctic Research Office, "The First International Polar Year," www.arctic.noaa.gov/aro/ipy-1/History.htm (Accessed 28 Apr. 2005).

²² William Barr, "Geographical Aspects of the First International Polar Year, 1882-1883," *Annals of the Association of American Geographers* 73, no. 4 (1982): 463.

²³ Frängsmyr, "Polarforskning - från hjälte till vetenskapsman," 8.

²⁴ Frängsmyr, "Polarforskning - från hjälte till vetenskapsman"; Barr, "Geographical Aspects of the First International Polar Year, 1882-1883."

were responsible for the expeditions.²⁵ In Sweden, several members of the polar year committee had connections to meteorology and one of the expedition members was a young meteorologist who would later become head of the central meteorological office.²⁶

The different expeditions and auxiliary stations gathered vast amounts of data, including details on temperatures, wind, and air pressure. The material also includes one of the first detailed meteorological descriptions of a passing low pressure area. However, the data gathered was never fully utilized. They were published in different languages without any coordination, and it is not until recently that they have become available in a coordinated manner.²⁷ Therefore, the First International Polar Year is sometimes not considered to have contributed any major scientific breakthroughs.²⁸ That may have been the case for the natural sciences, but not necessarily in all study fields. For example, Arctic anthropology traces its roots back to this international effort, especially the studies of indigenous knowledge, including Inuit observations of sea ice, patterns of navigation, local weather forecasting, and human adaptations.²⁹ Social scientists active in planning the International Polar Year 2007-2008 have also noted that many publications from the First International Polar Year show how polar research was construed as a multidisciplinary endeavor over 100 years ago, "much to the surprise of our colleagues from other polar disciplines."³⁰

The preparation and the execution of the First Polar Year illustrate an attempt to shift polar research from a nationalistic focus, where the polar regions were used to build a national image, to the building of international scientific networks. It appears that the existing political realities were not quite ready to support such endeavors, however. Not only was the effort delayed due to wars, there was also no strong international coordinating mechanism that could ensure that data were properly gathered and analyzed. The IMO was either not strong enough or interested enough in the issue to take on such a role. The Arctic may simply not have been central to the concerns of the meteorological offices that made up the IMO. Maybe the effort was dwarfed in relation to remaining nationalistic interests in the Arctic. It also appears that the interdisciplinary networks that were built for the effort did not become long lived. This early internationalist effort and its lack of legacy can also be understood in the context of the general development of science. As Crawford describes, there was a surge in international scientific congresses and organizations at the end of the 1800s, made possible by a new mode of communication: the railroad. Some of these left legacies, especially in creating standards, while others were more short-lived. Crawford points out that nationalism and internationalism in science co-existed to a degree that had not occurred beforehand and was not to recur again, which explains why many internationalist efforts became cau-

²⁵ Barr, "Geographical Aspects of the First International Polar Year, 1882-1883."

²⁶ Frängsmyr, "Polarforskning - Från Hjalte Till Vetenskapsman," 9-10.

²⁷ NOAA Arctic Research Office, "The First International Polar Year."

²⁸ NOAA Arctic Research Office, "The First International Polar Year."

²⁹ Igor Krupnik, Michael Bravo, Yvon Csonka, Grete Hovelsrud-Broda, Ludger Müller-Wille, Birger Poppel, Peter Schweizer, and Sverker Sörlin, "Social Sciences and Humanities in the International Polar Year 2007-2008: An Integrating Mission," *InfoNorth* 58, no. 1 (2005): 91.

³⁰ Krupnik, et al., "Social Sciences and Humanities in the International Polar Year 2007-2008: An Integrating Mission," 92.

salities of the World War I.³¹ The lack of legacy from the First International Polar Year could thus partly be understood by the lack of structures that could support continued international coordination of research.

The Arctic

In relation to the scientific community, the Arctic can historically be described as a land of discovery, where the explorers often ignored or denied the presence of indigenous peoples.³² While the early exploitation, starting in the 16th century was mainly aimed at tapping the vast natural living resources, the Arctic later also became a nationalistic icon in relation to southern nation states.³³ Exploitation of resources also became a concern in relation to international governance. For example, the Arctic features one of the first international agreements to protect a threatened species; the 1911 Fur Seal Treaty between the United States and Russia was an effort to secure conditions that would allow a sustainable harvest. There were also early international regulatory efforts to protect musk ox in Greenland and reindeer on Spitsbergen, which were part of a wider movement of world-wide nature protection.³⁴ Already before World War I, negotiations started to regulate both nature conservation and exploitation of natural resources on Spitsbergen, and these were very much guided by both economic and ideological nationalistic interests. After the war, the negotiations resulted in the Spitsbergen Treaty of 1921.³⁵ In addition to the cooperation initiated from outside the Arctic, there are long traditions of cooperation across national borders among indigenous peoples. Borders were something imposed by the outside world, often creating artificial divisions among people in the region. This was the case in the Saami region of northern Fennoscandia and among peoples in the Bering Sea region.³⁶

The war years

The first half of the 20th century brought two world wars that put a damper on international collaboration both in the Arctic and in the world at large. In the scientific world, there remained some efforts to gather data internationally. For example, in 1919, the International Union of Geodesy and Geophysics was established, which included studies of meteorology, oceanography, and vulcanology.³⁷ Several similar scientific socie-

³¹ Elisabeth Crawford, *Nationalism and Internationalism in Science, 1880-1939. Four Studies of the Nobel Population* (Cambridge, MA: Cambridge University Press, 1992), chapter 2.

³² Richard Vaughan, *The Arctic. A History* (Gloucestershire: Alan Sutton Publishing, 1994); Young and Einarsson, "Introduction," 23.

³³ Michael T. Bravo and Sverker Sörlin, *Narrating the Arctic. A Cultural History of Nordic Scientific Practices* (Canton, MA: Science History Publications, 2002); Urban Wråkberg, "Nature Conservationism and the Arctic Common of Spitsbergen 1900-1920," *Acta Borealis* 23, no. 1 (2006): 1.

³⁴ Oran R. Young, Gail Osherenko, eds., *Polar Politics. Creating International Environmental Regimes* (Ithaca and London: Cornell University Press, 1993); Selin and Linnér, *The Quest for Global Sustainability*.

³⁵ Wråkberg, "Nature Conservationism and the Arctic Common of Spitsbergen 1900-1920."

³⁶ Lassi Heininen, "Circumpolar International Relations and Geopolitics," in *Arctic Human Development Report*, ed. AHDR, (Akureyri: Stefansson Arctic Institute, 2004), 207.

³⁷ Spencer R Weart, "The Discovery of Global Warming," www.aip.org/history/climate, International Cooperation-2.

ties were created around this time, including an organization called the International Research Council (1919-1931). There had earlier also been an International Association of Academies (1899-1914). In 1931, these two efforts towards internationalization of science developed into the International Council of Scientific Unions (ICSU).³⁸ This early non-governmental organization later became a major driver for global change research, including early efforts to assess knowledge relevant to climate change.

The idea of cooperation in polar research was still alive. As early as 1925, scientists started discussing a second international polar year. The ambitions were grand with plans for extending the observation networks globally rather than concentrating efforts on polar areas. However, the economic situation forced the enthusiasts to postpone their ideas and when it was eventually launched it was much more modest in scope.³⁹ In the mean time, breakthroughs for aviation brought increasing needs for better weather forecasts. Thus, when the Second International Polar Year eventually was realized in 1932-33, the IMO had a special focus on improving weather observations in the polar region. These were also important for providing forecasts to the increasing maritime activities. Scientifically, there was an interest in gathering data about the newly discovered jet stream. In the language of the official website for the International Polar Year 2007-2008 discussing this earlier period, the scientific effort "heralded advances in meteorology, magnetism, atmospheric science, and in the 'mapping' of ionospheric phenomena that advanced radioscience and technology."⁴⁰ Forty permanent observation stations were established in the Arctic. The world data centers that were created to handle the data are another legacy.⁴¹

Conclusions of early development

The early development of climate science appears to be driven in part by actors and actor networks in the natural sciences beginning with their interest in the ice ages but with time also increasingly shaped by society's needs for better weather forecasting. There were emerging international networks between scientists interested in the Arctic illustrated by the international polar years, among scientists in general illustrated by an emerging international research organization, and also among meteorological offices. The emerging networks mirrored changes in international society. They were facilitated by new possibilities in travel and had an increasing emphasis on communication across national borders. Collaborations appear to be driven by professional organizations rather than by states. This mirrors an international society where nationalism was a fundamental structure and where international regimes had yet to appear as important for coordinating state activities. While the cooperation among meteorological offices resulted in

³⁸ ICSU was later renamed International Council for Science; Weart, "The Discovery of Global Warming", International-2; ICSU, "About ICSU. A Brief History," www.icsu.org/5_abouticsu/INTRO_Hist_1.html (Accessed 19 Oct. 2004).

³⁹ Gösta Liljequist, "Det Internationella Geofysiska Året 1957-58 - den moderna polarforskningens startår," in *Polarforskning. Förr, nu och i framtiden*, ed. Swedish Royal Academy of Sciences, 24-33 (Stockholm: Swedish Royal Academy of Sciences, 1982).

⁴⁰ IPY 2007-2008, "History of IPY," <http://www.ipy.org/development/history.htm> (Accessed 13 Apr. 2007).

⁴¹ WMO, "IMO: The Origin of WMO."

the creation of the IMO, the polar efforts did not leave any pan-Arctic organizational legacy. A possible explanation was that the Arctic was seen too much in relation to nationalistic interests. The scientific communities that had taken an interest in long-term climate changes and other fundamental geophysical issues also started to organize internationally and took part in creating ICSU as a non-governmental organization. Even if there are no sign of formal governmental cooperation in areas related to climate research, the emerging international networks, exemplified by the IMO and ICSU, were the seeds for a future global climate regime.

Between mid-1800s until the end of World War II the Arctic can be described as a periphery to central colonial powers within the nation states with Arctic territories. Science played a central role in framing the Arctic in nationalistic terms, even if some individual scientists became increasingly interested in overcoming the limits that national borders imposed on Arctic research. There are also examples of counterpoints to the nationalistic ideals in efforts by individual scientists to use science as a means to establish better international relations.⁴² In spite of some examples of international agreements in the Arctic, the internationalist initiatives of the first two polar years did not affect this basic focus on nation states and their interests within the international system. Rather, Arctic development is better understood in the same light as the global development at the time, where international regimes were a way for colonial powers to assert their interests in their territories, whether it concerned threatened species or economically important resources.⁴³ The Arctic situation is also compatible with observations that internationalist developments in science from the late 1800s to the 1930s did not leave the nationalistic tendencies of science behind. Even if better communications, such as the railroads, allowed scientists to travel and collaborate, this was also a time when the ideology of nation-building was strong and where science was part of this effort.⁴⁴

In the Arctic, the war years, especially World War II, created a political and military situation in which international collaboration became more and more precarious.

4.2 Growing international cooperation

After the World War II, there were converging needs from the scientific and political communities. Scientifically, it had become increasingly clear that studies of many geophysical phenomena required international collaborations – the natural world did not pay attention to national borders. Moreover, at least the natural sciences were increasingly fostering an international rather than national identity, with the ICSU as an example. Politically, there was a need to bind people together again. The dangers of national-

⁴² Sverker Sörlin, "Hans W:son Ahlmann, Arctic Research and Polar Warming : From a National to an International Scientific Agenda, 1929-1952" in *Mundus librorum*, eds. Pentti Laasonen, Antto Leikola, Tapio Markkanen, Leena Pärssinen, Esko Rahikainen (Helsinki: Helsingin yliopiston kirjasto, 1996).

⁴³ Björn-Ola Linnér, *The Return of Malthus. Environmentalism and Post-War Population-Resource Crisis* (Isle of Harris: White House Press, 2003), 30.

⁴⁴ Crawford, *Nationalism and Internationalism in Science, 1880-1939. Four Studies of the Nobel Population*, chapter 2.

ism had become all too apparent and the impetus was strong to find effective ways to build a new world order. This included the creation of the United Nations and the Bretton-Woods financial institutions but also organizations that have been central to the development of climate science. In this context, it became an explicit policy to foster scientific links across national borders.

World Meteorological Organization (WMO)

Meteorology was an area in which international collaboration was already organized at the end of World War II, but not through governmental cooperation. However, in 1947, representatives of 31 countries attending the Eighth Conference of Directors of the IMO endorsed the transformation of IMO into the intergovernmental World Meteorological Organization (WMO), which was created in 1950. In 1951 the WMO became a special agency under the United Nations.⁴⁵

According to Miller, the development of the WMO was intimately connected to a US foreign policy of scientific internationalism. The ideological ideal driving it was to construct a stable world order that could serve American interests. One of the major tools it used to do this was to promote international cooperation. This would help other countries towards economic prosperity and therefore reduce the risk of social unrest, which would otherwise create a fertile ground for communist regimes. Promoting a free international exchange of scientific data would also ensure that American scientists had access to scientific work from all parts of the world. Moreover, the ideology of international cooperation was aimed at reducing the risk that science and technology would again be captured by a militaristic state, as had happened in the German war effort.⁴⁶

The WMO became an ideal model for this post-war US foreign policy. Not only was there already an existing scientific network among the national meteorological offices on which it could build, the new regime could be framed as a matter of technical cooperation, which did not threaten the sovereign rights of other states.⁴⁷ The United States had the chairmanship of the IMO and thus an opportunity to prepare the restructuring into a formal cooperation among sovereign states rather than an informal network among meteorological offices.⁴⁸ The new structure mustered new economic resources, which were used to invest in new technologies that improved capacity to observe Earth's weather. These technologies later came to include computers, satellites, telecommunication, and remote sensing, all of them key components in the technical network that is used to detect and understand global climate change. It also committed governments to standardizations of the measurements.⁴⁹

The WMO illustrates the interplay between an existing actor network and political state interests in creating a regime. Already in the 1930s, the IMO had discussed the

⁴⁵ WMO, "The Beginnings of WMO (1950s-1960s)," www.wmo.ch/wmo50/e/history_e.html (Accessed 18 Oct. 2005).

⁴⁶ Clark A. Miller, "Scientific Internationalism in American Foreign Policy," in *Changing the Atmosphere. Expert Knowledge and Environmental Governance*, eds. Clark A. Miller and Paul N. Edwards, 167-217 (Cambridge, MA: MIT Press, 2004).

⁴⁷ Miller, "Scientific Internationalism in American Foreign Policy," 177.

⁴⁸ Miller, "Scientific Internationalism in American Foreign Policy," 188.

⁴⁹ Miller, "Scientific Internationalism in American Foreign Policy," 190-191.

idea of a convention that would regulate meteorological cooperation but this effort was stalled by the war.⁵⁰ After the war, the idea was actively promoted as part of the US efforts to build a new world order. It also illustrates how formal intergovernmental cooperation mustered new resources and created political legitimacy. The norms of the international cooperation in meteorology, as well as the physical and political structures to support data gathering and sharing that developed under the auspices of the WMO, were further strengthened in connection with the International Geophysical Year in 1957/58.

The International Geophysical Year 1957/58

The idea of an international geophysical year was born by a small group of scientists in 1950 from an informal discussion on how new technology from the war, such as rockets and radar, could be used for advancing the science of geophysics.⁵¹ When they appealed for money, their ideas fit well into US Cold War military ambitions. This would be a way of collecting data in areas that would otherwise be inaccessible. In addition, the effort could be used to gain prestige in the ideological war between East and West. Some also saw the potential for using scientific cooperation as a means to thaw East-West relations.⁵²

The non-governmental scientific organization ICSU was the linking point for International Geophysical Year activities. The initiative had thus moved from the meteorological community with its focus on weather observations to a community interested in more fundamental aspects of Earth as a planet. However, the WMO assumed responsibility for preparing and coordinating the meteorological research program. According to Miller, the "prior existence of international data collection networks and protocols, authoritative bodies capable of setting priorities, and institutional support for the publication of data substantially eased the burden of building a globally coordinated research enterprise."⁵³ The structures for cooperation within the WMO were thus central for the international coordination.

Although climate science was not a major emphasis in the International Geophysical Year, the physical infrastructure that was set up for this initiative has been important to future climate change research. One example is the chains of weather observing stations that were established to collect data simultaneously. Moreover, all the meteorological data were collected in three central World Data Centers, which still play a key role in gathering climatological information.⁵⁴ The International Geophysical Year also marked the initiation of regular measurements of carbon dioxide levels in the atmosphere. The data from Mauna Loa, Hawaii, displaying a curve of steadily increasing concentrations have become an icon to show the influence of human civilization on Earth's atmosphere. Weart has described this as the "capstone" on the structure built by early climate

⁵⁰ Miller, "Scientific Internationalism in American Foreign Policy," 182.

⁵¹ IPY 2007-2008, "History of IPY."

⁵² Weart, "The Discovery of Global Warming", International-3.

⁵³ Miller, "Scientific Internationalism in American Foreign Policy," 200.

⁵⁴ Paul N. Edwards, "Representing the Global Atmosphere," in *Changing the Atmosphere. Expert Knowledge and Environmental Governance*, eds. Clark A. Miller and Paul N. Edwards, 31-65 (Cambridge, MA: MIT Press, 2004).

scientists and the “discovery of the possibility of global warming.”⁵⁵ Scientists also started to gather data on solar radiation and in 1957 the WMO set up a global observation system to measure ozone levels in the atmosphere.⁵⁶ The International Geophysical Year marked the beginning of drilling for ice cores to study what the climate was like in the past. Such ice cores from Greenland and Antarctica have become important tools for understanding the dynamics of global climate change. Logistically, the International Geophysical Year pushed Earth scientists to coordinate their work to a greater extent than before, creating the foundation of an international scientific community.⁵⁷

The Arctic was no longer in focus the same way as in the previous polar years, even if new forms of logistic support made it possible to set up research stations in new places, including stations on the pack ice. Instead, emphasis was placed on the Antarctic, which until this time had been inaccessible to any large-scale scientific investigations. Air transport and modern snow tractors had changed the odds for successful scientific work on this continent and the International Geophysical Year was the starting point for serious Antarctic research. In the Antarctic, the International Geophysical Year also marked the beginnings of political cooperation, and as a direct result, negotiations began on what became the Antarctic Treaty.

The International Geophysical Year also became a cultural starting point for looking at planet Earth as a whole. In particular, the Soviet Sputnik satellite in 1957 together with later American space launches marked the beginning of the space race.⁵⁸ Several writers have pointed out that the changed awareness brought on by looking at Earth from the outside has been fundamental for our culture, similar to a scientific revolution.⁵⁹

Using the analytical scheme of interactions among regimes and actors networks, the International Geophysical Year illustrates how formalized governmental and non-governmental cooperation played a key role in creating a network of people and technologies that emphasized Earth as system and created a global view of the physical forces that affects its dynamics. Moreover, the scientific starting point was neither at the local level nor at the national level but now at the global level. The drivers were both scientific and related to the geopolitical situation of the time. There was a wish to understand fundamental principles of Earth as a system, but by using technologies developed by the military this became based on the political aspirations and organizational resources that were connected to an ideology of using science collaboration as part of creating a new world order.

⁵⁵ Weart, *The Discovery of Global Warming*, 38.

⁵⁶ WMO, "World Meteorological Organization. Milestones," www.wmo.ch (Accessed 1 Feb. 2007).

⁵⁷ Weart, "The Discovery of Global Warming," International-4.

⁵⁸ Weart, "The Discovery of Global Warming," International-4.

⁵⁹ Mette Bryld and Nina Lykke, *Cosmodolphins. Feminist Cultural Studies of Technology, Animals and the Sacred* (London, New York: Zed Books, 2000), 10; Sheila Jasanoff, "Heaven and Earth: The Politics of Environmental Images," in *Earthly Politics. Local and Global in Environmental Governance*, eds. Sheila Jasanoff and Marybeth Long Martello, 31-52 (Cambridge, MA: MIT Press, 2004), 37.

Scientific developments

Scientifically, the question of global warming was not a major issue at the time of the International Geophysical Year. Rather, the general understanding at the time was that the oceans would absorb almost all the excess carbon that humans may put in the atmosphere. Moreover, the war years had unusually cold weather, which made it less pertinent to discuss global warming. If anything was on the agenda, it was the perpetual question of the ice ages and the potential of a returning ice age on Earth. However, experiences of the vast impact of technology from using atom bombs had raised the legitimacy of ideas that people were able to affect the climate. There are examples of both scientists and politicians mentioning nuclear weapons and climate change as comparable threats to civilization. A popular belief was that fallout from the bombs could cause climate cooling.⁶⁰ This theme resurfaced in the environmental debate in the early 1980s under the rubric of nuclear winter.⁶¹

The bombs did not only provide the seed for a new discourse of environmentalism. It also gave rise to new scientific techniques, specifically the use of radioactive tracers which were used to study the dispersal of the fallout. Closely related to this was the development of techniques to date material through its radiocarbon profile. In 1955, an expert on this new science – Hans Plass – showed that carbon from ancient fossil fuel had been added to the atmosphere. This finding was picked up by the director of Scripps Oceanographic Institute, Roger Revelle, who has been described as a key actor in the US scientific elite working on climate change science.⁶² Revelle hired Seuss to study radiocarbon in the ocean surface and as a result realized that the chemistry of sea water kept the ocean from retaining all the carbon it absorbs. Therefore, the ocean was not likely to retain the human emissions of carbon dioxide.⁶³ In 1957, Revelle and Seuss wrote: "Human beings are now carrying out a large scale geophysical experiment of a kind that could not have happened in the past nor be reproduced in the future."⁶⁴ In 1956 and 1957, Revelle testified to US Congress about the potential consequences of this experiment and explained that climate change might turn California and Texas into deserts. Revelle regularly advised US federal agencies and leaders to advance his research program.⁶⁵ For example, the testimony has been described as a way of trying to get funding for the International Geophysical Year. Revelle was also instrumental in pushing David Keeling to start the carbon dioxide measurement on Mauna Loa that became part of the International Geophysical Year.⁶⁶

⁶⁰ David M. Hart and David G. Victor, "Scientific Elites and the Making of US Policy for Climate Change Research 1957-74," *Social Studies of Science* 23, no. 4 (1993): 643, 647.

⁶¹ Constance Holden, "Scientists Describe 'Nuclear Winter,'" *Science* 222, no. 4625 (1983): 822; R. P. Turcp, O. B. Toon, T. P. Ackerman, J. B. Pollack, and C. Sagan, "Nuclear Winter. Global Consequences of Multiple Nuclear Explosions," *Science* 222, (1983): 1283; Lydia Dotto, *Planet Earth in Jeopardy* (Chichester: John Wiley & Sons, 1986).

⁶² Hart and Victor, "Scientific Elites and the Making of US Policy for Climate Change Research 1957-74."

⁶³ Weart, *The Discovery of Global Warming*, 26-29.

⁶⁴ Roger Revelle and Hans E. Suess, "Carbon Dioxide Exchange Between Atmosphere and Ocean and the Question of an Increase of Atmospheric CO₂ During the Past Decades," *Tellus* 9, (1957): 18.

⁶⁵ Hart and Victor, "Scientific Elites and the Making of US Policy for Climate Change Research 1957-74," 647.

⁶⁶ Weart, *The Discovery of Global Warming*, 35, 43.

Climate science in a social context: the birth of environmentalism

The Cold War had implications for the larger social context of research. Specifically, the testing of nuclear bombs alerted the general public to the destructive power of technology and that human society could have a major impact on the environment. Moreover, it became clear that the effects could be geographically far-ranging. It was suddenly possible to think that human society could be a threat to itself.⁶⁷ In the United States, protests against nuclear tests became an early embryo of the environmental movement to which Rachel Carson could appeal when she was protesting against the use of chemical pesticides in her seminal book *Silent Spring*.⁶⁸ In the Arctic, the nuclear tests became a rallying point for local control of the environment when indigenous peoples in northern Alaska managed to stop the use of nuclear explosives to excavate a harbor. Moreover, there was concern about how the fallout from nuclear tests would affect reindeer and caribou. This sparked an initial awareness about contaminants in traditional foods.⁶⁹

Even if climate change was not a major issue in this early phase of the environmental movement, a few seeds of recognizing its potential importance were there. The seeds included the new knowledge about the fate of carbon dioxide from fossil fuels, which Revelle conveyed to the US Congress. As early as 1959, there were news accounts in the *New York Times* about the thin ice in the Arctic Ocean.⁷⁰ Most important was the growing awareness about potential long-range impact of technology and the framing of climate change as “a large-scale geophysical experiment.” In 1963, a private conservation foundation issued a report about the potential for rising global temperatures, and in 1965 a sub-panel of climate experts were included on a panel on environmental issues formed by the Presidents’ Science Advisory Committee. Again Revelle appeared as central knowledge broker. The presidential report was the first official recognition that climate warming could be caused by human activities and have important consequences.⁷¹

4.3 Politics of the atmosphere

The 1960s and 1970s brought climate science into a new era. Scientifically, new technologies followed by new ways of looking at the Earth as a system laid the foundation for the science of climate change. Politically, we saw the birth of international environ-

⁶⁷ Linnér, *The Return of Malthus*, 102, 212.

⁶⁸ Donald Worster, *Nature's Economy. A History of Ecological Ideas* (Cambridge: Cambridge University Press, 1994); Linda Lear, *Rachel Carson. Witness for Nature* (New York: Henry Holt and Company, 1997).

⁶⁹ Carl Hild, “Human Health and Well-Being,” in *Arctic Human Development Report*, ed. AHDR, 155-168 (Akureyri: Stefansson Arctic Institute, 2004), 161.

⁷⁰ Weart, *The Discovery of Global Warming*, 42.

⁷¹ William W. Kellogg, “Mankind's Impact on Climate: the Evolution of Awareness,” *Climate Change* 10, (1987): 113; Hart and Victor, “Scientific Elites and the Making of US Policy for Climate Change Research 1957-74”; President's Science Advisory Commission 1965 as quoted in Shardul Agrawala, “Context and Early Origin of the Intergovernmental Panel on Climate Change,” *Climate Change* 39, (1998): 605; Weart, *The Discovery of Global Warming*, 44.

mental politics in general and politics of the atmosphere in particular – a development that tied advances in science with political ambitions to lessen Cold War tensions between East and West. But a new tension was increasingly visible – between the industrialized and the developing world, or between the global North and global South.

Satellites for peace

Satellites were a new technology brought forth by the Cold War and the space race. They monitored military activities, but meteorologists and geophysicists also saw opportunities in this development. The satellites could be used for gathering data about the weather conditions high in the atmosphere, creating a basis for better weather forecasts, including the first generation of computer models for weather prediction. For the United States, an international collaboration could also provide insights in the Soviet meteorological program. In 1963 in an address to the United Nations about the peaceful uses of satellites, US President J. F. Kennedy proposed an international cooperative effort for weather prediction and eventually weather control in order to have better understanding of the global climate system.⁷² With the WMO up and running, the organizational framework was in place for such a proposal and in 1963 the World Weather Watch became one of its core activities.⁷³ A major activity for the World Weather Watch was to set standards for how weather data was to be gathered. Such standards can be seen as a co-production of science and policy. Edwards describes them as socially constructed tools: “They embody the outcome of negotiations that are simultaneously technical, social and political in character.”⁷⁴ To set standards had been a long-time ambition among meteorologists but previously had been met with limited success.⁷⁵ The World Weather Watch also linked data collections from different sources, including satellites, rockets, buoys, radiosondes, commercial aircrafts, and conventional observing stations.⁷⁶ The World Weather Watch thus illustrates how an intergovernmental regime could provide a more efficient structure for streamlining data gathering than the former non-governmental cooperative efforts with similar ambitions.

Global systems studies were also of interest to ICSU, and together with the WMO this nongovernmental organization set up the Global Atmospheric Research Program (GARP) in 1967. GARP included both panels of specialists running different research projects and a board of government representatives responsible for funding and other support. It thus had the co-production of science and policy explicitly built into its structure and norms. A central activity of GARP was to gather data sets on a global scale, which further enforced the standardization efforts of the World Weather Watch. A driving force to standardize data was that data had to be usable in the computer models that were developing at the time – early forerunners of today’s global climate models.⁷⁷ As

⁷² Agrawala, “Context and Early Origin of the Intergovernmental Panel on Climate Change”; Edwards, “Representing the Global Atmosphere,” 48.

⁷³ Weart, “The Discovery of Global Warming,” International-5.

⁷⁴ Paul N. Edwards, “‘A Vast Machine’: Standards As Social Technology,” *Science* 304, (2004): 827.

⁷⁵ Edwards, “‘A Vast Machine’: Standards As Social Technology.”

⁷⁶ Edwards, “Representing the Global Atmosphere,” 47-48.

⁷⁷ Weart, “The Discovery of Global Warming,” International-6; Edwards, “Representing the Global Atmosphere.”

indicated by the name – *Global Atmospheric Research Program* – climate science was at this time increasingly framing the issues in global terms and focusing on understanding the global climate system.

A frozen Arctic

The Arctic did not play a prominent role in the emerging global climate science, neither did polar research. There was no scientific reason to ignore polar regions, their roles being previously recognized in the international polar year efforts. However, for the Arctic, the Cold War political setting created major obstacles for international research collaboration. The region was divided between the North Atlantic Treaty Organization (NATO), led by the United States, and the Warsaw Pact, led by the Soviet Union, with Sweden and Finland as non-aligned nations squeezed between the two superpowers.⁷⁸ Both land and sea were heavily militarized, including radar stations for early warning of long distance missiles and tests of nuclear weapons in the Aleutian Islands and on Novaya Zemlya.⁷⁹ Heininen has written that the Cold War had “transformed the region first into a military flank, then a military front or even a ‘military theater.’”⁸⁰ Many proposals for arms control and confidence building were put forth but the formal agreements did not include the Arctic.

Later, conflicts over contested marine territories were also increasingly coming to the fore through claims for larger zones of exclusive rights for economic exploitation, as seen by the so-called fishing wars or cod wars.⁸¹ The extensions of sovereignty claims allowed even more freedom for militarization. The same year as the United Nations Convention on Law of the Seas was signed – 1982 – a Swedish diplomat wrote that the Arctic was one of the most heavily militarized areas in the world and that the Law of the Sea and new zones of sovereignty made areas inaccessible to research that had been open only a decade earlier. For example, the emerging new regime concerning the high seas greatly hampered a Swedish polar expedition in 1980, when the Soviet Union would not allow sampling on its northern continental shelf.⁸² This setting for research collaboration can be placed in contrast with Antarctica, where the International Geophysical Year had led to the creation of the Scientific Committee on Antarctic Research (SCAR) to coordinate research.

In spite of political tensions, the Arctic was not devoid of cooperation. Indigenous peoples in the region started to organize across borders with the creation of the Saami Council in 1956 and the Inuit Circumpolar Conference in 1977. The Nordic countries had a cooperation focusing on the northern regions of the Nordic countries, which started in 1967 under the auspices of the Nordic Council of Ministers.⁸³ In 1982, a

⁷⁸ Young and Osherenko, *Polar Politics. Creating International Environmental Regimes*, 24, 190 ff.

⁷⁹ Heininen, "Circumpolar International Relations and Geopolitics," 207-208.

⁸⁰ Heininen, "Circumpolar International Relations and Geopolitics," 218.

⁸¹ School of International Services American University, "The Cod War. Case 402 in the Mandala Projects' Inventory on Conflicts and the Environment," www.american.edu/TED/icefish.htm (Accessed 29 Sept. 2006).

⁸² Bo Johnson Theutenberg, "Polarområdena - politik och folkrätt," in *Polarforskning. För, nu och i framtiden*, ed. Swedish Royal Academy of Sciences, 40-55 (Stockholm: Swedish Royal Academy of Sciences, 1982).

⁸³ Heininen, "Circumpolar International Relations and Geopolitics," 215.

Northern Sciences Network was established under UNESCO's Man and Biosphere Programme.⁸⁴ In spite of these initiatives, the general picture for the Arctic differed from the global political development, with geopolitics and security issues taking pre-eminence over ideals of multilateral cooperation. Realists' perspectives with state security interests in focus serve well to describe international relations in the Arctic region at this time.

Transboundary air pollution and sustainable development

Even if climate change had become part of the agenda in some scientific circles, it was not a major societal issue in the 1960s and early 1970s. But the environment was. When Sweden was looking for ways to strengthen the United Nations the environment was thus a suitable theme during a time when the United Nations was plagued by East-West tensions and issues surrounding decolonization. The result was a Swedish initiative for the United Nations to organize a conference on the environment. This initiative gained further salience for Swedish policy makers because the causes of Sweden's major environmental issues of the time were becoming clear: sulphur emissions from the burning of fossil fuels in other parts of Europe were behind the acidification of lakes and fish deaths in Sweden. Unlike many local environmental problems, this menace could not be dealt with at the national level. It thus became important to convince other governments that the environment and pollution were transnational issues.⁸⁵ The initiative was accepted and the United Nations Conference on Human Environment took place in Stockholm in 1972. This conference not only marked the beginning of the environment as a global political issue. It also brought new perspectives to the debate, notably the conflicts between environment and development, especially in relation to the need for economic development in poor countries.

There were several preparatory activities directly related to climate change. In the United States, a small informal meeting in 1970 issued a report called *The Study of Critical Environmental Problems*, which received attention because it examined controversies surrounding the development of supersonic transport.⁸⁶ A more international gathering was held in Stockholm in 1971, where experts from 14 nations discussed climate change and issued the report *Study of Man's Impact on Climate (SMIC)*.⁸⁷ The SMIC experts did not come to any consensus: would the greenhouse gases warm the Earth faster than pollution would cool it? Nevertheless, they issued a warning about severe climate change. The review comments noted the possibility of melting polar ice.⁸⁸ The reports about climate change that were prepared for the Stockholm Conference cannot be characterized as scientific breakthroughs. Rather, they were syntheses

⁸⁴ Clive Archer and David Scrivener, "International Co-operation in the Arctic Environment," in *The Arctic. Environment, People, Policy*, eds. Mark Nuttall and Terry V. Callaghan, 601-619 (Amsterdam: Harwood Academic Publishers, 2000), 602.

⁸⁵ Lundgren, *Acid Rain on the Agenda*, 288; Selin and Linnér, *The Quest for Global Sustainability*, 19.

⁸⁶ Hart and Victor, "Scientific Elites and the Making of US Policy for Climate Change Research 1957-74."

⁸⁷ Study of Man's Impact on Climate (SMIC), *Inadvertent Climate Modification: Report of the Study of Man's Impact on Climate (SMIC)* (Cambridge: Cambridge University Press, 1971).

⁸⁸ Weart, "The Discovery of Global Warming," International-7.

and assessments of the scientific knowledge available at the time.⁸⁹ Nevertheless, together with statements at the Stockholm Conference, they illustrate that global warming was starting to be framed as an international issue worthy of policy attention. These statements include a recognition that “the Earth’s temperature may rise as a result of increased atmospheric content of carbon dioxide due to future consumption of fossil fuels.”⁹⁰ Moreover, the Stockholm Action Plan advised a general precautionary approach and recommended governments to “be mindful of activities in which there is an appreciable risk of effects on climate” and to “[c]arefully evaluate the likelihood and magnitude of climate effects.”⁹¹

Why did climate science enter the international policy arena at this particular point in time? In a study of US scientific elites, Hart and Victor attribute the breakthrough to an opening of a policy window. Previous attempts to further this research in the United States had been caught up in interdepartmental turf fighting. With the Stockholm Conference, there was a new international arena, which opened a domestic policy window in the United States that could be converted to increased funding for research into the greenhouse effect. This development was helped along by a number of weather-related anomalies and an increased political concern about how the impact of such anomalies could cause political instability in the Third World.⁹² Hart and Victor’s focus on an actor network needs to be complemented with the international developments leading to the Stockholm Conference, which demonstrated a mechanism that could legitimately tackle international issues: the United Nations as a forum for cooperation. As described by Selin and Linnér in a study of the Stockholm Conference, the political development included an emerging international discourse on environment and development, which connected ecological deterioration, a growing demand for natural resources, and a focus on human development. Moreover, multilateralism was in vogue, increasing the political focus on cooperation across national boundaries, even if this was also challenged in the name of protecting national sovereignty.⁹³ Focus on the wider international developments brought attention to a discourse that was on the rise at the time and later became a key issue in climate policy: sustainable development. Closely connected to this was a growing focus on equity and the increasing tensions between the global North and South.⁹⁴

⁸⁹ Hart and Victor, “Scientific Elites and the Making of US Policy for Climate Change Research 1957-74.”

⁹⁰ United Nations, *Conference on the Human Environment: Identification and Control of Pollutants of Broad International Significance. A/Conf.48/8, 7 January 1997*, para 42.

⁹¹ United Nations, *Conference on the Human Environment: Identification and Control of Pollutants of Broad International Significance. A/Conf.48/8, 7 January* rec. 70; Björn-Ola Linnér and Merle Jacob, “From Stockholm to Kyoto and Beyond: A Review of the Globalisation of Global Warming Policy and North-South Relations,” *Globalization* 2, no. 3 (2005): 403.

⁹² Hart and Victor, “Scientific Elites and the Making of US Policy for Climate Change Research 1957-74.”

⁹³ Selin and Linnér, *The Quest for Global Sustainability*, 4-5.

⁹⁴ Linnér and Jacob, “From Stockholm to Kyoto and Beyond.”

Post-Stockholm politics: UNEP and the case of ozone depletion

The Stockholm Conference framed the environment as an international issue worthy of attention by the United Nations. A major outcome at the organizational level was the creation of the United Nations Environment Programme (UNEP). This new agency was given the primary role of monitoring and assessing the quality of the environment and alerting the world to any environmental danger signals.⁹⁵ It would come to play a critical role in both the emerging politics of the atmosphere and in science relating to these politics. One of the first issues UNEP tackled was the threat to the stratospheric ozone layer. The Arctic Climate Impact Assessment (ACIA) links climate change to ozone depletion and it is therefore pertinent to examine the background for the ozone regime.

Threats to Earth's ozone layer had previously been connected to the development of supersonic transport, but in 1974 Mario Molina and Sherry Rowland put forward a hypothesis that stable, non-toxic chemicals called chlorofluorocarbons (CFCs) could destroy ozone. This started what has been called an "ozone war" between environmentalists and the industries producing the chemicals.⁹⁶ As a result of the debate, some countries, including the United States and Sweden, banned the use of CFCs in spray cans, but the US industry argued that tackling the problem on a national basis would create competitive disadvantages. UNEP was the international institution with responsibility for the environment, and in 1975 it took the issue on board.⁹⁷ Initially, cooperation was focused on monitoring the ozone layer and harmonizing national policies. UNEP saw itself as a facilitator of international scientific consensus, but the Scandinavian countries also wanted political action and pushed for negotiations towards a convention, partly to recognize the 10-year anniversary of the Stockholm Conference.⁹⁸ Work was thus initiated to create a global framework convention, which was realized in the Vienna Convention on the Protection of the Ozone Layer in 1985.⁹⁹ Only a few months after it was signed, and when a scientific assessment report was in the final stages of preparation, the British Antarctic Survey reported an unexpected, sharp depletion of ozone over Halley Bay, Antarctica. The Antarctic "ozone hole" caught the attention of scientists, policy makers, and the public alike. Not only did this find speed up negotiations for binding protocols to the framework convention, it also created a public awareness that human society could change the atmosphere in vivid enough terms to make front page news.¹⁰⁰

Based on an analysis of the scientific and policy discourses, Litfin has shown how a group of scientific knowledge brokers were able to control, frame, and interpret this new information. Their close interaction with the policy sphere paved the way for mak-

⁹⁵ Stephen O. Andersen and K. M. Sarma, *Protecting the Ozone Layer. The United Nations History* (London: Earthscan, 2002), 43.

⁹⁶ Lydia Dotto and Harold Schiff, *The Ozone War* (Garden City, New York: Doubleday & Company, 1978).

⁹⁷ Andersen and Sarma, *Protecting the Ozone Layer. The United Nations History*, 45.

⁹⁸ Litfin, *Ozone Discourses*, 73.

⁹⁹ Litfin, *Ozone Discourses*, 74; William C. Clark, Jill Jäger, Jeannine Cavender-Bares, and Nancy M. Dickson, "Acid Rain, Ozone Depletion, and Climate Change: An Historical Overview," in *Learning to Manage Global Environmental Risk. Vol. 1*, ed. Social Learning Group, 21-55 (Cambridge, MA: MIT Press, 2001), 39; Evert Vedung and Erik Klefbom, *Ozonhålet. Global, nationellt, lokalt* (Stockholm: Liber, 2002), 40.

¹⁰⁰ Litfin, *Ozone Discourses*; Edwards, "Representing the Global Atmosphere," 49.

ing the political regimes effective in reducing the use of CFCs and other ozone-depleting chemicals.¹⁰¹ In addition, one could argue that the existence of UNEP as a new international agency, and with its highly dynamic Secretary General Mustafa Tolba, also played a major role in the ozone science-policy dynamics.¹⁰² Not only did UNEP provide an arena for negotiations. It also initiated assessments of the scientific knowledge on which to base policy decisions, thus pushing for consensus and supporting a political legitimacy that individual scientists may not have had.

The Arctic did not play a role in the early ozone discussions. A major reason was that the extremely cold temperatures in the upper atmosphere that contributed to the large ozone hole over the Antarctic were thought to be unique to the southern polar region. Arctic ozone holes are better described as a Swiss cheese and are often caused by dynamic air movement.¹⁰³ Although the smaller Arctic ozone holes and the downwards trends did not catch the same global attention, they were reported in an assessment of the Arctic environment, where they were discussed as also connected to climate change.¹⁰⁴

Climate science in the 1970s: a focus on models and impact

Researchers concerned with the global climate were in the 1970s continuing their focus on the global carbon cycle and how humans may affect it. Methodologically, the development of computer technology created new ways of getting a picture of what might be in store. Modeling was intimately connected to global networks for data collection that were set up in connection with the International Geophysical Year, illustrating how technology development could feed on the international institutionalization of meteorological networks.¹⁰⁵ The first general circulation models of the entire three-dimensional global atmosphere analyzing climate change due to emissions of carbon dioxide were presented in 1973, and in 1974 climate modeller Syukuro Manabe presented model results indicating that a doubling of carbon dioxide levels would lead to a 3-4 degree Celsius rise in global temperature.¹⁰⁶ Bert Bolin, who later became the first chair of the Intergovernmental Panel on Climate Change (IPCC) recollected the events in connection with an interview in 1991: "It was a remarkable result that to a large extent is still valid today. There have, of course, been much more detailed calculations but the conclusion is basically the same."¹⁰⁷ Edwards point to the central role of climate models and how they have become "an obligatory passage point" for knowledge of climate change.¹⁰⁸ For Bolin, the model results created an impetus to become more involved with policy.

¹⁰¹ Litfin, *Ozone Discourses*.

¹⁰² A description of UNEP as a "driving force" appears in Clark, et al. "Acid Rain, Ozone Depletion, and Climate Change: An Historical Overview," 39.

¹⁰³ AMAP, *Arctic Pollution Issues: A State of the Arctic Environment Report*, 165.

¹⁰⁴ AMAP, *Arctic Pollution Issues: A State of the Arctic Environment Report*, 166.

¹⁰⁵ Edwards, "Representing the Global Atmosphere."

¹⁰⁶ Aant and Jan Nolin, *Climate As Research and Politics. The Case of Sweden* (Göteborg: Institutionen för vetenskapsteori, Göteborgs universitet, 1998).

¹⁰⁷ Annika Nilsson, *Greenhouse Earth* (Chichester: John Wiley & Sons, 1992), 205.

¹⁰⁸ Bruno Latour's phrase as cited by Edwards, "Representing the Global Atmosphere," 33.

Even when climate science internationally was increasingly looking at the global climate system, a competing emphasis on climate impacts remained in the United States, where Long and Iles have noted a surge in impact assessments in the early 1970s.¹⁰⁹ Most of them focused on short-term climate variability rather than long-term climate change. The effects were in relation to various sectors of society, such as agriculture and the social and economic impacts. By the late 1970s, impacts were increasingly defined in terms of first order impact, which included the physical parameters related directly to climate and second order impact that included effects on ecological systems, agricultural productivity, and property loss. According to Long and Iles, this led to a distribution of different research tasks to different disciplines and a carving out of specific issues in order to facilitate research. Also introduced was a concept of "net impacts, which would take both positive and adverse effects into account."¹¹⁰

According to Weart, the growth in climate research slowed in the 1970s in spite of growing public and scientific interests. But at the international level under the auspices of the WMO, there remained an interest in taking on the issues. And in 1978, the scientists' demand for action led to an international workshop on climate issues under the auspices of the WMO and ICSU, which in turn led to the First International Climate Conference in 1979. To prepare for the workshop, a series of review papers were commissioned to assess the state of climate science. Participation in the conference was by invitation and included mostly scientists and government officials. The consensus reached was hardly news and included a statement that there was a clear possibility that an increase in carbon dioxide may result in significant and possibly major long-term changes of the global-scale climate.¹¹¹ A more substantial outcome was that the WMO, ICSU, and UNEP launched the World Climate Programme.¹¹² This program also included a branch specifically devoted to climate research: the World Climate Research Program (WCRP), which took over tasks previously held by the GARP.

Another result was a series of workshops under the auspices of the WMO, ICSU, and UNEP to better understand the climate problem. They were held in Villach, Austria.¹¹³ The first one, held in 1980, had the task of providing a carefully prepared scientific assessment of the carbon dioxide question to provide guidance to the World Climate Program and advice to nations.¹¹⁴ Two things are important about this description of the purpose. One is that the issue is framed in terms of carbon dioxide, in contrast to climate variability as framed in the earlier US climate impact assessments. The second is the clear purpose of providing advice to nations, a political imperative that later emerged as central in much of climate change science. However, the conclusion from the meeting was that it was premature to have any management plans for carbon dioxide. Instead, the sponsoring organizations agreed to conduct another assessment, due in 1985. In the meantime, in 1983, there was a meeting bringing together climate scientists

¹⁰⁹ Long and Iles, *Assessing Climate Change Impacts*, 5.

¹¹⁰ Long and Iles, *Assessing Climate Change Impacts*, 7.

¹¹¹ Weart, "The Discovery of Global Warming," *International-9*.

¹¹² Agrawala, "Context and Early Origin of the Intergovernmental Panel on Climate Change," 607.

¹¹³ Wendy E. Franz, *The Development of an International Agenda for Climate Change: Connecting Science to Policy* (Kennedy School of Government, Harvard University, 1997), 7.

¹¹⁴ Franz, *The Development of an International Agenda for Climate Change*, 8.

and biologists focused on the impact of climate, but again with no clear conclusions.¹¹⁵ In 1985, the assessment was done and passed on to the conference and the situation changed. UNEP's secretary general was obviously informed of its findings and made a forceful statement at the beginning of the conference. A key player in the assessment process was Bolin, then head of the International Meteorological Institute at Stockholm University, where UNEP had funded research.¹¹⁶ He has recollected the 1985 meeting as follows: "Tolba's introductory statement at the Villach meeting was very forceful. So forceful that I myself got cold feet. Was it right to run off like this? Do we know enough to back up all of Tolba's statement?" adding that they did not know enough to back it up at the time.¹¹⁷ Nevertheless, at the conference the chair detailed the task at hand; it was to develop a consensus statement and recommendations for actions.¹¹⁸ The message that came out made a clear connection between the scientific understanding of climate change and the need for policy action: "As a result of increasing concentrations of greenhouse gases, it is now believed that in the first half of the next century a rise of global mean temperature could occur which is greater than in man's history."¹¹⁹ The recommendations included consideration of a global convention.

Scientifically, a new concern brought forth by the report presented at Villach in 1985 was the inclusion of greenhouse gases other than carbon dioxide. Also, the report combined input from scientists concerned with the carbon cycle and global climate along with those interested in impacts. Many authors have thus pointed to Villach 1985 as a seminal event in climate science and policy development. However, after a close reading of the various reports, Franz has argued that the difference lay not in the science but in timing – the time was ripe for policy action.¹²⁰ Franz attributes this change to the absence of domestic political restraints and that the international institutional setting created a leeway for policy conclusions that had not been there before. People attended the conference in their personal capacities and were urged to shed any national perspectives. Moreover, the sponsoring organizations wanted a call for policy action and were ready for it in a way that they had not been in 1980.¹²¹ This conclusion is supported by an analysis of four European case studies of the international shaping of climate research, where Nolin states that before 1988, national research in many countries had a better chance of influencing international policy than domestic policy.¹²² As an agency under the United Nations, UNEP provided the perfect platform. Other factors were at play as well, not least was the recent successful negotiation of the Vienna Convention

¹¹⁵ Franz, *The Development of an International Agenda for Climate Change*, 8.

¹¹⁶ Interview with Bolin in 1991 in Nilsson, *Greenhouse Earth*, 206; Agrawala, "Context and Early Origin of the Intergovernmental Panel on Climate Change"; Elzinga and Nolin, *Climate As Research and Politics. The Case of Sweden*.

¹¹⁷ Interview with Bolin in Nilsson, *Greenhouse Earth*, 206.

¹¹⁸ Franz, *The Development of an International Agenda for Climate Change*.

¹¹⁹ Statement by the UNEP/WMO/ICSU International Conference on "The Assessment of the Role of Carbon Dioxide and of Other Greenhouse Gases in Climate Variation and Associated Impacts, Villach Austria, 9-15 October 1985" in Bert Bolin, Bo Döös, Jill Jäger, and Richard A. Warrick, eds. *The Greenhouse Effect. Climate Change and Ecosystems* (Chichester: John Wiley & Sons, 1986), xx.

¹²⁰ Franz, *The Development of an International Agenda for Climate Change*, 11.

¹²¹ Franz, *The Development of an International Agenda for Climate Change*, 14-16.

¹²² Jan Nolin, "Global Policy and National Research. The International Shaping of Climate Research in Four European Union Countries," *Minerva* 37, (1999): 125.

for Protection of the Ozone Layer. This was one of several international agreements related to environmental issues that were on the political agenda. Others related to acid rain, undersea mining, and fisheries.¹²³ There was thus a general development of using international regimes as a tool for dealing with environmental problems, which made it natural to also discuss climate change in those terms.

Bodansky describes the initial agenda-setting phase of climate policy action as being steered by a small group of western-oriented scientists who operated as entrepreneurs and knowledge brokers on the greenhouse effect through journals and personal contacts with policy makers.¹²⁴ From Franz's analysis, it appears that although the small group of entrepreneurs could serve as knowledge brokers, their influence was also due to the fact that international organizations were in place to sponsor meetings and push for strong statements. The new player in the field was UNEP, which had recently created a role for itself in the scientific assessments and political action concerning the thinning ozone layer. Franz describes it as UNEP having "[f]ound a niche as a broker of conventions."¹²⁵ Here was a new place in the politics of the atmosphere where it could potentially take on a leading role.

The formal result of the 1985 Villach meeting was the creation of the Advisory Group of Greenhouse Gases. This group met and adopted a work plan to further the dialogue between science and policy but its role was not long-lasting, partly because its connections to policy makers were very weak.¹²⁶ Even if the scientific credibility was high among its members, one could describe it as lacking the political legitimacy that is crucial for having an impact according to later studies of global scientific assessments.¹²⁷ Here it appears that it was not so much the structures of international cooperation that were at play, but rather that the cooperation included the creation of an organization that took a very active role, and that it acted partly independently from the parties of the intergovernmental cooperation.¹²⁸ The message from Villach spread. For example, it became integrated in the 1987 Brundtland Commission report *Our Common Future*.¹²⁹

Arctic images in the formative years of climate policy

What role did the Arctic play in the formative years of the climate science and policy interface? Politically, the Arctic was not a recognized region and, as outlined above, international relations were colored by Cold-War political dynamics. In climate science,

¹²³ Franz, *The Development of an International Agenda for Climate Change*, 17.

¹²⁴ Daniel Bodansky, "The History of the Global Climate Change Regimes," in *International Relations and Global Climate Change*, eds. Urs Luterbacher and Detlef F. Sprinz, 23-40 (Cambridge, MA: MIT Press, 2001), 27.

¹²⁵ Franz, *The Development of an International Agenda for Climate Change*, 18.

¹²⁶ Agrawala, "Context and Early Origin of the Intergovernmental Panel on Climate Change," 610.

¹²⁷ Noelle Eckley, William Clark, Alex Ferrell, Jill Jaeger, and David Stanners, *Designing Effective Assessments: the Role of Participation, Science and Governance, and Focus* (European Environment Agency, 2001); Mitchell, et al., *Global Environmental Assessments: Information and Influence*, e.g. 120-121.

¹²⁸ Breitmeier, "International Organizations and the Creation of Environmental Regimes," 101-102.

¹²⁹ World Commission on Environment and Development, *Our Common Future* (Oxford: Oxford University Press, 1987), 175; Franz, *The Development of an International Agenda for Climate Change*, 21.

the picture of the Arctic centered on its role in the global climate system. For example, the report that was written for the 1985 Villach meeting discusses the role of reflections from the polar ice in relation to climate models, the role of ice core data for determining atmospheric levels of carbon dioxide and methane, and water-saturated tundra as a source of methane. Sea-ice extent is mentioned as a moderately high priority for monitoring.¹³⁰ This report's discussion of impact of climate change focuses on agriculture and forestry and does not include consideration of the Arctic.

The origin of the Intergovernmental Panel on Climate Change (IPCC)

One reason for the quiet dismissal of the Advisory Group of Greenhouse Gases from this scene was the creation of the IPCC. As described by Agrawala, and supported by an interview in this study, the idea of an intergovernmental organization to assess climate change grew out of competition over ownership of the climate issues within the United States, between the Department of Energy and the Environmental Protection Agency.¹³¹ Moreover, global change research was becoming established as an international collaboration in the International Geosphere and Biosphere Programme (IGBP), with US research funders putting major program efforts into such global perspectives on environmental change.¹³² There were thus people who saw an international climate change assessment as the best way forward. An international assessment would also buy time for the United States in the discussions that UNEP's director general had initiated about a possible climate convention. According to Agrawala's account of the history, neither the WMO nor the United States wanted Tolba to capture climate the way he had ozone depletion.¹³³ An international assessment organized with governmental influence combined several interests in a way that made it feasible to move forward. The eventual design of the IPCC was inspired by the organizational setup for the co-production of science and policy of the GARP, combined with ideas about a comprehensive assessment from the first US climate assessment. Therefore its design included concern for science, impacts, and response options. In contrast to the Villach report, the IPCC was borne out of a political process rather than from an initiative by the science community. Agrawala specifically describes it as political process between the United States and the United Nations. One could see it as the interaction both between existing organizations (mainly UNEP and the WMO competing about ownership over the issue) and actors within the United States with different interests including environment, energy policy, and emerging global change research. By November 1988, the IPCC was up and running and in 1990, it delivered its first comprehensive assessments reports.

¹³⁰ Bolin, et al., *The Greenhouse Effect*, e.g. 224-225 (ice albedo), 274 and 160 (ice cores), 165 (methane emission), 308 (monitoring).

¹³¹ Agrawala, "Context and Early Origin of the Intergovernmental Panel on Climate Change," 613; Interview Robert Corell, March 24, 2004.

¹³² Interview Robert Corell, March 24, 2004.

¹³³ Agrawala, "Context and Early Origin of the Intergovernmental Panel on Climate Change," 612.

Arctic images in the first IPCC assessment

The first IPCC report paid attention to the Arctic both in relation to its role in the global climate system and in relation to potential impacts. Examples of the former include a discussion of tundra and boreal wetlands as sources of methane, the role of ice-albedo feedbacks in climate models, and a discussion of the North Atlantic mixing of ocean water and heat transport. The first IPCC assessment also mentions that polar regions may warm two to three times more than the global mean and that some models predict an ice-free Arctic with profound consequences for marine ecosystems. There were some attempts at making regional scenarios. The Arctic is not included in this discussion but there is a mention that the warming may be enhanced at higher latitudes, with eastern Siberia as an example.¹³⁴

In the impact assessment presented by Working Group II, polar islands are mentioned as especially sensitive and that the warming may affect the distribution of species, for example tree species on the taiga. The boreal forest and tundra have their own sections in the document. The Arctic is not mentioned in discussions about coastal settlements, erosion damage, and changes in the physical and social environment but is included in the text on economic activities with a discussion about the possible need for changes in the design of pipelines due to thawing permafrost and new potential for navigation as the sea ice is reduced. Snow, ice and permafrost have a chapter of their own with lengthy discussions on the physical changes but also mentioning the effects on infrastructure, vegetation, and socioeconomic development, including hydropower, tourism, snow removal, and mining.¹³⁵ In summary, the first IPCC assessment illustrates an emerging interest in the sensitive ecosystems of the Arctic and infrastructure as it relates to exploitation of resources.

A climate convention

The first IPCC assessment set the stage for negotiations about a global climate convention. Initially, policy response were part of IPCC's mandate but very soon, in October 1989, the WMO and UNEP set up a task force to work on action-oriented measures, to which the governments could respond. This was soon replaced by the Intergovernmental Negotiating Committee under the auspices of the United Nations General Assembly.¹³⁶ The change was partly in response to arguments from developing countries that climate change was not only a technical issue but linked to development.¹³⁷ Climate science and climate policy were thus formally split.

This chapter will not dwell on the political negotiations that eventually led to the United Nations Convention on Climate Change (UNFCCC). Suffice it to say that the

¹³⁴ T. Houghton, Jenkins G.J., and J. J. Ephraums, eds. *Scientific Assessment of Climate Change - Report of Working Group I* (Cambridge: Cambridge University Press, 1990), 302, 150, 180, 304, 140.

¹³⁵ M. J. McG. Tegart, G. W. Sheldon, and D. C. Griffiths, eds. *Impacts Assessment of Climate Change - Report of Working Group II* (Australian Government Publishing Service, 1990) 3-3, 3-7, 3-10-12, 5-15, 7-1 ff.

¹³⁶ Shardul Agrawala, "Structural and Process History of the Intergovernmental Panel on Climate Change," *Climate Change* 39, (1998): 621, 634.

¹³⁷ Bodansky, "The History of the Global Climate Change Regimes," 30; Miller, "Climate Science and the Making of Global Political Order," 60.

IPCC and knowledge about climate change and its potential impacts were not the only driving forces. In addition, growing general public awareness about the environment combined with the lack of progress after the UN Human Environment Conference in Stockholm 1972 resulted in a UNEP report pointing out how the structure of the global economy had worsened environmental problems in developing countries. Several meetings in the global South had also expressed concern about the impact of global warming on poorer countries.¹³⁸ This all fed into the upcoming 20-year follow-up of the Stockholm Conference. A number of different international agreements were being negotiated and there was an impetus to transform the Brundtland Commission ideals of sustainable development into political commitments. The pressure was on and when the political leaders of the world met for the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, the UNFCCC was ready to be signed. The way its commitment was phrased left most political issues to be further negotiated:

The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.¹³⁹

By highlighting anthropogenic interference, this phrase created key research questions for climate science, leaving researchers to show that any shifts in weather pattern and global climate indicators were indeed the result of human action and not only part of natural fluctuations.

Earth system studies

At about the same time that climate was starting to become an issue of international politics, the scientific discourse was widened to refer not only to climate change but to global change. There was increasing interest in understanding the global system dynamics across a range of spatial scales and range of disciplines. For this purpose, ICSU created the International Global Geosphere-Biosphere Program (IGBP) in 1996 and the smaller social science counterpart the International Human Dimensions Programme (IHDP). This became a starting point for international scientific collaborations that have later played a key role in emphasizing Earth as a system and that this system is in a state of change. In addition to the growing intergovernmental cooperation focusing on global climate change, there is thus a push from a non-governmental scientific organization for a global framing of environmental issues, a framing that started taking hold in connection with the International Geophysical Year 1957/8 but became more and more explicitly connected to environmental problems and often framed as global change.¹⁴⁰

¹³⁸ Linnér and Jacob, "From Stockholm to Kyoto and Beyond," 406.

¹³⁹ United Nations Framework Convention on Climate Change. Article 2.

¹⁴⁰ Steffen, et al., *Challenges of a Changing Earth*.

Evolution of the IPCC

Being an intergovernmental organization under the auspices of the United Nations, the IPCC is governed by the same rules of procedure as other UN bodies.¹⁴¹ The major decision-making body – the plenum – is thus a highly political arena. While this body plays a key role in approving outlines of the assessments produced by the IPCC and the final summaries for policy makers, the development of the outline and the actual writing of the scientific reports are carried out in three different working groups.

Working Group I has had, from its start, a key task to provide assessments of the science of climate change, which has included discussions about the sources, concentrations, and the climate impacts of greenhouse gases; as well as observations of climate variability and change; and models predicting the potential effects of various emission scenarios. It was Working Group I that in the Second IPCC Assessment Report concluded that “The balance of evidence suggests a discernable human influence on global climate.”¹⁴²

The emphases of the other two groups have changed over time. Working Group II was initially responsible for assessing “environmental and socio-economic impacts of climate change.” For the Second Assessment Report, its mandate widened to include the technical and economic feasibility of potential adaptation and mitigation strategies. In the Third Assessment Report the focus was on vulnerabilities and adaptation in various sectors and regions and the implications of climate change for sustainable development.¹⁴³ In the Third Assessment, the polar regions have their own chapter.

Working Group III initially had a mandate to formulate response strategies, but after the formation of the Intergovernmental Negotiating Committee and later the UNFCCC, its task was reformulated to assess the socioeconomic dimensions of climate change. In this context issues such as “no-regret” options and the “precautionary principle” have been discussed. In the Third Assessment Report, the focus was on mitigation in the context of sustainable development.

IPCC’s work is governed by several explicit norms that have been negotiated and developed over time. They include balanced geographic representation, that assessments should be “comprehensive, objective, open and transparent,” and that “IPCC Reports should be neutral with respect to policy.” Consensus is another clear norm: “the Panel, its Working Groups and any Task Forces shall use all best endeavors to reach consensus.”¹⁴⁴ If consensus is not possible, there are special procedures for recording dissenting views. Although the norms of objectiveness and openness are similar to the norms within science, the goals of consensus and geographical representation attest to the political side of the IPCC. Siebenhüner also mentions several occasions where the science-policy-interface nature of the IPCC has prompted structural changes. In particular, he

¹⁴¹ Tora Skodvin, *Structure and Agent in the Scientific Diplomacy of Climate Change. An Empirical Case Study of the Science Policy Interaction in the Intergovernmental Panel on Climate Change* (Dordrecht, Boston, London: Kluwer Academic Publishers, 2000), 106.

¹⁴² IPCC, *Climate Change 1995. The Science of Climate Change. Summary for Policymakers*, IPCC/UNEP/WMO, 1995; <http://www.ipcc.ch/pub/sarsum1.htm> point 4.

¹⁴³ IPCC, *16 Years of Scientific Assessment in Support of the Climate Convention* (Geneva: IPCC, 2004), 6, 8.

¹⁴⁴ Principles Governing IPCC Work. Approved at the Fourteenth Session (Vienna 1-3 October 1998) and amended at the 21st Session (Vienna, 2 and 6-7 November 2003.)

mentions how political pressures and public scrutiny of the scientific conclusions have led to an evolution of the review procedures in order to safeguard IPCC's scientific credibility.¹⁴⁵ Currently, there is a two-stage review process that involves both scientists and government representatives. Moreover, Biermann analyzed how the lack of legitimacy in the global South forced the IPCC to both find ways to involve more scientists from the South and to address issues that are important to southern countries. Southern scientists have also challenged how the IPCC initially framed key concerns in climate science.¹⁴⁶

The development of the IPCC illustrates that states have become important actors in assessing climate change, in addition to the scientific community that had been active earlier. It also shows how certain norms become highlighted in the political context. The norm of geographical representation is an example. This became important after the IPCC had been criticized for lacking perspectives from the global South.¹⁴⁷ The drivers for knowledge production here become closely intertwined with the global discourse on equity and needs to ease global North-South tensions. It also illustrates an emerging critique against western science, as a source of universal knowledge, and globalism, as defined by western science, as a legitimate framing of environmental problems. In short, it questions the universality of science and its sole right to speak for nature and thus introduces political concerns into knowledge production.¹⁴⁸ This can be placed in contrast to the promotion of scientific internationalism during the Cold-War period and illustrates how the North-South tensions in global politics, that started to come to the fore in the 1972 Stockholm Conference, also came to include knowledge production and framing of climate change. In the context of the IPCC, it became important to find norms, such as geographical representation, that could ensure the political legitimacy of the process without sacrificing credibility to the climate science community.

There is a reciprocal relationship between the IPCC and the UNFCCC. The first IPCC assessment and a supplementary report in 1992 played important roles in the initial negotiations for the Convention, and the second assessment in relation to the negotiations of the Kyoto Protocol. Conferences of the Parties have also in agreements referred to the IPCC reports in relation to basing decisions on the latest scientific, technical and socioeconomic information. Nevertheless, at the first Conference of the Parties, the UNFCCC created its own unit for analyzing technical and scientific questions – the Subsidiary Body for Scientific and Technological Advice (SBSTA). SBSTA uses the IPCC as one of its inputs but has also come with requests to the IPCC for in-depth reports on specific topics.¹⁴⁹ One such request was a report to follow up on the focus on vulnerability at the global level in Working Group II's Second Assessment Report in

¹⁴⁵ Bernd Siebenhüner, "How Do Scientific Assessments Learn? Part 1. Conceptual Framework and Case Study of the IPCC," *Environmental Science & Policy* 5, (2002): 411.

¹⁴⁶ Biermann, "Whose Experts?"

¹⁴⁷ Biermann, "Whose Experts?"

¹⁴⁸ Clark A. Miller and Paul N. Edwards, "Introduction," in *Changing the Atmosphere. Expert Knowledge and Environmental Governance*, eds. Clark A. Miller and Paul N. Edwards, 1-30 (Cambridge, MA: MIT Press, 2001), 11.

¹⁴⁹ IPCC, *16 Years of Scientific Assessment in Support of the Climate Convention* 10.

1995 with a more regional approach. The result was a so-called Special Report published in 1997: *Regional Impacts of Climate Change: An Assessment of Vulnerability*.¹⁵⁰

This regionally focused assessment revealed a wide variation in vulnerability and has been described by the IPCC as an important step in its impact assessment process. For the Arctic, the human dimensions now appear, with a focus on the impact on communities and indigenous peoples that were not there in previous assessments. The Summary for Policymakers illustrates this new focus:

The Antarctic Peninsula and the Arctic are very vulnerable to projected climate change and its impacts. Although the number of people directly affected is relatively small, many native communities will face profound changes that impact on traditional lifestyles. Direct effects could include ecosystem shifts, sea- and river-ice loss and permafrost thaw. Indirect effects could include feedbacks to the climate system such as further releases of greenhouse gases, changes in ocean circulation drivers, and increased temperature and higher precipitation with loss of ice, which could affect climate and sea level globally.¹⁵¹

As stated in the latter part of the quote, the relationship between the polar regions and the global climate system remains a major concern, with focus on ocean circulation and on feedbacks connected to ice dynamics. When IPCC presented its Third Assessment Report in 2001, the polar regions were granted their own chapter by Working Group II, where the analysis was developed further. In addition to topics on changes in the physical and biological environment, there is also a focus on the impact on human communities with discussions about indigenous peoples and economic activities, the latter including, oil- and gas extraction, building, transportation, pollution, fisheries, and reindeer husbandry. However, according to the then IPCC chair, Robert Watson, development, equity and sustainability were only dealt with at a superficial level in many instances. His conclusion is that a much broader community of scholars from social sciences and humanities needs to be engaged in the IPCC.¹⁵²

The IPCC is currently in its fourth assessment cycle, with reports due in 2007. At the time of this writing this dissertation, only the summary for policymakers from Working Group I and II had been published.

Conclusions of post-war development and politics of the atmosphere

The period after World War II up until the 1990s and the firm establishment of climate science and policy into international governance can be characterized as a time of strong drive towards multilateralism as a political ideal and internationalization of science. The drivers for the internationalization of science were both political and scientific. Geopolitically the United States, in particular, has at times used these ideals as tools in promoting liberal democracy and keeping communism at bay, not least in relation to poor

¹⁵⁰ IPCC, *The Regional Impacts of Climate Change. An Assessment of Vulnerability. Summary for Policymakers. Special Report of Working Group II* (Geneva: IPCC, 1997).

¹⁵¹ IPCC, *The Regional Impacts of Climate Change*, 8.

¹⁵² Robert Watson, "Reflections on the IPCC, published in an amendment to IPCC, *16 Years of Scientific Assessment in Support of the Climate Convention*.

countries in the global South. It has also been a tool for *détente*. Scientific interests needed international cooperation in order to understand geophysical phenomena that were global in character, this included the climate system. These interests reinforced each other and help build both technological and human networks that have been important to framing climate change as a global issue and to formalizing these networks in an intergovernmental climate regime of which the IPCC and the UNFCCC represent two different aspects.

Compared to the structural context of the early development of climate science, the post-war development thus feature a shift in the structure of international society, with a declining emphasis on nationalism and sovereignty and a growing emphasis on international cooperation. Non-governmental actors still play a key role in coordinating scientific and professional networks, ICSU being the most central such actor. However, ICSU's role became increasingly connected to intergovernmental cooperation, and as political sensitivities came to the fore, intergovernmental cooperation takes center stage. States emerge as key actors to a much greater degree than during earlier development. During the 1970s and 1980s, atmospheric scientists participated as knowledge brokers but with time their activities became increasingly structured by the intergovernmental cooperation. This is especially apparent in assessments of the science under the auspices of the IPCC. The international cooperation in climate research under the World Climate Research Programme also makes this an important feature of basic scientific research.

A second trend during the post-war years is that global North-South conflicts became increasingly apparent, reflecting a move away from colonialism as a fundamental structure of international society but retaining the economic inequalities between core and periphery. The tensions and efforts to overcome them manifest themselves in the series of UN conferences, starting in 1972, on the environment and development, and on the discourse of sustainable development.¹⁵³ The tensions also come to the fore in knowledge production about climate change, where claims for universality of western science was challenged and geographical representation becomes a tool for creating political legitimacy for the IPCC. The global North-South tensions can also be described in terms of former colonies increasingly challenging the colonizer's right to power over knowledge production and over the environmental policy agenda. This issue also became relevant to the Arctic, and will be further analyzed in the next section.

This period also includes changes in the framing of Arctic climate change. Initially, the focus is only on the role of Arctic physical processes in relation to the global system, while mentions of impacts on Arctic society and indigenous peoples start appearing in the later IPCC assessments.

4.4 An emerging Arctic regime

If Arctic scientific cooperation was stifled by military and strategic concerns during the Cold War, the late 1980s and the 1990s signaled a new era for this part of the world. Environmental and scientific cooperation became key policy concerns. Towards the turn of the millennium, the Arctic was increasingly creating a new international role for itself

¹⁵³ Selin and Linnér, *The Quest for Global Sustainability*.

with an onus on environmental stewardship and attempting to define what sustainable development might mean for the region. The emerging Arctic regime also became a site where colonial views of the Arctic were increasingly challenged by indigenous peoples. This section summarizes some of the recent political developments in the Arctic, including the birth of several new organizations, which later set the stage for the ACIA. I argue that it has become increasingly salient to talk about an Arctic regime, with principles and norms set apart from other regimes. The Arctic regime is much broader in its issue scope than the global climate regime, with environmental collaboration and sustainable development as overarching themes for its work, but narrower in its geographic scope with a regional rather than global participation.

Scientific networks and new political opportunities

In Antarctica, the International Geophysical Year in 1957/58 led to formalized international research cooperation in the Scientific Committee on Antarctic Research under the auspices of ICSU. At that time, similar research cooperation in the Arctic was prevented by the Cold-War tensions that had shifted the International Geophysical Year research focus from the Arctic to Antarctica. However, the wish for pan-Arctic research cooperation remained alive within the polar research community and among non-governmental scientific networks.¹⁵⁴ Therefore, scientists with an Arctic interest were quick at picking up signals from the new political developments in the Soviet Union in the mid-1980s – President Mikhail Gorbachov's mission towards glasnost and perestroika. For example, in connection with a meeting in 1986, there were informal talks about these new signals and according to one interviewee's account; the participants agreed that it was time for the Arctic countries to start discussing such a possibility.¹⁵⁵ Another account highlights a meeting in the United States as the start of the negotiations for Arctic research cooperation.¹⁵⁶ Three scientists later prepared a report that laid the ground for further work towards a formal collaboration.¹⁵⁷ Schram Stokke described the political circumstances in terms of softening national competitive interests in the area (especially military) that made it easier to take environmental concerns and a wish for scientific cooperation into consideration. Also, the lack of clear national interests provided room for entrepreneurial groups, such as the scientific networks around polar research, to manoeuvre.¹⁵⁸ At the time, in the late 1980s and early 1990s, increasing bilateral cooperation among Arctic states included research and environmental cooperation as well as settling boundary disputes.¹⁵⁹

Politically, many writers have pointed to a symbolic turning point away from Cold War frostiness in pan-Arctic relations when Gorbachev gave a speech in Murmansk in

¹⁵⁴ Interview Anders Karlqvist, June 21, 2005.

¹⁵⁵ Interview Odd Rogne, April 14, 2004.

¹⁵⁶ Young, *Arctic Politics. Conflict and Cooperation in the Circumpolar North*, 186.

¹⁵⁷ Archer and Scrivener, "International Co-Operation in the Arctic Environment," 603.

¹⁵⁸ Olav Schram Stokke, "The Northern Environment: Is Cooperation Coming?," *Annals of the American Academy of Political and Social Science* 512, no. Nov 1990 (1990): 58, 62.

¹⁵⁹ Young, *Arctic Politics. Conflict and Cooperation in the Circumpolar North*, 185.

October 1987.¹⁶⁰ The direction of his speech was to establish a program of international cooperation that included resource development, scientific research, environmental protection, opening up of sea routes, and recognition of indigenous peoples' rights.¹⁶¹ Gorbachev also offered a new definition of the Arctic in which "[t]he Arctic is not only the Arctic Ocean but also the northern tips of three continents: Europe, Asia, and Russia ... where frontiers come close to each other and the interests of states belonging to mutually opposing military blocs and non-aligned ones cross."¹⁶² Keskitalo has analyzed this as a concession to allowing the non-rim states Finland, Iceland, and Sweden into an Arctic cooperation.¹⁶³ Up until then Arctic countries were usually defined as Arctic rim states, i.e. countries bordering the Arctic Ocean (Canada, Denmark, Norway, the Soviet Union, and the United States). The Soviet Union, in particular, had insisted that Arctic affairs should be dealt with only by Arctic rim countries, but Canada also initially adopted an exclusionist stance.¹⁶⁴ As the discussion about Arctic research cooperation was beginning to take shape, this was soon questioned by Swedish actors who did not want to be left out, and later also by Iceland. From a scientific point of view, there was also an interest in involving large polar research nations such as Great Britain, West Germany, and Poland. Norway also had an interest to get more small countries involved as a counterweight to the United States and the Soviet Union. Norway played a critical role as the mediators in the initial discussion to get the Soviet Union on board.

Many of the discussions about Arctic cooperation took place among research administrators, but an interview in this study also indicates that they acted with the backing of, and through consultations with, their respective departments of foreign affairs.¹⁶⁵ The discussions, along with the new Soviet attitude, led to "increasingly politicised exchanges first at the scientific and then at diplomatic levels" and eventually the creation of the International Arctic Science Committee (IASC) in 1990.¹⁶⁶

Although self-defined as a "non-governmental organisation whose aim is to encourage and facilitate cooperation in all aspects of arctic research, in all countries engaged in arctic research and in all areas of the arctic region scientific organization," IASC's link to political interests are clearer in its structure.¹⁶⁷ Its Council consists of scientific organizations of the original eight members, plus those of other countries with significant Arctic research wishing to join; it also includes a Regional Board whose members are responsible for ensuring that IASC's activities are compatible with the interests of Arc-

¹⁶⁰ Young, *Creating Regimes: Arctic Accords and International Governance*, 32; Archer and Scrivener, "International Co-Operation in the Arctic Environment," 603; Heininen, "Circumpolar International Relations and Geopolitics," 208.

¹⁶¹ Young, *Creating Regimes: Arctic Accords and International Governance*, 32.

¹⁶² Gorbachev 1987, para 20 quoted in Carina Keskitalo, "Region-Building in the Arctic: Inefficient Institutionalism? A Critical Perspective on International Region-Building in the 'Arctic'," ISANET, ISA Annual Convention, March 24-27, 2002 (Accessed 23 Oct. 2003).

¹⁶³ Keskitalo, "Region-Building in the Arctic: Inefficient Institutionalism?" 4.

¹⁶⁴ Stokke, "The Northern Environment: Is Cooperation Coming?," 63; Archer and Scrivener, "International Co-Operation in the Arctic Environment," 604; Keskitalo, "Region-Building in the Arctic: Inefficient Institutionalism?"

¹⁶⁵ Interview Odd Rogne, April 14, 2004.

¹⁶⁶ Archer and Scrivener, "International Co-Operation in the Arctic Environment," 603.

¹⁶⁷ IASC, www.iasc.no (Accessed Jan. 2005).

tic states.¹⁶⁸ The main aim of IASC has been to increase knowledge about Arctic processes. Judging from documents created in its early life as an organization, there was an emphasis on the global significance of changes in Arctic climate, weather, and ocean circulation.¹⁶⁹ Here the image of the Arctic as a linchpin for global change appears. There were also collaborations with other international programs focusing on global change.¹⁷⁰

IASC has mainly been geared towards the natural sciences, although there have been attempts at bringing in social sciences in connection with interdisciplinary projects. An early forum for social science collaboration was instead the International Arctic Social Science Association, which was founded in conjunction with the 7th Inuit Studies Conference in 1990 in Fairbanks, Alaska.

Political cooperation

The diplomatic activities set in motion by Gorbachev's speech had an eye towards formal political cooperation.¹⁷¹ Several other circumstances favored the formation of a circumpolar regime at this time. Already alluded to was the lessening military tension between East and West, which was probably a prerequisite for any new initiatives. In addition, a number of events made the need for more knowledge about the Arctic environment urgent, including the Chernobyl nuclear power plant accident in 1986, the 1989 Exxon Valdez oil spill in Alaska, and the increasing visibility of severe environmental damage from the smelters on the Kola Peninsula.¹⁷² At the structural level, cooperation was further made possible by the collapse of the Soviet Union, a growth of transnational contacts among indigenous peoples, as well as devolution of political authority from central to regional governments.¹⁷³

States were the main actors, especially Finland and Canada.¹⁷⁴ Their diplomatic activities culminated in the Declaration on the Protection of the Arctic Environment in 1991, the so-called Rovaniemi Declaration, and the creation of the Arctic Environmental Protection Strategy (AEPS) as a forum for collaboration around transboundary environmental issues. Scientific networks may have played more of a role in the initiation of the AEPS than is apparent from Young's account of the formation of this regime, but it did not operate as an epistemic community presenting a common solution or perspective to a problem. Rather, it may have provided a networks that included the Soviet Union, which could be used to scout out the potential for political negotiations. A person who took part in the initial discussions has described himself feeling a bit like an "experimental rabbit let out in the manège for the bureaucrats and the foreign minis-

¹⁶⁸ Young, *Creating Regimes: Arctic Accords and International Governance*, 34; Archer and Scrivener, "International Co-Operation in the Arctic Environment," 604.

¹⁶⁹ IASC 1990. The 1990 Council Meeting Report as quoted in Archer and Scrivener, "International Co-Operation in the Arctic Environment," 604.

¹⁷⁰ Archer and Scrivener, "International Co-Operation in the Arctic Environment," 604.

¹⁷¹ This process has been described in detail in Young, *Creating Regimes: Arctic Accords and International Governance*.

¹⁷² Keskitalo, "Region-Building in the Arctic: Inefficient Institutionalism?" 3.

¹⁷³ Young, *Creating Regimes: Arctic Accords and International Governance*, 32.

¹⁷⁴ Young, *Creating Regimes: Arctic Accords and International Governance*; Keskitalo, "Region-Building in the Arctic: Inefficient Institutionalism?"; Interview David Stone April 26, 2004.

try people to study to see if it worked.”¹⁷⁵ The scientific networks and the trial arenas they provided may have been especially important in this politically highly sensitive region. Moreover, as was the case with the UNECE Convention on Long-Range Transboundary Air Pollution (LRTAP), science and environment also provided what was perceived as relatively neutral grounds for a collaboration that could further help reduce political tensions.

The Arctic Environmental Protection Strategy

The initial collaboration in the AEPS focused on preparing reports on different pollution issues, including organochlorines, heavy metals, acidification, noise, oil pollution, and radioactivity. According to Young, the new Arctic regime mirrored European experiences from working with pollution issues in the UNECE LRTAP.¹⁷⁶ One of the early activities was an expert meeting in Oslo in 1990 that drafted a proposal for an Arctic Monitoring and Assessment Programme (AMAP), setting assessing anthropogenic pollution as its first priority. AMAP’s work was initially organized in relation to different parts of the environment: atmosphere, terrestrial, freshwater, marine, remote sensing and modeling, and emissions and discharges, with an overall objective to “assess and report the status of the Arctic Environment.”¹⁷⁷ The expert group identified climate change and the effects of stratospheric ozone depletion as significant threats to the Arctic environment but placed the main responsibility for measuring the causes and effects and to understand the processes on “other international groupings and in other fora.”¹⁷⁸ Climate change was thus seen as a second priority.¹⁷⁹ After a scientific review conducted by IASC and the International Council for Exploration of the Seas, AMAP’s work was refocused along pollution-specific lines.¹⁸⁰ This became the organizing principle for AMAP’s first major assessment of pollution in the Arctic, which included a chapter on climate change and ultraviolet radiation.¹⁸¹

¹⁷⁵ Interview Odd Rogne, April 14, 2004

¹⁷⁶ Young, *Creating Regimes: Arctic Accords and International Governance*, 34-35.

¹⁷⁷ The Monitoring Programme for Arctic Monitoring and Assessment Programme, AMAP. AMAP Report 93:3, 4; Monica Tennberg, *Arctic Environmental Cooperation: A Study in Governmentability* (Hants and Burlington: Ashgate Publishing Company, 2000), 50-51; Elin Mathiassen, *Vitenskap og politikk: Om produksjon og formidling av vitenskapelig kunnskap i Arctic Monitoring and Assessment programme - Arktis råd*, Diss. Statsvitenskap. Norges teknisk-naturvitenskaplige universitet, 2001).

¹⁷⁸ Arctic Monitoring and Assessment Programme. Minutes from the expert meeting in Oslo 12-16 Nov 1990, 4; See also State of the Arctic Environment. Updated draft proposal for Arctic Monitoring and Assessment Programme (AMAP). Prepared by State Pollution Control, Norway, 6-8.

¹⁷⁹ The AEPS also established the Arctic Monitoring and Assessment Task Force with the mandate to implement AMAP. The documentation confirms their initial emphasis on persistent organic contaminants, heavy metals, and radionuclides. See Minutes from the First meeting of the Arctic Monitoring and Assessment Task Force, Tromsø, Norway 2-6 December 1991, Appendix 12. For a detailed account of the implementation of the Arctic Environmental Protection Strategy, see Young, *Creating Regimes: Arctic Accords and International Governance*; see also Tennberg, *Arctic Environmental Cooperation: A Study in Governmentability*, 47.

¹⁸⁰ Tennberg, *Arctic Environmental Cooperation: A Study in Governmentability*, 50-51; Mathiassen, *Vitenskap og politikk*.

¹⁸¹ AMAP, *Arctic Pollution Issues: A State of the Arctic Environment Report*; AMAP, *AMAP Assessment Report: Arctic Pollution Issues* (Oslo: Arctic Monitoring and Assessment Programme, 1998).

Tennberg has, in an analysis of Arctic environmental cooperation, characterized the early work of AMAP as legitimizing the existing situation and the lack of special measures to protect the Arctic. She contrasts AMAP's conclusion that the Arctic remains a clean environment to the summaries presented by other concurrent reports on the Arctic environment, which pointed to threats posed by resource exploitation and climate change.¹⁸² However, AMAP itself has highlighted the role the report played in negotiations on the UN ECE LRTAP Protocol on Persistent Organic Pollutants and for the Stockholm Convention on Persistent Organic Pollutants.¹⁸³ This latter view has support from other observers.¹⁸⁴ In particular, AMAP together with the Northern Contaminants Programme in Canada provided a knowledge base and network from which indigenous peoples could act in the international arena.¹⁸⁵ It also led to the Arctic Council Action Plan to Eliminate Pollution of the Arctic.

Another early working group in the AEPS was the Working Group on Conservation of Arctic Flora and Fauna (CAFF), created in 1992. It had quite a different way of working from AMAP and was more organized around different projects, in which scientists established expert networks on particular issues. Its initial agenda was focused on Canadian and Norwegian interests in building a network of protected areas. Organizationally, it was more modest than AMAP.¹⁸⁶ Even if climate change and ozone depletion were not the major focus for CAFF either, they were included as part of the discussions and thus on the radar scanning for future knowledge needs.

The AEPS and its working groups differed from IASC in that it was intergovernmental cooperation that included only the eight Arctic states (Canada, Denmark, Finland, Iceland, Norway, Russia, and the United States) as members. These countries were also formally represented in the working groups. Scientists were brought in as experts, for example to write the scientific assessments of pollution issues in the Arctic, but their tasks were politically mandated and their reports formally delivered to the environmental ministers of the Arctic countries.

A special feature of the AEPS from the beginning, in particular in CAFF, was the inclusion of indigenous knowledge and attention to co-management of natural resources. The rhetoric around including indigenous concerns and knowledge was present already in discussions about the AEPS and later several steps were taken to enhance their participation and contribution.¹⁸⁷ Discussions considering the inclusion of traditional knowledge of indigenous people also appeared in the early documentation of AMAP's work.¹⁸⁸ The indigenous component of AMAP's objectives are "to recognize the importance of and use of Arctic flora and fauna to the indigenous peoples" and to recognize what potential risks emerging from these problems might pose to Arctic resi-

¹⁸² Tennberg, *Arctic Environmental Cooperation: A Study in Governmentability*, 52-53.

¹⁸³ AMAP, *Arctic Pollution Issues* 2002, 2.

¹⁸⁴ Downie and Fenge, *Northern Lights Against POPs*.

¹⁸⁵ Interview Terry Fenge, May 3, 2004.

¹⁸⁶ Young, *Creating Regimes: Arctic Accords and International Governance*, 136.

¹⁸⁷ Tennberg, *Arctic Environmental Cooperation: A Study in Governmentability*, 62 ff.

¹⁸⁸ Minutes of the First meeting of the Arctic Monitoring and Assessment Task Force Tromsø, Norway 2-6 December 1991, 5.

dents, including indigenous peoples.¹⁸⁹ In practice the use of indigenous people's knowledge was limited in the early work of AMAP.¹⁹⁰ In IASC, the relationship to indigenous knowledge was more contentious and several statements from the mid-1990s indicate that there was a concern among indigenous peoples that IASC was not interested enough in the concerns of the people of the region.¹⁹¹

The Arctic Council

In September 1996, the AEPS was subsumed into the Arctic Council. Ideas about an Arctic Council had been presented in 1970 in Canada in the potential form of an Arctic Basin Treaty.¹⁹² By the end of the 1980s, they were again taken up by the Canadian government in an effort to energize the nascent AEPS and with impetus from a report by an Arctic Council Panel that included the Inuit Circumpolar Conference and two non-governmental organizations.¹⁹³ The proposed structure was quite radical in relation to other international bodies. Although intergovernmental in nature, it also included positions as Permanent Participants for the indigenous peoples of the region. The proposed aims were wider than that of the AEPS, and in addition to environmental cooperation they included promoting sustainable economic development to empower Arctic aboriginal peoples and promote regional security.¹⁹⁴

When Canada formally forwarded the idea of an Arctic Council at the 1991 Rovaniemi meeting, it was met with a sceptical attitude, especially from the United States, who argued that it would duplicate activities in other international fora. However, a change in US Arctic policy in 1994, to focusing more on environment and sustainable development and less on military security, later paved the way for intensified political negotiations. In spite of major disagreements surrounding the added focus on sustainable development, the negotiations resulted in the Ottawa Declaration that established the Arctic Council as a high level forum for cooperation. Although the declaration was silent on how countries were to be represented, the responsibility shifted from Departments of Environment to Departments of Foreign Affairs. Archer and Scrivener described this as foreign ministers seeing the Council as a mechanism to reassert their control over Arctic cooperation.¹⁹⁵ In spite of the widened mandate, military issues are still explicitly excluded from the Arctic Council agenda.

The working groups established under the AEPS continued under the Arctic Council. A new working group on sustainable development was added, which had been created to address pressures from the Inuit Circumpolar Conference to broaden the agenda of

¹⁸⁹ The Monitoring Programme for Arctic Monitoring and Assessment Programme, AMAP. AMAP Report 93:3, 4.

¹⁹⁰ Tennberg, *Arctic Environmental Cooperation: A Study in Governmentability*, 71.

¹⁹¹ Tennberg, *Arctic Environmental Cooperation: A Study in Governmentability*, 60-61.

¹⁹² Cohen and Pharands as quoted in Keskitalo, "Region-Building in the Arctic: Inefficient Institutionalism?" 11.

¹⁹³ Archer and Scrivener, "International Co-Operation in the Arctic Environment," 613; Heinenen, "Circumpolar International Relations and Geopolitics," 212.

¹⁹⁴ Archer and Scrivener, "International Co-Operation in the Arctic Environment," 613.

¹⁹⁵ Archer and Scrivener, "International Co-Operation in the Arctic Environment," 615.

the Arctic Council to not only consider environmental damage and pollution.¹⁹⁶ The concept of sustainable development has been controversial in the Arctic Council, with conflicts over how appropriate development strategies for the Arctic should be framed.¹⁹⁷

The Arctic Council does not have any regulatory function and is thus a so-called soft law agreement. In some circles, there is still discussion about the need for a formal convention protecting the Arctic environment.¹⁹⁸ There are also on-going discussions about the need to audit existing regimes relevant to the Arctic as a basis for discussing whether they need to be strengthened.¹⁹⁹

Another line of concern is the Council's poorly defined role in relation to other international fora in the Arctic that are less focused on intergovernmental cooperation.²⁰⁰ One such arena is the interregional cooperation Northern Forum, established in 1991. This is a non-governmental organization with representatives from 19 different regions extending beyond the Arctic Eight. In contrast to the Arctic Council, indigenous peoples have a rather weak position in the Northern Forum. Their focus is more on concrete issues than foreign relations.²⁰¹ There is also a formal collaboration among Arctic Parliamentarians, where representatives appointed by parliaments in the Arctic Eight and the European Parliament meet every other year. In these meetings, indigenous peoples, Permanent Participants in the Arctic Council, take part as observers. In addition, there is sub-regional international cooperation in the Barents Euro Arctic Region (BEAR), across the Bering Strait, and among the nations of the North Atlantic in the West-Nordic Council.

Although most international cooperation in today's Arctic in some way relates to the Arctic Council, these other organizations provide a contrast to the Council's intergovernmental nature. The contrast in some ways reflects an important historical structure of the region that is often described in terms of a predominance of core-periphery relations in the region.²⁰² In the AEPS and later Arctic Council, the predominant interests were formulated in national capitals south of the Arctic,²⁰³ but this was also increasingly

¹⁹⁶ Mark Nuttall, "Indigenous Peoples' Organisations and Arctic Environmental Cooperation," in *The Arctic. Environment, People, Policy*, eds. Mark Nuttall and Terry V. Callaghan, 621-637 (Amsterdam: Harwood Academic Publishers, 2000), 629.

¹⁹⁷ Nuttall, "Indigenous Peoples' Organisations and Arctic Environmental Cooperation," 630; Keskitalo, "Region-Building in the Arctic: Inefficient Institutionalism?" 3, 12.

¹⁹⁸ E.g. Linda Nowlan, *Arctic Legal Regime for Environmental Protection* (Gland, Switzerland and Cambridge, UK, and Bonn, Germany: IUCN - The World Conservation Union and ICCEL, 2001).

¹⁹⁹ E.g. Conference Statement of the Parliamentarians of the Arctic Region, Kiruna, Sweden, 2-4 August 2006 item 28. See also several presentations at the conference available at www.arcticparl.org/?/element/elementid/conference7 (Accessed 12 Dec. 2006).

²⁰⁰ Oran R. Young, "The structure of Arctic cooperation: Solving problems/seizing opportunities. Paper prepared at the request of Finland in preparation for the Fourth Conference of Parliamentarians of the Arctic Region, Rovaniemi, 27-29 Aug 2000"; Heininen, "Circumpolar International Relations and Geopolitics," 215.

²⁰¹ Heininen, "Circumpolar International Relations and Geopolitics," 211.

²⁰² Young, *Arctic Politics. Conflict and Cooperation in the Circumpolar North*, 18; Young, *Creating Regimes: Arctic Accords and International Governance*, 31.

²⁰³ Young, Oran R. (1992 draft) "The Political Dynamics of International Regions: the Arctic as a Multiple Use Region" Prepared under the sponsorship of the Mac Arthus Foundations, as quoted in Keskitalo, "Region-Building in the Arctic: Inefficient Institutionalism?" 10.

moderated or challenged by concerns raised by Arctic indigenous peoples by means of their positions as Permanent Participants. An example of the increasingly strong indigenous voice is the statement made by the Permanent Participants calling for action at the beginning of an assessment of pollution in the Arctic that AMAP published in 2002.²⁰⁴

Is there a circumpolar Arctic regime? I argue that the intergovernmental collaboration in the Arctic Council incorporates principles and norms concerning circumpolar cooperation regarding environmental protection and sustainable development (see also Chapter 2 of this dissertation for a working definition of regimes). The Arctic Council decision-making procedures give indigenous peoples seats at the table as Permanent Participants, and both the founding document and many practices recognize their knowledge about the environment. This attests to norms that differ from many other intergovernmental fora. From a legal point of view, the Arctic Council cooperation is best described as a weak regime because it is not connected with any binding agreements. The collaboration has instead focused on producing scientific assessments about environmental challenges in the region. So far, the Arctic Council has lacked a strong organizational backing for coordinating its various activities.

Science-policy relations

Knowledge production was and remains important to political cooperation in the Arctic. Initially, it provided an image of relatively neutral arena in which potential political cooperation could be tested.. Later, scientific assessments of environmental problems became a core activity of the political cooperation. According to Schram-Stokke, the Arctic Council can be seen as cognitive frontrunner in international relations.²⁰⁵ However the relationship between the intergovernmental cooperation and the scientific community is not straightforward. For example, proposals to make IASC an advisory board to the AEPS have been turned down. There were discussions within the AEPS to establish its own scientific and technical advisory body, but IASC argued that this arrangement could politicize science.²⁰⁶ The advisory body was never established, but in practise the politically mandated working groups, especially AMAP, provided this role while IASC focused on coordinating research. AMAP has a formal mandate to provide scientific advice on future actions and consequently there is division of responsibility between the politically more independent IASC and AMAP, which is a formal science-policy arena.²⁰⁷ With its dual roles, AMAP can be described as boundary organization where governments both guide knowledge production and formulate scientific policy advice together with scientific experts.²⁰⁸

²⁰⁴ AMAP, *Arctic Pollution Issues* 2002, v.

²⁰⁵ Tennberg, *Arctic Environmental Cooperation: A Study in Governmentability*, 47-43; Mathiassen, *Vitenskap og politikk: Om produksjon og formidling av vitenskapelig kunnskap i Arctic Monitoring and Assessment programme - Arktis råd*; Schram Stokke, "International Institutions and Arctic Governance."

²⁰⁶ Tennberg, *Arctic Environmental Cooperation: A Study in Governmentability*, 57, 60-61.

²⁰⁷ According to AMAP Strategic Plan: 1998-2003, 2, AMAP's overall objective is "to provide reliable and sufficient information on the status of, and threats to, the Arctic environment, and to provide scientific advice on actions to be taken" (emphasis added).

²⁰⁸ David H. Guston, "Boundary Organizations in Environmental Policy and Science: An Introduction," *Science, Technology & Human Values* 26, no. 4 (2001): 399.

In the governmental cooperation, indigenous peoples' participation has also included calling attention to indigenous knowledge. The extent to which it has been included has varied between the different working groups but CAFF has had programs focusing on indigenous knowledge from the beginning, while AMAP has addressed indigenous issues mainly in relation to human health. Nuttall described the situation in the AEPS as one in which indigenous environmental knowledge was institutionalized and indigenous peoples perspectives were regarded almost uncritically as experts on environmental conservation.²⁰⁹ He also shows how this is fitting with the original declaration launching the AEPS, which stresses the special role of indigenous peoples in protecting the Arctic environment. In the Arctic Council, indigenous peoples have an even stronger role with their position as Permanent Participants, which they use to forward their perspectives and knowledge in various assessment processes.

In spite of the formal recognition of indigenous knowledge, in the context of knowledge production about the Arctic, there are also underlying controversies. One issue is defining who has the right to determine how Arctic research is conducted. A history of colonial knowledge production done without concern for people living in the Arctic raises issues about the ethics of research conduct and also who has the right to define the Arctic environment.²¹⁰ Indigenous peoples have not always considered the scientific community, including IASC, as receptive to including indigenous knowledge. There have even been statements about how the lack of communication between different groups in the production of knowledge affirms existing power structures. Likewise, IASC did not want to become a tool for social and policy action, a stance that has also spilled over into its attitude towards social sciences.²¹¹ From an indigenous point of view, knowledge production, especially as it relates to the environment, is part of self determination.²¹² Control over how the Arctic is framed by science can thus be seen as part of asserting political independence within the more general trend of decolonization of the Arctic. Moreover, indigenous peoples have been able to use the environmental framing of the Arctic, extending this concept into sustainable development, and create a role for themselves in the broad international context.²¹³ A key example of this is the role that the image of Inuit interests played during negotiation of the Stockholm Convention on Persistent Organic Pollutants.²¹⁴ The increasing recognition of indigenous knowledge and its integration with conventional western knowledge traditions are also apparent in higher education initiatives such as the University of the Arctic. This is a virtual university that facilitates collaboration among a number of different institutions of higher education in the Arctic, and its governing structure includes indigenous

²⁰⁹ Tennberg, *Arctic Environmental Cooperation: A Study in Governmentability*, 55 ff; Nuttall, "Indigenous Peoples' Organisations and Arctic Environmental Cooperation," 623.

²¹⁰ Tennberg, *Arctic Environmental Cooperation: A Study in Governmentability*, 59; ICARP II Working Group 11, *ICARP II. Working Group 11. Arctic Science in the Public Interest. Science Plan 2005*.

²¹¹ Tennberg, *Arctic Environmental Cooperation: A Study in Governmentability*, 60.

²¹² Nuttall, "Indigenous Peoples, Self-Determination and the Arctic Environment."

²¹³ Nuttall, "Indigenous Peoples' Organisations and Arctic Environmental Cooperation," 624.

²¹⁴ Downie and Fenge, *Northern Lights Against POPs*; Stephanie Meakin and Terry Fenge in Heininen, "Circumpolar International Relations and Geopolitics," 210.

peoples' organizations as well as a standing committee to promote indigenous input. Its goal is to include traditional knowledge holders as Arctic professors and experts.²¹⁵

The scientific community has also been building Arctic networks independent of Arctic political cooperation. They include research programs initiated by the World Climate Research Program, such as the Arctic Climate Systems Study (ACSYS) started in 1993. The goal was to understand the role of the Arctic in the global climate by specifically looking at the global consequences of natural or human-induced change in the Arctic climate system and whether the Arctic climate system was as sensitive to increased greenhouse gas concentrations as climate models suggest. The ACSYS program ended in 2003. Some of the gaps in knowledge identified at the ACSYS final conference are now being addressed by the project Climate and Cryosphere (CliC).²¹⁶ Many organizations working with Arctic research coordinate their meetings during the annual Arctic Science Summit Week. There have also been conferences to initiate and coordinate long-term research planning, one in 1995 and one in 2005.²¹⁷

Conclusions: An emerging Arctic regime

Since the end of the Cold War, the Arctic has increasingly come forth as an international region with a collective voice in the international arena, captured by the expression "The Age of the Arctic."²¹⁸ The interaction of policy priorities and knowledge production has been central in building this regional identity. A key policy driver has been the ambition to cross the previous East-West divide and in this endeavour the important tools have been scientific and environmental cooperation. The scientific community has had an interest in cooperation as it has created access to previously closed areas. Arctic indigenous peoples started cooperating across national borders already during the Cold War. For them, the emerging political and scientific cooperation provided a circumpolar venue for becoming active participants in knowledge production with international ramifications. In terms of the analytical lenses of regimes and actor networks, the 1990s was a time of, at least the partial merging of networks from conventional western science, indigenous political movements, and foreign policy interests of Arctic nation states. The emerging Arctic regime created the Arctic Council as its formal decision-making forum. The most critical structural determinant of this development, or at least the timing of events, appears to have been the collapse of the Soviet Union and the consequent ease of East-West tensions. This precipitated a shift of state interests in favor of collaboration and regime building rather than maintaining military security concerns as the key issue for the region.

²¹⁵ Gunilla Johansson, Chris Paci, and Sylvi Hovdenack Stenersen, "Education," in *Arctic Human Development Report*, ed. AHDR, 169-185 (Akureyri: Stefansson Arctic Institute, 2004), 182.

²¹⁶ Report of the ACSYS Final Science Conference. WCRP-120, WMO/TD No. 1249, September 2004.

²¹⁷ *Second International Conference on Arctic Research Planning (ICARP II). The Arctic System in a Changing World. Conference Proceeding. Copenhagen Denmark, 1-2 November 2005*, ed. Sara Bowden, (Edmonton: Nisku Printing, 2005).

²¹⁸ Oran R. Young, "The Age of the Arctic," *Foreign Policy* 61, (1985): 160.

4.5 Conclusions and discussion

This review shows that climate science and political concerns have become increasingly connected and that actor networks involved in producing knowledge about the climate have become structured as part of a global climate regime. It also shows that the development of climate science and Arctic research have been closely linked since the mid-1800s. Both globally and in the Arctic, knowledge production has been intertwined with political concerns. Although the initial driver for carrying out global climate science was scientific curiosity about Earth as a system, concerns about human impacts on the global environment have become increasingly important with time. State interests in using scientific and environmental cooperation as tools for ensuring political security have also been a powerful driver. In climate science and policy, actor networks and state interests have often merged in international regimes. The regimes have played a role for mustering resources that strengthened the actor networks. Experiences from the Arctic show how they can also serve as venues for new actors to challenge the power of western scientific knowledge in framing issues and setting the policy agenda.

International scientific collaboration

International collaboration has been a theme in climate data gathering and analysis. During the war years, it was hampered by geopolitical circumstances and relatively weak institutional structures at the international level. For example, both the International Meteorological Organization (IMO), and the International Council for Scientific Unions (ICSU) were non-governmental organizations. After World War II, the international scene changed. Powerful state interests favored the building of international regimes under the umbrella of the United Nations and around a number of specific issues, including meteorology and climate science as well as the environment more generally. Organizationally, the emerging global climate regime is now represented by entities such as the World Meteorological Organization (WMO), the United Nations Environment Programme (UNEP), the Intergovernmental Panel on Climate Change (IPCC), and the United Nations Framework Convention on Climate Change (UNFCCC). The new scene mirrors changes in the structure of international society with the increasing attention to collaboration and regime-building. In this process, non-governmental scientific and professional organizations become embedded in the same networks as the intergovernmental regimes, see Figure 4.1. Examples are joint activities between ICSU and the WMO. States have emerged as increasingly important actors, while both planning for climate science and its societal use have become increasingly dependent on an international political context. This international context appears to have increased climate science's potential to influence policy compared to the earlier developments, roughly before the Stockholm Conference in 1972, when this context was not in place. There is thus a co-evolution of climate knowledge production and political order that fits well with the concept of co-production of science and policy.

The historic perspectives provided in this chapter also highlight how today's global framing of climate change is a product of a combination of factors that include political dynamics from the Cold War, the rise of environmentalism in the 1960s, new technologies, and non-governmental international collaboration that facilitated the growth of a

certain scientific understanding. In addition formal regimes play a role by mustering new resources (as in the case of structures for collaboration in the WMO). They also provide venues for state actors outside the North American or European spheres to voice their concerns, which has often been in opposition to the universalistic framing of issues in western science and policy (e.g. in the IPCC).

For the Arctic, a culture of international collaboration can be traced back to the First International Polar Year in 1881-84. For most of the 1900s, the sensitive military and geopolitical position of the region postponed the development of political cooperation and also put a hamper on the production of climate knowledge. The Arctic, thus, did not play a prominent role in the International Geophysical Year 1957/58, which was one starting point of forming the image of global climate change. Neither did the Arctic play a prominent role in the first reports from the IPCC, reports that played a critical role in developing the global climate policy regime. In fact, it took almost another 30 years until changes in the Soviet Union created opportunities for developing pan-Arctic scientific and political cooperation. This highlights the role of realist politics and state actors' strategic interests, as opposed to regimes, in shaping political order. Basic structures of international society such as core-periphery dynamics and sovereignty concerns have remained part of the picture and are still issues with potential to influence climate science and policy in the region.

Developments in polar research

The historical overview provided in this chapter also highlights important developments in polar research. Specifically, it shows the strong role of international collaboration, and even internationalism as an ideology, since the late 1800s, at least within climate-related research. This can be placed in contrast to the earlier polar research, where nationalistic motives and the building of new national images played a prominent role. There may still be commonalities; most important is that knowledge production about the Arctic was driven by interests outside the region.

It is only very recently, and partly using the emerging pan-Arctic regime as a platform, that indigenous peoples in the region have started to participate in the non-local knowledge production. Local knowledge production has a rich history of its own, which is outside the scope of this dissertation, but the structure of the current pan-Arctic regime has provided a setting where there are opportunities for local knowledge traditions to meet with the international climate science community. The Arctic thus provides an arena for studying the meeting of knowledge traditions focusing on different spatial scales. Moreover, the close connection between science and policy in this setting allows an analysis of the power dynamics in such meetings and how credible knowledge becomes defined. These issues come to the fore in the Arctic Climate Impact Assessment. This process of evaluating climate change in a regional context is described in detail in the next chapter.

Figure 4.1. History of the global climate regime and some connections to the Arctic. Note the frequent links between non-governmental and intergovernmental cooperation, including joint research programs and sponsorship of activities.

Acronyms: AEPS – Arctic Environmental Protection Strategy; GARP – Global Atmospheric Research Programme; ICSU – International Council for Science (formerly International Council of Scientific Union); IGBP – International Geosphere-Biosphere Program; IGY – International Geophysical Year; IHDP – International Human Dimensions Program; IMO – International Meteorological Organization; IPY – International Polar Year; UNEP – United Nations Environment Programme; UNFCCC – United Nations Framework Convention on Climate Change; WCRP – World Climate Research Programme; WMO – World Meteorological Organization.

III. A case study of the Arctic Climate Impact Assessment

Chapter 5

Science and Policy in the ACIA Process

Within the scientific community, the key role of polar regions in the global climate system has been recognized at least since the late 1800s, but up until the past few years, the Arctic did not play a central role in the public discussion or in climate change policy. The year of 2004 marked a change to this relatively quiet role and Arctic images became prominent in the coverage of climate change.¹ Two recent illustrations are a *Time Magazine* special report on climate change illustrated by a polar bear on melting sea ice accompanied by the headline “Be worried. Be very worried”² and a *60 Minutes* TV-special where the Arctic is called a bellwether, a barometer, and a canary in the mine warning about things to come.³ Some of this publicity was generated by the presentation of the Arctic Climate Impact Assessment (ACIA). There was also increasing policy interest in Arctic climate change, exemplified by congressional hearings in the United States, high level policy discussions in the Arctic Council, and side events featuring Arctic interests at conferences of the parties of the United Nations Framework Convention on Climate Change (UNFCCC).⁴

This chapter analyzes the processes that generated and shaped the ACIA. The emphasis is on how the ACIA process developed rather than the final content of the ACIA reports, which will be the focus in the next chapter. This chapter is divided into four major parts: 1) the early origin of the ACIA, 2) the scientific report, 3) the overview document, and 4) the policy process. There is also a short discussion of other ACIA-related activities. Each major section begins with a chronological description of events

¹ A search on the Swedish *Mediarkivet*, which covers 50 Swedish newspapers, magazines and wire services, gave 65 hits in 2004 using the words *Arktis* and *klimat*. This can be compared to 20 hits in 2003, 8 in 2002, and 11 in 2005. A search in the on-line archive of *Washington Post* using *Arctic* and *climate change* as search terms gave 10 hits in 2004 as well as in 2005, compared to 5 in 2003, the previous high. The range up until 2002 was 0-3. A similar search in the *New York Times* gave 17 hits in 2004 and 23 in 2005. The previous high was 15 in 2000. The range for individual years in the 1990s was 1-5.

² "Special Report Global Warming," *Time Magazine*, April 3, 2006.

³ Bob Corell, chair of the Arctic Climate Impact Assessment, quoted in "A Global Warning: Scientist Says Global Warming Intensifies Storms, Raises Sea Levels," *60 Minutes*, Feb. 19, 2006.

⁴ US Senate Committee on Commerce, Science & Transportation, March 3, 2004: 2004 and US Senate Committee on Commerce, Science and Transportation, Sep. 15, 2004.

that highlights the co-production of climate science and policy in the Arctic regional arena. It is followed by an analytical discussion focusing on international regimes, actor networks, and the norms that govern the interactions between science and policy. This chapter concludes with an overall discussion of the role of regimes and the science-policy dynamics in the ACIA process.

5.1 Early origins

The ACIA had three initiation points. The first point is in the arena of global climate science as it has been articulated in the Intergovernmental Panel on Climate Change (IPCC). The second point is in an organization for Arctic scientific cooperation and its attempts to identify areas for potential collaboration. The third point is in politically mandated scientific assessments of environmental problems conducted within the framework of the Arctic Council. This section discusses the dynamics that brought these three arenas together. Connecting these arenas was a meeting between international regimes, each with different spatial scales in focus and each with its own set of norms about both knowledge production and science-policy interactions. Who set the agenda and how was it modified in the initial phase of the assessment process?

A meeting of regional and global science arenas

Climate science relies heavily on data from the present and past, preferably with as good geographical coverage as possible. In the Arctic, this has always been a challenge. Not only have distances in sparsely populated areas and difficult weather conditions made it expensive and hard to collect data, but the strategic military location and the political division of the region into two parts during the Cold War kept large parts of the Arctic closed for international data collection. When political relations between East and West began to thaw in the 1980s, new opportunities arose for climate science.

One of the early cooperative efforts in this emerging political setting was the International Arctic Science Committee (IASC), which was created in 1990 to facilitate circumpolar research cooperation. One driving force was to meet the needs of climate science for circumpolar climate data.⁵ Such data are important for understanding how the Arctic climate system functions, including its role in the global climate system, and thus serve as a base for improving climate models. IASC started several climate-related groups and created a "Scientific Plan for a Regional Research Programme in the Arctic on Global Change."⁶ This included a joint effort in glaciology, studies of climate feedbacks in the terrestrial ecosystem, and human dimensions in global change. Ultraviolet radiation was also introduced as a topic for interdisciplinary collaboration.⁷ These issues

⁵ Written personal communication with Odd Rogne March 31, 2004, and interview April 14, 2004.

⁶ Scientific Plan for A Regional Research Programme in the Arctic on Global Change. Proceedings of a Workshop at Reykjavik, Iceland 22-25 April 1992. IASC and National Academy Press, Washington D.C. 1994.

⁷ IASC, *Effects of Increased Ultraviolet Radiation in the Arctic* (Oslo: IASC, 1995); Archer and Scrivener, "International Co-operation in the Arctic Environment," 603.

received continued attention under the theme of "The Impact of Global Changes on the Arctic Region and its People."⁸

IASC also identified climate impact studies as a priority. At this point in time, the early 1990s, the focus of the IPCC was still on the global climate system and there were no regional climate models by which researchers could create regionally relevant scenarios. There had already been a regional integrated assessment of climate impact on the Mackenzie Basin covering the entire watershed of the Mackenzie River, conducted as a research project from 1989 to 1997. IASC choose a similar approach of taking smaller regions as a starting point and actively involving local stakeholders.⁹ According to IASC's executive secretary, there was a wish "to create meaningful results for people living in the region."¹⁰

IASC chose to work with two international regions – the Barents Sea and the Bering Sea. The specific criteria for choosing them included "their importance as economic zones and weather generators; their sensitivity to climate; and the presence of local native populations, regional scientific expertise, research gaps to be addressed and availability of potential funding to address these issues."¹¹ Another common feature was that both regions were politically and militarily sensitive areas between two superpowers, and there had been very little scientific cooperation during the Cold War.¹² This made them suitable objects for study to an organization that was created to overcome political boundaries as the frozen East-West political relations were thawing.

The Bering Sea Impact Study (BESIS) held a number of workshops with the purpose of "getting scientists and stakeholders, the people affected by the change together."¹³ The project resulted in several reports and the work in BESIS later became integrated into and a starting point for the Alaskan section of the US National Climate Impact Assessment. According to IASC's executive secretary, the Barents Sea Impact Study (BASIS) had problems with lack of basic information, particularly in relation to Russia. It, therefore, had to become more of a research project before any assessment could be made. The BASIS project later developed into the EU funded research project Balance (2002-2005), aimed at assessing the vulnerabilities of the Barents Sea system to climate change based on a common modeling framework for major environmental and societal components.¹⁴

⁸ Archer and Scrivener, "International Co-operation in the Arctic Environment," 605.

⁹ Stewart Cohen, "Participation in Integrated Assessment," *Tiempo* no. 34 (1999); Stewart J. Cohen, "What If and So What in Northwest Canada: Could Climate Change Make a Difference to the Future of the Mackenzie Basin," *Arctic* 50, (1999): 293; NCE Knowledge Site, "Mackenzie Basin Impact Study," http://yukon.taiga.net/knowledge/resources/mbis/index_printable.html (Accessed 6 Dec. 2006).

¹⁰ Interview Odd Rogne April 14, 2004.

¹¹ BESIS Project Office, *The Impacts of Global Climate Change in the Bering Sea Region. An Assessment Conducted by the International Arctic Science Committee Under Its Bering Sea Impact Study. Results of a Workshop, Girdwood, Alaska 18-21 September 1996* (Fairbanks: BESIS Project Office, 1996), 7.

¹² BESIS Project Office, *The Impacts of Global Climate Change in the Bering Sea Region*, 5.

¹³ Foreword in *Implications of Global Change in Alaska and the Bering Sea region. Proceeding of a Workshop*. University of Alaska, Fairbanks. June 1997.

¹⁴ Balance, "Global Change Vulnerabilities in the Arctic Region: Linking Arctic Natural Resources, Climate Change and Economies" <http://balance1.uni-muenster.de/> (Accessed 13 Apr. 2007).

While BESIS and BASIS were running, IASC's Executive Committee started a discussion on using assessments as a tool for identifying priorities among the different proposals for projects they received. By 1998, IASC had decided to focus on climate change. They had also observed that two Arctic Council working groups had been tasked to undertake such an assessment. In addition, IASC prepared a paper on the principles of conducting assessments, drawing on experiences from global assessments of ozone depletion and climate change. The author was Bert Bolin, founding chair of the IPCC, who at the time was vice chair in IASC's Executive Committee. The structure of the IPCC is clearly visible in his proposal, with a division of scientific and policy-oriented products but including an arena in which both policy makers and scientists can take part. Specifically, he suggested a bulk report written for the scientific community where individual scientists take responsibility for the content and without recommendations for political action. Second, there should be a summary for policymakers written for laymen, and in particular for politicians, where "the selection of what to include should preferably be done in co-operation with those who have proposed the analysis." The purpose, according to the discussion paper, was to involve the non-scientific community, and in particular politicians, in transforming policy into action.¹⁵

Another person active in IASC at this time was Robert W. Corell, at the time US representative and chair of IASC's Regional Board. Corell and Bolin had a mutual interest in what the IPCC had identified as need to complement the global focus with more regional studies. Corell's recollection of events is as follows:

We asked ourselves a simple question: If you were to try to downscale to something more local, where would you do it? And we ended up in the Arctic. We actually looked at other places where you could do it. You could argue doing this in the monsoon region in the Indian Ocean. You could do it in the Amazonas. There are these hot spots in the climate system. But what made the Arctic attractive was that there was a sufficient amount of research that we knew that the [climate change] signals were very strong. We suspected they were strong ... We also saw that there was some machinery in place to actually do it. We had IASC, all circumpolar. We knew we had an Arctic Council.¹⁶

IASC was receptive to the idea and Corell was asked to deliver a draft outline. That paper and Bolin's principles for conducting scientific assessments were on the table at the same Executive Committee meeting in February 1999.

Several authors have identified Bolin as one of the key people in the development of global climate science arenas, in particular the IPCC.¹⁷ The early origin of the ACIA illustrates the role of such individual actors in connecting the global and regional networks and in transmitting norms from the global arena to the Arctic science regime. Corell had mostly been active in the United States. Nevertheless, they were both part of

¹⁵ Some principles for conducting Scientific Assessments by IASC (A sketch by Bert Bolin). Discussion paper prepared for IASC's Executive Committee January 28, 1999.

¹⁶ Interview Robert Corell, March 24, 2004

¹⁷ E.g. Agrawala, "Structural and Process History of the Intergovernmental Panel on Climate Change."; Skodvin, *Structure and Agent in the Scientific Diplomacy of Climate Change. An Empirical Case Study of the Science Policy Interaction in the Intergovernmental Panel on Climate Change.*

a global climate science network that the previous chapter of this dissertation has identified as important in framing climate change in policy relevant terms and as a global issue.

Arctic Council: AMAP and CAFF

Political cooperation in the Arctic took shape at about the same time IASC was formed in the early 1990s (see Chapter 4 for details). In 1991, it was formalized by the Arctic Environmental Protection Strategy (AEPS), which focused the shared concern about “the threats to the Arctic environment and the impact of pollution on the fragile Arctic ecosystem.”¹⁸

The operational activities of the AEPS were organized by working groups, of which the Arctic Monitoring and Assessment Programme (AMAP) has the strongest organizational backing. Initial discussions about its mandate were already held in 1990 and by 1993 AMAP’s task had been further defined.¹⁹ Although climate change and the ozone layer/UV radiation are mentioned as concerns in the political documents, for example that “increased temperatures and precipitation may result in dramatic ecological and socio-economic effects,” it is also clear that these issues were not a major priority within the AEPS.²⁰ The rationale for this lack of emphasis was the existing global cooperation in these areas. Therefore, AMAP’s task was defined not as a mandate to take initiatives on its own but rather to ensure that Arctic concerns were taken into account in the global processes and that monitoring needs were coordinated:

Noting the existing global cooperation on climate change and stratospheric ozone programs, the Ministers requested AMAP to regularly review the integrated results of these programs with a view to identifying gaps in the scope of the monitoring and research under these fora and with a view to ensuring that specific issues related to the Arctic region are placed on the agenda of the appropriate international bodies. The Ministers also requested AMAP to coordinate their monitoring programs with those planned by other programs in order to maximize data collection in logistically difficult areas and to integrate results as well as to contribute to the assessment of potential synergistic effects of multiple stresses on the Arctic and its inhabitants.²¹

Another early working group within the AEPS was the Working Group for Conservation of Arctic Flora and Fauna (CAFF). In a report from 1993, the issues of climate change and ozone depletion/UV are not directly visible although they may have been implied in phrases such as “the importance of CAFF’s identification of the full spectrum of human-caused threats to Arctic species and habitats.” However, CAFF’s own meet-

¹⁸ Arctic Environmental Protection Strategy (AEPS). Rovaniemi Declaration, 1991.

¹⁹ Arctic Monitoring and Assessment Programme- Minutes from the expert meeting in Oslo 12-16 Nov 1990; The Monitoring Programme for Arctic Monitoring and Assessment Programme, AMAP. AMAP Report 93:3; See also Young, *Creating Regimes: Arctic Accords and International Governance*.

²⁰ Arctic Environment. Second Ministerial Conference, Nuuk, Greenland, September 1993; See also section 4.4 of this dissertation.

²¹ Arctic Environment. Second Ministerial Conference, Nuuk, Greenland, September 1993.

ing reports from 1994 show that climate change was an identified concern and discussed in connection with the development of tools for monitoring biodiversity.²²

Even if the AEPS deferred the main responsibility for assessing climate change and ozone depletion to global regimes, both CAFF and AMAP kept them on their agendas. For example AMAP was tasked to do an initial assessment, which was delivered in 1997/98 as part of a major assessment of Arctic pollution issues.²³ The politically negotiated “Executive Summary” of the assessments discusses climate change and ozone/UV both as concerns in their own right and in relation to the primary mandate of AMAP – pollution issues. A key example is the identified knowledge gap concerning the combined effects of climate change and contaminant pathways.²⁴ This was later addressed in an assessment of the impact of climate change on transport and effects of contaminants.²⁵

Also at CAFF, climate change was discussed in relation to its primary mandate – conservation of Arctic flora and fauna. In its 2001 report *Arctic Flora and Fauna*, both climate change and ozone depletion are mentioned as a diffuse threat and various passages address the potential impacts of climate change on different ecosystems. The report concludes that monitoring the impacts of climate change and ultraviolet radiation is vital, as is further research to understand the dynamics of the systems that will be affected.²⁶

A joint process

As a result of AMAP’s first assessment of climate change and ultraviolet radiation, the 1997 ministerial meeting of the Arctic Council in Alta endorsed that AMAP should continue “activities for monitoring, data collection, exchange of data on the impacts of the effects of contaminants and their pathways, UV radiation and climate change on Arctic ecosystems with special emphasis on human health impacts and the effects of multiple stressors.” It also states that the Senior Arctic Affairs Officials “recognise the need to initiate monitoring and assessment activities on climate change and ultraviolet-B radiation, focusing on the effects and interactions with other agents impacting the Arctic, and to forge linkages with other organisations.”²⁷ The report does not mention any climate impact assessment. Rather, the early discussion illustrates that the regional political co-operation in the AEPS framed climate change mainly as a concern in relation to its interaction with other environmental problems, such as contaminants and ultraviolet radiation and their effects on human health.

²² Specifically the development of a circumpolar vegetation map. See, CAFF International Working Group. Third Annual Meeting Report, 1994, 27

²³ AMAP, *Arctic Pollution Issues: A State of the Arctic Environment Report*; AMAP, *AMAP Assessment Report: Arctic Pollution Issues*.

²⁴ AMAP, *Arctic Pollution Issues: A State of the Arctic Environment Report*, x.

²⁵ AMAP, *Arctic Pollution Issues 2002*; R. W. Macdonald, T. Harner, H. Fyfe, H. Loeng, and T. Weingartner, *AMAP Assessment 2002: The Influence of Global Change on Contaminant Pathways To, Within, and From the Arctic* (Oslo: Arctic Monitoring and Assessment Programme (AMAP), 2002).

²⁶ CAFF, *Arctic Flora and Fauna. Status and Conservation* (Helsinki: Edita, 2001), 86, 101, 126, 154, 180, 207, 255.

²⁷ SAAO Report to the Ministers for the Fourth Ministerial Conference of the Arctic Environmental Protection Strategy (AEPS), June 12-13, 1997, Alta, Norway.

An early step in the continued work within AMAP was a joint workshop with CAFF on climate change in March 1998.²⁸ The major task of the workshop was to inventory current research initiatives relevant for further monitoring activities and to define criteria for future monitoring. The objectives defined by AMAP and CAFF were in line with their respective core tasks, thus mirroring the documentation from the Alta ministerial meeting: "The ultimate objective of an AMAP/CAFF program on climate change is to provide policy advice on how pollution control and conservation planning in the Arctic should be modified to account for changes in climate."²⁹ Similar to the Alta documentation, the report does not mention any need for a circumpolar climate impact assessment, such as the ACIA, but rather reflects a wish for building a long-term AMAP/CAFF program.

In the fall of 1998, the idea of an assessment appears in AMAP's Work Plan and is presented to the Senior Arctic Officials as "a new program on effects studies in relation to climate change and UV-B" in cooperation with CAFF and several other international organizations. The Ministerial Declaration welcomed this initiative.³⁰ AMAP's 12th Working Group meeting in Helsinki in December of the same year featured a US proposal to produce a "circum-arctic synthesis of climate change impacts in the arctic."³¹ The discussion included the need for collaboration between AMAP and CAFF as well as with international fora outside the Arctic Council structure, in particular IASC.³² The AMAP Working Group supported a proposal to establish an inter-organizational Assessment Steering Committee. The terms of reference gives the Assessment Steering Committee responsibility to oversee the assessment process for climate and UV and to coordinate the preparation of assessment reports together with the AMAP and CAFF secretariats. They also give it responsibility for preparing the reports "according to decisions made by the AMAP and CAFF [Working Groups] and to cooperate with appropriate international organizations."³³ IASC was present as observer at the meeting and had mentioned in a statement that climate change and UV were two areas of joint interest. IASC is also mentioned specifically as potential representative to the Assessment Steering Committee. Another issue on the agenda was AMAP's Work Plan for 1998-2003. Here new priorities on effects due to changes in climate and UV-B effects became explicit and included scheduling of an assessment for 2006.³⁴ After AMAP's 1997/98 assessment reports, there was thus a burst of preparations for the shift in focus toward a more active interest in assessing climate change and UV impacts compared to the earlier work of political cooperation in the Arctic.

Three months later, in March 1999, the Assessment Steering Committee created by AMAP held its first meeting. An important issue at this meeting was to determine who

²⁸ CAFF Technical Report No 5. AMAP/CAFF Workshop on climate change, Rovaniemi, 24-25 March 1998.

²⁹ CAFF Technical Report No 5, 6.

³⁰ Report of the Senior Arctic Officials to the Arctic Council. Iqaluit, Canada. September 17-18, 1998. Part 2B; The First Ministerial Meeting of the Arctic Council. Iqaluit, Canada September 17-18

³¹ Synthesis of Climate Impacts in the Arctic. Attachment to a discussion paper on climate change in the Arctic.

³² Minutes from AMAP 12th Working Group Meeting, Helsinki, December 7-9, 1998, 9-10.

³³ Minutes from AMAP 12th Working Group Meeting, Helsinki, December 7-9, 1998, Appendix 8.

³⁴ AMAP Strategic Plan 1998-2003. AMAP Report 99:6, 2 and Annex 4.

was to be involved in the assessment. Although climate change was seen as a major threat to biodiversity in CAFF's work, CAFF's representative said that the management board and the CAFF Working Group had yet to have a substantive discussion on the climate change issue: "Hence CAFF would not be able to define its involvement in a joint assessment at this meeting." He did, however, provide a list of issues of interest to CAFF. Interviews confirm that CAFF's initial involvement was very modest.³⁵ IASC's representative brought attention to the importance of connections with the IPCC. According to the meeting minutes, "[i]t was suggested that Arctic could be one of IPCC's pilot areas and, since assessment needs a strong intergovernmental venue, the Arctic Council can give such an opportunity." AMAP, CAFF, IASC, and the IPCC were suggested as the main players. The meeting participants also stated that UV-B effect studies had no coordinating mechanism similar to the IPCC and also not the same attention by governments. Another issue raised was that the mandates of AMAP and CAFF were limited to the environmental impacts of climate change effects, and that the inclusion of socioeconomic aspects would therefore require a decision by the Arctic Council.³⁶

During the following seven months, the main structure of the ACIA was drawn up. One event, with over a hundred participants, was a workshop in Tromsø with an aim to "identify the need and requirements for such an assessment and lay out the foundation for it by attempting to summarize some of the existing knowledge."³⁷ The workshop featured presentations on a wide range of topics including physical, biological, and social impacts. Leaders of the previous sub-regional assessments also presented their findings, which may have inspired the idea of a sub-regional assessment in the ACIA as a way of linking biogeophysical impacts with human dimensions.³⁸ Part of the document was based on work that had been carried out in the Bering Sea Impact Assessment. A special drafting meeting was also held in which AMAP, CAFF, IASC, and the World Climate Research Programme (WCRP) produced a proposal for an Arctic climate impact assessment, which was presented to the Arctic Council Senior Arctic Officials meeting later that spring.³⁹ According to the Arctic Council meeting minutes, the proposal was generally well received but more detail, along with a budget, was needed.⁴⁰ A second meeting of the Assessment Steering Committee was held in Copenhagen to prepare a more detailed outline of content and strategy for ACIA, and in November 1999, ACIA was presented to AMAP's 13th Working Group meeting as well as to the Senior Arctic Officials.⁴¹ The sections included, at this stage, were a 20-page summary of scientific findings, an assessment of current literature and analysis of emerging data as

³⁵ Interviews Magdalena Muir, March 24, 2004, Kent Wohl, April 15, 2004, and Robert Corell, November 21, 2004.

³⁶ Minutes from the 1st meeting of the Assessment Steering Committee. Silver Spring, MD, USA, March 11, 1999.

³⁷ *Impacts of Global Climate Change in the Arctic Regions. Report from a Workshop on the Impacts of Global Change 25-26 April, 1999. Tromsø, Norway.* International Arctic Science Committee 1999, 3.

³⁸ Personal communication Steward Cohen, March 3, 2007.

³⁹ Minutes from the 13th Meeting of Arctic Monitoring and Assessment Programme Working Group (AMAPWG). Toronto, Canada, November 10-12, 1999. AMAP Report 99:5, agenda item 2.2; Written personal communication from Odd Rogne, March 31, 2004.

⁴⁰ Senior Arctic Officials Meeting. Anchorage, Alaska, U.S.A. May 3-6, 1999. Minutes revised September 28, 1999.

⁴¹ Present at this meeting was also the International Council for Exploration of the Seas.

well as a policy document aimed at Senior Arctic Officials and ministers. The questions raised about how to handle socioeconomic questions were not resolved, although IASC offered to provide expertise. Including traditional ecological knowledge in the assessment was discussed and supported by a remark from the Inuit Circumpolar Conference delegate. It stated that it was important that “information such as this gets into the global climate negotiations.”⁴²

At the Senior Arctic Officials’ meeting, the United States, then under the Clinton administration, offered to serve as the lead country for the project including organizing a scoping workshop and providing funding for the staff, the secretariat, and the participation by US experts as well as publishing and distributing the final report. Some countries expressed a concern about the socioeconomic issues and how they would be included in the assessment.⁴³ This turned out to be a recurring theme during the ACIA process and would also have consequences for the framing of climate change, which is discussed further in Chapter 6 of this dissertation. There were also some concerns about the review and adoption of policy recommendations, an issue that turned out to be a major stumbling block, which is discussed further in section 5.4.

By the next Arctic Council meeting, the ACIA process was well underway. A key event was the scoping workshop, to which over 40 experts were invited to discuss the potential content of the ACIA scientific report. The workshop documentation identifies AMAP, CAFF, and IASC as the key players to be formally involved in the assessment as joint organizers and core participants in the Assessments Steering Committee. It also mentions a secretariat at the International Arctic Center at the University of Alaska Fairbanks funded by the National Science Foundation and the National Oceanic and Atmospheric Administration (NOAA). Moreover, the links to the IPCC were clear, for example, the first lines of the introduction to the workshop state: “For several years, the IPCC has been preparing periodic assessments of global climate change. As this process has matured, it has become clear that there is a need to obtain a better characterization of climate variability and change at regional scales.”⁴⁴ In addition, work was carried out to create a formal connection via an appointed liaison between ACIA and the IPCC.

Some decisions had already been made about the content of the assessment. For example, it was stated from the onset that the definition of climate was broad and specifically included ultraviolet radiation. Another directive was that primary attention was to be paid to the impacts of climate change. The draft implementation plan also included an outline of the assessment report. Even if there was a call to the working groups to discuss whether the plan was sufficiently inclusive, it still illustrates that the overall framing of climate change in ACIA was formulated at a very early stage and in a way that specifically focused on climate change impacts. The formal documentation does not give any indication that alternative foci were discussed. This could possibly be ex-

⁴² Minutes from AMAP 13th Working Group Meeting, Toronto, Canada November 10-12, 1999. See also Minutes of the Second Meeting of Assessment Steering Group II (ASG II) of the Arctic Monitoring and Assessment Programme. Toronto, Canada, November 8-10, 1999. AMAP Working Paper 99:3.

⁴³ Senior Arctic Officials Meeting. Washington D.C. U.S.A. November 18-19, 1999. Minutes Draft (4/12/2000).

⁴⁴ ACIA. Report of the 3rd Meeting of the Assessments Steering Committee and a Scoping Workshop, February 28 – March 1, 2000, Washington, DC, U.S.A. ACIA report No. 1.

plained by the history of the Arctic political cooperation and the way it had placed the primary responsibility for climate change knowledge production and policy with global regimes. Moreover, as discussed in the previous chapter, the United States had been a major driver behind the establishment of the IPCC, and may not have wanted the ACIA to compete in IPCC's domain.

Although, policy recommendations did not appear as a central topic at the workshop, the minutes indicate that an agreement was set that policy issues should be left to the politically mandated working groups of CAFF and AMAP. The argument was that "science and action recommendations to the Arctic Council had been part of their earlier activities."⁴⁵ This illustrates an effort to separate the policy from the scientific process, but possibly also a need to actively involve policy makers somewhere in the ACIA process, in line with IASC's discussion paper on how to set up an assessment.

At the Arctic Council meeting in April 2000, the political discussion about the ACIA continued among Senior Arctic Officials, reaffirming some of the same points that had been raised earlier. This included the concern about how the assessment should handle socioeconomic aspects. Also, several countries (Iceland, Norway, and Sweden) explicitly brought up the need to clearly separate the scientific and political parts of the process. A statement in the meeting minutes from Sweden can serve as example: "Sweden said that they were still doubtful whether the ACIA should address the political implications, stressing that a clearer division is needed between politics and science."⁴⁶ Another issue raised by the ACIA, represented by Robert Corell, was the need to ensure the full participation of indigenous groups in the process. The Inuit Circumpolar Conference and Saami Council emphasized the role of traditional and indigenous knowledge, stating, for example, that "traditional knowledge can be just as expert as science."

Half a year later, at the second ministerial meeting of the Arctic Council, in Barrow, Alaska, the stage was set for the political representatives to make a formal decision about the ACIA. The 12-page implementation plan presented to the meeting included an outline of the scientific report along with the structure and major contents of each chapter. The overall goal of the ACIA is stated as follows:

- Evaluate and synthesize knowledge about climate variability, climate change, and increased UV radiation and their consequences, and
- Provide useful and reliable information to the governments, organizations and peoples of the Arctic region in order to support policy-making processes and to IPCC's further work on climate change issues.

The assessment will include environmental, human health, and social and economic impacts and recommend further actions. This assessment will be conducted in the context of other developments and pressures on the Arctic environment, its economy, regional resources, and peoples.⁴⁷

⁴⁵ ACIA. Report of the 3rd Meeting of the Assessments Steering Committee and a Scoping Workshop, February 28 – March 1, 2000, Washington, DC, U.S.A. ACIA report No. 1.

⁴⁶ Arctic Council Senior Arctic Officials Meeting, Fairbanks, Alaska, April 27-28, 2000. Minutes revised 10/12/00.

⁴⁷ Arctic Climate Impact Assessment (ACIA) Implementation Plan version 3.7, prepared by the Assessment Steering Committee September 2000. Document for the Barrow Ministerial meeting.

The implementation plan also laid out a process for the review of the scientific and synthesis documents “to assure scientific quality,” and that “AMAP and CAFF will review the Policy Document through their national networks.” The responsibility for producing the policy document was also clearly placed with AMAP and CAFF, rather than with ACIA’s Assessment Steering Committee. In the “guiding principles,” it is clear that the authors wanted to guard the scientific integrity and independence of the process from “political and commercial pressures.”⁴⁸

The ministers endorsed and adopted the ACIA. Their request specified that the assessment was to support “policy making processes and the work of the IPCC” and that it was to include policy recommendations.⁴⁹ This meeting marked the formal political approval of the ACIA process and therefore it is useful to pause for an analysis of some key issues in this early phase of the ACIA.

Analysis of early phase

Some key features of the ACIA were visible in the early phases of the process, even before its formal inception. This includes a close connection with the global climate assessments in the IPCC even to the point that ACIA’s role was described, at times, as a support to the IPCC in its continued work on regional climate assessments. It is noteworthy that no strong connection was made with the global assessments of ozone depletion and ultraviolet radiation carried out by UNEP/WMO, despite the outspoken intention of including impacts of ultraviolet radiation in the ACIA. Other potentially relevant regimes, such as the cooperation in the Convention on Biodiversity, are also not specifically mentioned, whereas international scientific collaborations connected to global change research are occasionally included. One reason might be that the driving actors involved in the initiation of the ACIA and their networks had strong connections to climate science and policy, but no similarly strong connections to some of the other research fields and global science-policy processes that may have been relevant to the *impact* of climate change. However, actors with other interests and connections were also present, including representatives of Arctic Council working groups focused on pollution and biodiversity, and policy representatives emphasizing socioeconomic issues. Therefore, other dynamics are likely to also be at play in placing such strong focus on the IPCC. One factor could be that the structure of international environmental cooperation has divided issue areas into different regimes. It takes special measures to overcome this division and the incentives may not have been strong enough. Both governance structure and actors networks thus favored a close connection to the IPCC only. Another factor that may have further enhanced the focus on climate change in particular could have been the lack of political agreement in global climate policy and the ambition to use the Arctic to strengthen the scientific common ground to move the policy process forward. This is what AMAP had managed to do in relation to persistent organic pollutants, and according to one interview account this idea was also present in

⁴⁸ Arctic Climate Impact Assessment (ACIA) Implementation Plan version 3.7.

⁴⁹ Barrow Declaration on the occasion of the Second Ministerial Meeting of the Arctic Council, October 13, 2000.

the early discussions.⁵⁰ Supporting such a thesis is also the fact that the Arctic was singled out as appropriate for regional assessment partly because the signals of climate change were suspected to be extra strong.

An emphasis on regional stakeholders was present in the initial phase of the ACIA. This was, for example, identified as a prerequisite for a successful regional assessment in the Arctic by the actors concerned with global climate change. With the Arctic Council as the regional policy platform, these stakeholders become identified as states and indigenous peoples. At the very early phase of the ACIA, there were also some signs of discussions about the role of local stakeholders in connection with conducting sub-regional assessments, but this appears to be lost as the process developed.

The tension between science and policy was present from the start. On the one hand, there was a wish to have an intergovernmental platform to provide political legitimacy to the process in the region. In fact, the presence of such a platform was described as a reason for conducting the first regional climate impact assessment in the Arctic rather than somewhere else that could have been just as valuable to global climate science. On the other hand, there was a wish to clearly separate science and policy. This is apparent in the structure of the proposed reports, where policy gets its own document. This is in contrast to previous assessments within AMAP, where policy recommendations were included in the popular science overview document as a politically negotiated executive summary.⁵¹ It can also be placed in contrast to the IPCC process, where the summaries for policymakers are politically negotiated documents. Initially, the formal documentation is not explicit about who should have responsibility for the policy document and what this document should contain. However, as the process develops, there is a clear allocation of this task to the AMAP Working Group and the CAFF Working Group, which are political bodies with government representatives, as opposed to the Assessment Steering Committee, where the participation appears to have been based on covering the different aspects and interests of climate science and the organizations behind the assessment. On the science side, the integrity of the scientific process separate from political and commercial interests was stressed. Several governments also pointed out the need to keep science and policy separate. Consequently there may have been a mutual interest among policy makers and scientists to keep this separation, especially in climate change where the science has been controversial and politically challenged compared to the assessment of effects on pollution or biodiversity issues which was less so. However, the proposed structure of the assessment, with a separate document so clearly focused on policy, may also have made it more urgent to clarify responsibilities. One could interpret this as the science and policy spheres asserting authority over science and politics respectively, a matter that will be further accentuated later in the policy process.

A third point that needs to be made about the early origins of ACIA is that its inception relied upon a combination of scientific networks that linked global and regional

⁵⁰ Interview Robert Corell, November 21, 2004.

⁵¹ For an analysis of the science-policy interface in the 1997/98 assessment, see Mathiassen, *Vitenskap og politikk: Om produksjon og formidling av vitenskapelig kunnskap i Arctic Monitoring and Assessment programme - Arktis råd*.

interests, a few influential people driving the process, and the availability of a formal political regime.

In discussions with some participants in the process, it became clear that there are different views on who drove the initiation of the assessments. My interpretation is that this major assessment effort came about when global and regional interests merged. Even if major foundational work had been carried out by AMAP and that this work may have been sufficient in eventually getting the assessment off the ground, IASC created a bridge to the global assessment processes in the IPCC and to the international climate science networks, which got the ACIA going at the time it did. IASC would probably not have been able to act on its own, but it could play a role because IASC could connect to the momentum that was starting to build in AMAP. IASC was also dependent upon AMAP's political legitimacy as a working group of the Arctic Council. The Arctic Council connection was also important in mustering resources for the assessment.

An analysis of the early phase of ACIA thus points to the key role of the interplay between regional and global regimes. What are the arguments against such a conclusion? For example, would an assessment of climate impacts in the Arctic have been initiated without either of the regimes? Possibly without the global regime. It is clear that climate and UV were already on the regional agenda as important issues that could affect the sustainable development of the region. However, the presence of a global ozone regime and an emerging climate regime,⁵² when international environmental co-operation started in the Arctic in the early 1990s, appears to have postponed large-scale involvement in these issues. Moreover, when climate change is identified as a political priority the IPCC is described as a key partner, even to the point of the Arctic assessment catering to the needs of this global climate assessment regime. Based on this, I conclude that global regimes affected the timing of the ACIA process.

For knowledge production on the regional impact of climate change to occur, the presence of a suitable regional regime appears to be necessary. A suitable regime must have high credibility to stakeholders in the region but also within the scientific community. Suitability also entails the capacity or ability to muster resources to carry out an assessment. Supporting this conclusion is the fact that there has not been a surge of any other international regional climate impact assessments, in spite of a recognized need for more knowledge about both climate processes and climate impacts at this spatial scale. A tentative policy-relevant conclusion thus could be that regional regimes with interest in scientific and environmental issues and capacity to muster sufficient resources will be important for the future development of knowledge about climate change at the regional level. Moreover, the nature of such regimes can play a role in who has a say about the focus and process for the assessment.

⁵² The Vienna Convention on Protecting the Ozone Layer was signed in 1985. The Intergovernmental Panel on Climate Change delivered its first report in 1990 and the UN Framework Convention on Climate Change was signed in 1992.

5.2 The scientific report

At the core of international environmental assessments is usually a scientific document that reviews available literature and data on a specified topic. The majority of the work is done by scientists who are considered to be experts in their fields. This has been the norm within the IPCC and in AMAP's assessments of pollution issues in the Arctic. Other actors, such as local stakeholders, have limited influence on this core activity of gathering information and synthesizing the available knowledge. This is in contrast to IASC's sub-regional climate impact assessment of the Bering and Barents Sea regions that also included discussions with local stakeholders. In most respects, ACIA's scientific assessment follows the IPCC and AMAP model and could be described as governed by internal scientific norms. However, before the scientists even begin their work, there is a process to determine the scope of the assessment, where chapter headings were discussed and lead authors selected. This process is one in which science and policy interact closely with each other.

Defining the content

In the ACIA, the Assessment Steering Committee played a driving role in the early process of defining the content of the scientific report. Initially AMAP and CAFF are represented by their secretariats, IASC by senior scientists, and the indigenous peoples by one of the Permanent Participants in the Arctic Council. In the early phase of the ACIA, the Arctic countries also had either experts in climate/UV or representatives from their political delegations to AMAP and CAFF present. As soon as the ACIA secretariat was about to be established, this entity was also represented at the meeting.

It was the Assessment Steering Committee and the contact networks of its members that formed the basis for the initial ACIA report scoping meeting, where 40 experts discussed what the report should include. Additionally, there were also some political discussions about the content of the Senior Arctic Officials Meeting in June 2000. One issue was how "socioeconomic" issues should be handled. What socioeconomic issues included is not clear, other than a statement from the Inuit Circumpolar Conference that "it's not only about science, but people as well."⁵³ A related discussion was on how to ensure the participation of indigenous peoples, which the Permanent Participants phrased as the inclusion of traditional knowledge. A third comment on content was to "keep in mind issues relating to the connection of the Arctic region with the global system."⁵⁴

The minutes from the Assessment Steering Committee in June 2000 indicate that IPCC's Third Assessment Report and the US National Climate Impact Assessment, which were both underway at the time, also served as important starting points for the structure of the ACIA report. It was decided that the report should have 14 chapters organized into three main sections: The Arctic as part of the global system, impacts on

⁵³ Arctic Council Senior Arctic Officials Meeting. Fairbanks, Alaska, April 27-28, 2000. Minutes revised 10/12/00.

⁵⁴ Arctic Council Senior Arctic Officials Meeting. Fairbanks, Alaska, April 27-28, 2000. Minutes revised 10/12/00.

physical and biological systems, and impacts on humans and their activities. A final summary chapter was to attempt an integrated description of impacts.⁵⁵ The meeting also discussed potential lead authors for the chapters. Prior to the meeting, the ACIA executive director had called for nominations and had received names and curricula vitae from “a number of sources in Canada, Finland, Sweden, Norway, and the U.S.” The criteria used in the selection were that these authors should be “both knowledgeable scientists and leaders who could effectively organize the teams of contributing authors.”⁵⁶

At the Barrow ministerial meeting in October 2000, the table of contents was put before the politicians as part of the ACIA implementation plan. Some notes on record specifically discuss content. One note from the US chair was that “we must avoid causality; others are working on this issue and the Council could probably not add much.” “Others” in this case seems to refer to the IPCC as the statement was followed by a remark that the assessment should feed into its work. The issue of causality did however come up in the ACIA in a discussion on whether Arctic climate change can be attributed to emission of greenhouse gases, which is discussed further in Chapter 6 of this dissertation. The major focus of the comments appears to have been on the importance of the ACIA for drawing policy conclusions, including a request that Senior Arctic Officials (SAOs) and Ministers be kept informed and that there be “close ACIA-SAO links.”⁵⁷

Filling the outline

The next meeting of the Assessment Steering Committee, directly after the Barrow Ministerial, was the first time the organizers met with the lead authors who, together with the contributing authors, would carry out the brunt of scientific work in ACIA. The chapter outline evolved, including a new introductory chapter, a separation of terrestrial and freshwater ecosystems into two chapters, and much more detail under each heading. However, interviews with lead authors indicate that the outline was decided already before they became involved. It was, thus, a discussion on how to adjust the overall structure that was already in place.

A key event in the scientific process was a workshop on modeling and scenarios where authors discussed what respective inputs would best demonstrate future climate change impacts. In the report, this workshop is described as the foundation for the ACIA.⁵⁸ Several key decisions, in which the influence of the IPCC is clear, were made at this workshop. Specifically, the workshop participants saw no need for new scenarios of greenhouse gas emissions, but in order “to stay coordinated with the current IPCC approach” they decided to select a scenario that has been developed by the IPCC Special Report on Emissions Scenarios (SRES), namely B2. This scenario is a so-called

⁵⁵ Summary Report of the 5th Assessment Steering Committee (ASC) Meeting, June 15-16, 2000, Danish Polar Center, Copenhagen, Denmark.

⁵⁶ Summary Report of the 5th Assessment Steering Committee (ASC) Meeting, June 15-16, 2000, Danish Polar Center, Copenhagen, Denmark.

⁵⁷ Arctic Council. Notes from the Second Ministerial Meeting, Barrow, Alaska, U.S.A. October 12-13, 2000, which is not a full transcript of the meeting.

⁵⁸ Report from the Arctic Climate Impact Assessment Modeling and Scenarios Workshop. January 29-31, 2001. Stockholm, Sweden, 1.

“best guess” or “most likely” scenario. The reason for not using the A2, which is another of the major scenarios and often called “business-as-usual” or “worst case,” was to avoid criticism of being too alarmist. The scenarios are based on different assumptions about population growth, environmental protection and social equity.⁵⁹ Over a time scale of 50 years, the emissions between A2 and B2 are not very different, which the workshop participants point to as justification for choosing only one of them. The executive summary also points out that “[a]lthough many emission assumptions exist for the future, the range of projected Arctic temperature responses is similar to the range of responses observed due to model-to-model differences.”⁶⁰ The executive summary does not indicate that any of the other SRES scenarios were discussed at the workshop and no clear reasons are given other than that A2 and B2 “have emerged as having particular significance” as had been identified by “the general scientific community” as business-as-usual and most likely.

Most climate models work at the global level, while a regional assessment ideally would need higher resolution of the information about potential future climates. Therefore, it is not a surprise that regional models were on the agenda for the workshop. Some countries had already begun the work on regional models, including coverage of Sweden, Norway, parts of Alaska, and Canada, but the workshop concluded that “the list of sub-regional Arctic models is not yet complete,” and that results from an inter-comparison were not expected until late in 2001. None of the groups that wanted to develop a regional coupled oceanic-ice-atmosphere model was securely funded to do so. Apart from the regions with a long-term meteorological record where a different technique for climate scenarios could be used, the ACIA was therefore partly limited by the lack of available Arctic-wide climate models and the research-funding structures that had not identified such models as a priority. Although there was a suggestion to begin to develop an Arctic regional model, the ACIA was urged by one of the workshop organizers to go forward with the assessment “using currently available global models.” This was also the decision.⁶¹ Five modeling centers were chosen as were three time slices representing what the Arctic climate might look like in 2020, 2050, and 2080.

Another issue raised during the workshop was the need to find better links between the climate modelers and the people who would be using the model outputs for their impact studies. Without a facility for supplying impact studies with the appropriate climate scenario data, “the ACIA process is likely to fail,” the report states. Later, such as

⁵⁹ The SRES scenarios are elaborated in detail in IPCC’s Third Assessment Report: “The A2 storyline and scenarios family describes a very heterogeneous world. Underlying these is self-reliance and preservation of local identities. Fertility patterns across regions converge very slowly resulting in continuously increasing population. Economic development is primarily regionally oriented and per capita growth and technological change more fragmented and slower than in other storylines.” “The B2 storyline and scenario family describes a world in which the emphasis is on local solutions to economic, social and environmental stability. It is a world with continuous increasing global population, at a rate slower than A2, intermediate levels of economic growth, and less rapid and more diverse technological change than in the B1 and A1 story line. While the scenario is also oriented towards environmental protection and social equity, it focuses on local and regional levels.”

⁶⁰ Report from the Arctic Climate Impact Assessment Modeling and Scenarios Workshop. January 29–31, 2001. Stockholm, Sweden, 1.

⁶¹ Summary Report of the Seventh Assessment Steering Committee (ASC) Meeting, 19–20 April 2001, Reykjavik, Iceland.

facility was created at the Swedish Meteorological and Hydrological Institute and funded via the ACIA secretariat.⁶²

By the end of 2001, most lead authors had begun to recruit writing teams, and at the December Assessment Steering Committee meeting in Ottawa, they provided progress reports on their respective chapters. As outlined by the protocol, this included opportunities for other committee members to comment on the approaches and suggested content for each chapter.⁶³ Socioeconomic issues were on the table once again, according to the protocol with “lively discussion on the extent to which various chapters in the assessment will be expected to deal with impacts on humans.” There was a suggestion to add leaders of the Bering Sea and Barents Sea impact studies to the Assessment Steering Committee. A social science author labelled this as “a good idea from the point of view of social sciences.” However, others argued it would make the Assessment Steering Committee too large, and that it should be left to lead authors to recruit social science expertise as they needed it, or that it could primarily be a resource for the final synthesis chapters. At the end, the discussion was postponed until the next meeting.⁶⁴

Related to the question of social science but introduced as a separate question in the discussion was a suggestion from the ACIA chair to include a new chapter in the ACIA report: “A vulnerability approach to study the extent to which Arctic individuals and communities can be affected by things that influence human health and well-being, indigenous cultures and food security, and human settlement and development.” The issue had already been taken up at the 5th Assessment Steering Committee Meeting with a suggestion by the ACIA chair to “apply a vulnerability assessment strategy” to one of the chapters, perhaps human health, but now the idea was that this issue would receive its own chapter and provide a way of looking forward.⁶⁵ Referring to an ongoing research effort at Harvard University, he proposed to examine the impacts of environmental pollution, UV-B and climate change, and trends in human and social development that served as stressors on Arctic peoples and communities. After “an extensive discussion,” the Assessment Steering Committee decided to add a chapter on this Arctic Vulnerability Study before the final summary chapter. The protocol does not reveal the content of this discussion. The chapter would, however, continue to be a point of contention.⁶⁶

The December 2001 meeting was also the beginning of discussions concerning graphics and technical production, and by the next Assessment Steering Committee meeting, in June 2002, Paul Grabhorn of Grabhorn Studios presented his ideas of how to work with the lead authors on graphics.⁶⁷

⁶² Summary Report of the Seventh Assessment Steering Committee (ASC) Meeting, 19-20 April 2001, Reykjavik, Iceland.

⁶³ Summary Report of the Eighth Assessment Steering Committee (ASC) Meeting, 3-5 December 2001, Ottawa, Canada.

⁶⁴ Summary Report of the Eighth Assessment Steering Committee (ASC) Meeting, 3-5 December 2001, Ottawa, Canada.

⁶⁵ Summary report of the 5th Assessment Steering Committee (ASC) Meeting, June 15-16, 2000, Danish Polar Center, Copenhagen, Denmark.

⁶⁶ Summary Report of the Eighth Assessment Steering Committee (ASC) Meeting, 3-5 December 2001, Ottawa, Canada.

⁶⁷ Summary Report of the Ninth Assessment Steering Committee Meeting (ASC) 2-5 June, Asker Norway.

The protocol from this ninth meeting of the Assessment Steering Committee does not indicate any extensive discussion about content of the scientific report. The chapter structure appears to be set and the discussion focused on progress reports from the different lead authors with some specific questions raised in the discussion, for example on the need for additional information, lack of geographical coverage, and overlap between chapters. There was also a one-day workshop concerning integration across the chapters. On the more general level, an issue of language was raised concerning how the phrases “very likely, likely, possible, unlikely, and very unlikely,” were to be used in the assessment, with an agreement that there was a need for a common lexicon.⁶⁸

For about a year, the scientific report process disappeared from the formal ACIA documentation. This does not mean there was a lack of activity. Rather, the authors and contributors were busy writing. Moreover, a new group had been established based on a recommendation from the Executive Committee: The Assessment Integration Team. This group consisted of the Executive Committee with three added members from the Assessment Steering Committee and was charged with guiding the preparation of the introductory and the summary chapters of the scientific report. As discussed in section 5.3 of this chapter, the Assessment Steering Committee was also to guide the preparation of the overview document. The Assessment Integration Team also organized a cross-fertilization meeting, which was held in New Hampshire in March 2003.⁶⁹ Several participants in the process have described this meeting as an important event because chapter authors had the chance to discuss together across the division into chapters.⁷⁰ Moreover, this was a meeting where the science writer who was writing the overview and the people who would be working with the policy document had a chance to interact together with the experts responsible for the scientific report. However, it was not a formal Assessment Steering Committee meeting and there is no official written record of it.

The review

In the summer of 2003, the first official draft of the complete scientific report was sent out for review. The reviewers had been selected through nominations from the ACIA Executive Committee, AMAP, CAFF, IASC, the Indigenous Peoples’ Secretariat, and several national organizations. After further solicitation of nominees from the lead authors, the final selection was made by the Assessment Integration Team based on “scientific balance, country balance and gender equity.” All in all, 142 reviewers are selected of whom 79 returned reviews. In addition to the ACIA-initiated review process, several countries engaged national experts to review the science chapters. To collate all the review comments, the secretariat hired a person with experience from IPCC’s re-

⁶⁸ Summary Report of the Ninth Assessment Steering Committee Meeting (ASC) 2-5 June, Asker Norway.

⁶⁹ Summary Report of the Ninth Assessment Steering Committee (ASC) Meeting, 2-5 June 2002, Asker, Norway.

⁷⁰ E.g. interviews 16, 30, 42, 46, 48, and 70.

view process.⁷¹ In addition to general issues about each chapter, most authors received many pages of detailed comments. Each lead author was expected to reply to each of these comments, either accepting changes or providing some justification for not making the suggested change.⁷²

The Assessment Steering Committee discussed the possibility of making the reviews available on the World Wide Web but there was resistance to this idea because of concern that some of the reviewers may not have wanted their strongly phrased criticism so publicly accessible. While some argued that confidentiality was essential to successful peer review, other members of the Assessment Integration Team argued that the material had to be openly available for the process to be open and credible.⁷³ A paper providing guidance to the authors states that “[w]e are expecting that comments and responses will be put on the Web,”⁷⁴ but in the end, a decision was made that authors’ responses to external reviews would not be posted for public viewing, but that they could be requested from the ACIA Executive Committee.⁷⁵

The discussion surrounding the review process illustrates the contrasting perspectives when internal scientific norms confront other needs at the science-policy nexus. Even if the peer-review system has been challenged from time to time, including calls for more openness, there is more basic internal trust within the scientific community than in the policy arena. In this arena, science may be challenged and transparency in process becomes part of building (or safeguarding) scientific credibility. In highly contested science, someone is likely to ask what comments were made on drafts and how they were taken into account. This is also what happened at a discussion about ACIA-follow-up in the AMAP Working Group. This politically mandated body decided that the documentation, outlining how reviewers’ comments were handled, should be put on ACIA’s web site.⁷⁶ They have since become available via AMAP’s website, albeit hidden in the password area.⁷⁷

During the last meeting of the Assessment Steering Committee, in October 2003, the authors had to give their summary response to the review comments and how they planned to deal with them. In addition, the Assessment Integration Team had chapter liaisons present a more independent assessment of the review comments. For some of the chapters, the exercise of discussing the review was straightforward, but for a few chapters, major tensions came to the fore.⁷⁸ For example, comments on a chapter about

⁷¹ International Expert Review Process – ACIA Science Chapter Summary by Patricia Anderson, ACIA Secretariat via e-mail January 25, 2006, including supporting lists of nominations and selection of reviewers.

⁷² Guidance to ACIA Authors on Documenting Responses to Reviewers Comments. For Discussion at the ASC Meeting, 15-16 October 2003, London.

⁷³ Observation notes October 14, 16 and 17, 2004. International Expert Review Process – ACIA Science Chapter Summary by Patricia Anderson, ACIA Secretariat via e-mail January 25, 2006.

⁷⁴ Guidance to ACIA Authors on Documenting Responses to Reviewers Comments. For Discussion at the ASC Meeting, 15-16 October 2003, London.

⁷⁵ The reviews were made available to me as background material in connection to the meetings of the Assessment Integration Team and Assessment Steering Committee October 2004.

⁷⁶ Minutes of the 19th Meeting of the Arctic Monitoring and Assessment Programme (AMAP Working Group. St Petersburg, Russia, 12, 13, and 16 September 2005, Item 5.3.

⁷⁷ www.amap.no Accessed Sep. 20, 2006 without any need for a password.

⁷⁸ Observation notes London ASC meeting October 15-16, 2003.

the management and conservation of wildlife in the changing Arctic raised the question of whether climate impacts on conservation were really covered, leading to a decision to find an additional author.⁷⁹ In this discussion CAFF became an important pusher. Later this led to the division of the chapter into two chapters – one focusing on wildlife management as it relates to the use of living resources and the other focusing on conserving Arctic biodiversity. This process shows how an author of a chapter was not allowed to get away from the original purpose and outline of the assessment as it was set out by the Assessment Steering Committee. It also shows that CAFF had enough clout in the process to get a perspective included that a selected lead author had not prioritized.

The chapter on assessing vulnerabilities also generated a heated discussion. One controversial point was a case study in which a local population in Greenland had not been involved, raising questions about the research ethics of that kind of study.⁸⁰ The point was brought up by the indigenous peoples' representatives in the Assessment Steering Committee, the Danish spokesperson relating comments from Greenland, a lead author for another chapter, as well as by the chapter liaison, and illustrates that there are current sensitivities about outside researchers coming into the Arctic and doing studies without the approval and participation of locals. Another issue was whether this chapter was an assessment of available knowledge or a narrow research paper that had no place in the ACIA. The ACIA chair was one of the co-authors of this chapter, and although he did not take part in the discussion, this fact colored some of the dispute at the meeting. It was also pointed out that the process had been different for this chapter. For example, nomination of authors was not open.⁸¹ During the meeting, a small group discussed re-focusing the chapter, which also was renamed "Climate Change in the Context of Multiple Stressors and Resilience." This discussion illustrates that tensions can come up in an assessment process when the initial overall framing of the task is challenged. The dynamics and significance of the controversy will be further discussed in Chapter 6 of this dissertation.

Another assessment chapter that generated controversy was the summary, when lead authors of other chapters did not want to allow new material, which they had not included in their respective chapters, to be added to the summary. This debate continued at an Assessment Integration Team meeting half a year later.⁸² A specific issue was a table of economic impacts on industrial development. The lead author of the summary chapter expressed a clear wish to see these issues treated in the assessment and similar requests were voiced about lessons from the oil industry and the military. However, this was not covered in the relevant assessment chapter where they could have been brought up, i.e. the chapter on infrastructure, which created problems when the summary lead author wanted to bring them into the summary. This discussion illustrates the tension between the wish for credibility, based on the scientific independence of lead authors, and the wish of assessment leaders to cover aspects that were not explicitly included in the chapter outlines. In this case, scientific independence was clearly linked to the

⁷⁹ Observation notes and Summary Report on the Tenth Assessment Steering Committee (ASC) Meeting, 15-16 October 2003, London, U.K.

⁸⁰ Observation notes and Summary Report on the Tenth Assessment Steering Committee (ASC) Meeting, 15-16 October 2003, London, U.K.; Interview 30.

⁸¹ Observation notes October 14, 2003.

⁸² Observation notes March 24, 2004.

authority of the lead authors in the main part of the assessment rather than in ACIA's executive director as lead author of the summary. Not spoken out loud but underpinning the discussion may also have been developments in the policy process that made it clear that the United States was likely to question the scientific credibility of the ACIA. Scientific credibility had therefore become a more heavily weighted issue concerning more than only the reputation and credibility of individual authors.

The review also generated a discussion about some cross-cutting issues. They were raised by the ACIA chair and included discussions on the carbon cycle, whether Arctic climate change is anthropogenic in origin, and interactions between climate change and contaminants and biodiversity. The way in which cross-cutting themes were brought into the discussion illustrates the close interaction between the policy sphere and the scientific community more clearly than the treatment of specific chapters. These were questions raised by ACIA's chair and the AMAP and CAFF representatives, i.e. people who generally were closer to the policy sphere and more aware of its dynamics and needs, and who made specific references to what policy makers may want or need. Another specific example is a lively discussion on the Assessment Integration Team on how to place and phrase the overall conclusions and how they could be used in the policy document.⁸³

There was not much time before the authors had to submit their final draft after the London meeting. By now, it had become clear that the content of the scientific document had to be "frozen" before there could be any approval of the overview and policy documents. In practice, they had only until January 2004 to get their chapters ready and forwarded for technical editing, graphics work, and layout to meet the aim of having the report in print by the Arctic Council ministerial meeting in the fall of 2004. As it turned out, the process was much prolonged. At an Assessment Integration Team meeting in March 2004, there were outstanding issues for several chapters, including major changes in chapter structure, i.e. splitting the chapter on conservation into two chapters, one with a new lead author. Also, there remained an extensive discussion on the summary chapter around what materials could or could not be included on economic and regional impacts with reference to what had been evaluated as scientifically credible by the lead authors in the preceding chapters. There were also some concerns raised during the review of the overview document that called for a new look at the material in the underlying scientific chapters (new scientific findings that needed to be included). It would, thus, be an overstatement to say that the content of the whole science document was frozen at this point. Later in the process, the technical editing and production were more time-consuming than the ACIA had allocated in its initial time plan and the scientific report was not ready by what was supposed to be its formal release at the ACIA Scientific Conference in early November 2004. It was not until the early spring of 2005 that the first chapters became publicly available on ACIA's website and not until late October 2005 that the whole report was published in its final printed form. ACIA's chair has explained that the delay was caused by a gross underestimate of the time needed for technical editing.⁸⁴

⁸³ Observation notes October 17, 2005.

⁸⁴ Interview Robert Corell June 26, 2006. The delayed publication of the scientific report was not unusual compared to other scientific assessments from AMAP.

Analysis of scientific process

The process for the ACIA scientific report illustrates that even the scientific core of an assessment involves an interaction between the science and policy spheres. This is most clear at the beginning of the process, where the scope of the assessment, chapter outlines, and lead authors were being decided. The influences are not primarily in the form of policy makers pointing to specific questions to be addressed but in the indirect influences via policy-influenced organizations which provided the networks that were used for involving people. These include the Arctic Council working groups AMAP and CAFF. Also important are experiences from the IPCC and from the US National Climate Impact Assessment. IASC, which is the most scientifically-driven organization involved, appears not to have had as strong a role once the ACIA was formally launched in the Arctic Council setting. The scientific credibility is more vested with the lead authors. Although there are some adjustments to the assessment structure later in the process, there are no major shifts in its emphasis. For example, lead authors who did not follow the initial intention of the assessment were called to question, as was the case for conservation issues, where the interests of one of the Arctic Council working groups responsible for the assessment were not met. It was possible to introduce a new topic after the structure was set – vulnerability. But this was not without controversy, and the initiative of ACIA's chair was instrumental in the inclusion of the chapter in the report.

The interactions with the policy processes are also clear in the inclusion of traditional knowledge. The Arctic Council provided indigenous peoples' organizations with a platform from which they could voice their priorities. Moreover, the norms within the Arctic Council framework would have made it difficult to ignore them. However, interview material indicates that the inclusion of traditional knowledge was further facilitated by ACIA's chair, who saw it as a priority and later presented this inclusion as a unique feature of the ACIA compared to other scientific assessments.⁸⁵

Socioeconomic issues that were not related to indigenous issues do not get this preferential treatment, in spite of clearly expressed wishes from the policy community and concerns raised within the Assessment Steering Committee about the lack of discussion about impacts on industrial development. The protocols do not indicate an active resistance. Rather, the structure of the assessment and the available networks were such that they could not quite accommodate these wishes. The lack of socioeconomic expertise and mandate to assess such effects was brought up by AMAP as a point to bring to the attention of the Arctic Council, but in practice, the responsibility for socioeconomic issues was placed with the individual lead authors.⁸⁶ Consequently questions they did not prioritize were left hanging. Here it looks as if the political priorities did not have much influence on the scientific assessment but rather that the disciplinary structure of academia determined the rule of the game.

As the scientific process developed, socioeconomic impacts also became of question of where the credibility of the assessment was vested. The ACIA executive director, who was lead author of the summary chapter, did not get to include results from older

⁸⁵ Interviews 27, 60, 66, and 70. ACIA Presentation to Joint AMAP/CAFF Meeting April 15, 2004 by Robert Corell.

⁸⁶ Minutes of the Second Meeting of Assessment Steering Group II (ASG II) of the Arctic Monitoring and Assessment Programme. Toronto, Canada, November 8-10, 1999. AMAP Working Paper 99:3.

sub-regional assessments that discussed socioeconomic impact as this went against the wish of the other lead authors. This is in contrast to the success of CAFF-backed efforts to bring the treatment of conservation issues into line with CAFF's needs and a definition focusing on biodiversity. An important question thus becomes how the regime's structures can help bring one aspect forward in a scientific assessment or how the lack of a regime-backed initiative can leave other questions hanging.

Latour discusses how certain scientific understandings are black-boxed in the development of a science.⁸⁷ As time progresses, they are no longer open to scientific discussion but simply taken for granted almost as text-book knowledge. In the ACIA process, the choice of emission scenarios illustrates this point. Although discussed in the modeling and scenarios workshop early in the process, the underlying assumptions of socioeconomic, political, and technological development did not become part of the scientific work in the ACIA. Rather, a group consisting primarily of climate modeling researchers chose one scenario based on their understanding of a general scientific consensus, and this became a black-boxed input into the assessment of impact of climate change. Even if there was critique in the review process and the authors agreed to more clearly justify their choice, the selection of one major emission scenario over another effectively removed a potentially contentious discussion about the role of policy for future emissions from the scientific agenda. The treatment shows how an existing global regime can effectively close off certain issues from scientific inquiry at the regional level.

Compared to the IPCC, the production of the ACIA science report could be described as a process in which science and policy are both closer and further apart. They were closer in the sense that both the scientific process and the policy outcome were both Arctic Council activities, whereas scientific assessment and climate policy at the global level are divided into the IPCC and the UNFCCC, a separation that came about because of the political nature of the climate issue. One consequence of this close formal tie in the Arctic Council was the expectation that the assessment deliver its results in time for ministers to make some policy response at a specific meeting. Another was that tensions in the policy process could easily spill over into the scientific assessment activities. In fact, the delay in production of the science document became part of a political game, which will be further discussed in connection with the policy process and overview document. There was also pressure from the assessment leadership for the lead authors to address some policy relevant questions.

The scientific and policy processes can also be described as further separated compared to the global level because there was no attempt in the scientific report to involve government representatives in negotiating text, as is the case for IPCC's summaries for policy makers, where the scientific leadership and government experts have had long detailed discussions before agreeing on the final text. An ACIA lead author with experience from the IPCC described this: "What we have with the IPCC in the summary for policy makers is something every single nation, 100 plus nations have said, we accept, literally accept the accuracy of this document ... it was an agonizing four days ... chairing this ... but when you are done you have that ownership that gives the report a permanence that means it can't be ignored. You can't say that you don't own it."⁸⁸

⁸⁷ Latour, *Science in Action*, 2-3.

⁸⁸ Interview James McCarthy, November 4, 2004.

In ACIA the question of ownership was left for policy makers to negotiate in a separate policy process (see section 5.4 of this chapter).

The timing for the ACIA was set by the global regime for knowledge production about climate change – the IPCC – in that the ACIA was framed as an activity that would deliver a regional impact assessment in time to be used in the fourth IPCC assessment due in 2007. Thus one can say that the Arctic actors, as the process was defined, were not completely free to choose their own time frame. One consequence of this was that the ACIA did not have enough time to develop the regional climate models that the scientific community viewed as a priority. Instead, the assessment became based on the global models and their output for the Arctic. In relation to UV issues, the connection to IPCC's timetable appears to have made it more difficult to coordinate with the global ozone assessment conducted by the WMO, where the ties were not present from the beginning and therefore difficult to establish.

5.3 The overview document

ACIA's implementation plan, as it was approved in Barrow in 2000, includes the production of a summary document. It is described as "[a] comprehensive summary that synthesizes the main findings of the assessment and places in a policy-makers framework the state of our knowledge concerning the consequences of climate change over the entire Arctic region." For an analysis of science-policy interactions such a document is interesting because it is more likely to be read by a wide audience, including policy makers, than a detailed scientific report. If the messages in the report do not support a certain climate policy, there may be an increased need for policy makers to either control the content or discredit or distance themselves from it. At the same time, actors agreeing with its major messages may feel a need to protect its scientific credibility. The dynamics of how ownership over the document becomes decided and how it is framed in relation to the other ACIA documents can thus be used to analyze the tensions between science and policy in the ACIA process.

Taking shape

The implementation plan lays out how the summary document is to be produced: "This volume will be prepared by the ASC [Assessment Steering Committee] in concert with a scientific editor and lead authors in a simple, jargon-free language meant for policy-makers and the broader public, and will be subjected to peer review guided by the ASC." In ACIA's jargon, this document later became the "overview document." The responsibility for writing it was placed with a science writer, who worked closely together with the ACIA graphics expert.⁸⁹ Formally, the responsibility for the overview was placed with the Assessment Integration Team.

By the cross-fertilization meeting in New Hampshire in March 2003, the science writer and graphics expert were part of the ACIA process and this meeting marked their first

⁸⁹ Summary Report of the Ninth Assessment Steering Committee (ASC) Meeting 2-5 June, Asker, Norway.

interaction with the authors working on the scientific report. Based on these discussions and drafts of the science chapters, a list of key findings was developed that later became a structuring principle for the overview. The science writer and graphic artist had an idea early on of structuring the material differently than the chapter divisions of the scientific report: "The idea was that it was going to ... be these integrated themes and we would use a lot of case studies and explain the thing in a storyline manner."⁹⁰ When they started preparing a manuscript however, the structure of the scientific document was used to lay out the initial version of the overview. This initial draft version was sent out to lead authors for comment in the summer of 2003. At an informal meeting to present ACIA's results to the Senior Arctic Officials on Svalbard at the end of the summer, the science writer presented her ideas on the overview for the policy community.⁹¹

When the science writer and graphic artists next met the lead authors at the Assessment Steering Committee meeting in London in the fall, the science writer put out a request for more input. The main comments concerned the structure of the document with some wishes to place the major impacts more up front, where they would catch the attention of politicians, while others emphasized the need to follow the same sequence as in the scientific document. A specific concern was how to best trace material in the overview to the scientific document, as had been done in the overviews produced by the IPCC. There was also a discussion about the need for careful review of the overview.⁹² The science writer and graphic artist afterwards described this meeting as coming back full circle to their original idea for a more integrative approach.⁹³

In addition to the formal discussion, the meeting also offered the overview team opportunities to meet with lead authors and to discuss how the different sections of the science document would be best presented. They describe these meetings as a venue for synthesizing the information in a way that it had never been presented before:

For example, the climate change indicator graphics ... It's a new accumulation of content that has been separated out in a different way before.⁹⁴

We wish we had started way earlier with a process like that because we could have created something much more original and perhaps more effective of the stuff we want to show than to just draw on existing published literature.⁹⁵

They made a point about how meteorological data from a particular place could have been effectively integrated with indigenous knowledge in the same layout and thereby create a stronger message.⁹⁶

Central to the introductory part of the overview are the key findings, and the discussion about them illustrates how the wish to make a strong, policy-relevant message at times came in conflict with keeping the science and policy spheres separated. For example,

⁹⁰ Interview Susan Joy Hassol October 16, 2003.

⁹¹ Interviews 2, 3, and 12.

⁹² Observation notes from London meeting of the Assessment Integration Team October 14, 2003.

⁹³ Interview Paul Grabhorn and Susan Hassol, October 16, 2003.

⁹⁴ Interview Paul Grabhorn, October 16, 2003.

⁹⁵ Interview Susan Joy Hassol, October 16, 2003.

⁹⁶ Interview Susan Joy Hassol and Paul Grabhorn October 16, 2003.

during the Assessment Integration Team meeting in London, ACIA's chair argued for a clear strong message about human-induced climate change, while other voices in a lively discussion stressed the importance of keeping the sequence of science-overview-policy very clear. This discussion also raised issues about the "ownership" of the overview. Whereas several of the scientists and organization representatives at the meeting wanted to enter into specific discussions about language, the science-writer-graphics team emphasized the difficulties of word-smithing, i.e. formulating language, in such a large group.⁹⁷

Right after the meeting, a new version of the key findings and a new outline of the overview organized around the ten key findings was distributed to the Assessment Steering Committee with a request to review them to "assure ourselves that these are the essential ones."⁹⁸

According to the Assessment Steering Committee protocol, the next draft of the overview was to be ready by mid-January, the same date as was set for the final version of the scientific report, giving the lead authors a week for comments. The tight time table was set to meet the time lines of the policy process. Later it became clear that the policy community also wanted a national review of overview document.

The review process

According to ACIA's implementation plan, the overview was to be subject to peer review guided by the Assessment Steering Committee, and in London, they discussed how this review was to be conducted.⁹⁹ The procedure that emerged was that lead authors were to review the entire document to ensure that their material was correctly represented. In addition, the Executive Committee of the Assessment Steering Committee would go through the document line by line. In the eyes of the team working on the document, it was the Assessment Steering Committee that could give it legitimacy.¹⁰⁰

However, by now the United States had become very sensitive about the ACIA process, including the role of the overview, making allegations to the ACIA chair that it was being used to influence policy.¹⁰¹ It also became clear that the United States would request that the overview should go out for a national review. This shift can be interpreted that, at least for US policy makers, the scientific legitimacy vested in the Assessment Steering Committee was not sufficient enough to give the overview legitimacy. Instead legitimacy included policy-community-steered inputs into the document in a process that was more similar to IPCC's summaries for policy makers. Another interpretation is that the United States wanted to stall the overview because of its potential policy impacts.

The additional review made the time table for producing the overview tight. In addition to the review itself, there had to be enough time to do any revising and to finish the final version of the document before it was to be formally delivered to the AMAP

⁹⁷ Observation notes October 14-16, 2003.

⁹⁸ Letter from Bob Corell to Members of the Assessment Steering Committee and the Assessment Integration Team. Copy received from Robert Corell Nov 17, 2003

⁹⁹ ACIA implementation plan September 2000

¹⁰⁰ Observation notes London October 18, 2003

¹⁰¹ Interview Robert Corell November 25, 2003 and Interview 25.

Working Group and CAFF Working Group at their joint meeting in April 2004. After a round of comments from lead authors and discussions among the ACIA Executive Committee and chapter liaisons, a new draft was circulated in early February to AMAP, CAFF, IASC, and external reviewers, with comments due on March 12.¹⁰² Comments were then compiled ready to be discussed at a meeting of the Assessment Integration Team in Copenhagen March 22-24.

One whole day of the two-and a half day meeting in Copenhagen was devoted to a discussion of the review comments and how to incorporate them into the overview document. The comments ranged from general notes about structure, references, and content to specific suggestions for changes in wording. Most countries had provided the summaries as a national review. The exception was the United States, where the comments were given by individuals. In total, the compilation of review comments was over 150 pages.¹⁰³ At the review comments meeting, the science writer and a person in the Assessment Integration Team presented their perceptions of the comments and how they could be met, after which there was a more detailed discussion. Most of this stemmed from a memo from the science writer, where she had suggested changes to meet the major criticisms.¹⁰⁴

The Copenhagen meeting also featured a discussion about a potential preface for the overview. Based on discussion at the New Hampshire meeting a year earlier and a model that had been used in an AMAP report, *Arctic Pollution Issues 2002*,¹⁰⁵ the Permanent Participants had started to prepare a preface that placed the ACIA overview in context of the indigenous peoples of the North.¹⁰⁶ When the idea was presented to the Assessment Integration Team, it was at first met with silence. At this point in the ACIA process, anything that took up policy issues had become very sensitive. ACIA's chair laid out how the US State Department believed that the ACIA was using the overview to press a policy agenda and that it had used this belief the previous November to try and stop the overview. With that situation worked through, he was reluctant to take any action that would jeopardize the overview again. Others around the table also expressed discomfort about having something that could be seen as policy recommendations in the overview. For the Permanent Participants, the situation was different. The lack of progress in the policy process had made it important to find other fora to deliver a message from the indigenous community in the Arctic. The lack of preface could also raise questions about the legitimacy of the report to their constituents in the Arctic. One person said that if you do not have a preface, it is one more report done by outsiders. A preface would help engage the indigenous community. The Assessment Integration Team did

¹⁰² According to ACIA Secretariat's timetable dated December 19, 2003.

¹⁰³ Arctic Climate Impact Assessment Overview Report Expert Review – Master Collation March 15, 2004 and Addendum to the Collation March 17, 2004.

¹⁰⁴ Memo to AIT from Susan Hassol Regarding Review Comments 3/18/04; Observation notes March 23, 2004.

¹⁰⁵ AMAP, *Arctic Pollution Issues 2002*.

¹⁰⁶ For a perspective from the Inuit Circumpolar Conference and the proposed text, see Shiela Watt-Cloutier, Terry Fenge, and Paul Crowley, "Responding to Global Climate Change: The View of the Inuit Circumpolar Conference on the Arctic Climate Impact Assessment," in *2° is too much! Evidence and Implications of Dangerous Climate Change in the Arctic*, ed. Lynn Rosentrater, 57-68 (Oslo: WWF, 2006), 61-62.

not make any definitive decision. The advice was to continue to draft but to not give it to the United States. Hope was placed with the policy process – that it would get going again and make it less urgent for the Permanent Participants to use the overview as a policy arena.¹⁰⁷

This episode illustrates the balancing act between the need for scientific independence and credibility versus the wish to include indigenous peoples' concerns and how this balance is colored by the sensitivities of climate policy in general and the difficulties in the ACIA policy process in particular. One could interpret this as an increased need to keep science independent of policy when an issue is politically controversial – a need which was not as apparent in the preparation of the previous AMAP report on which the idea of an indigenous peoples' preface was modeled. In the background was not only global climate policy but also the colonial history of the Arctic and the role that science had played in that history with outsiders coming in and framing the picture of the Arctic. A question that was not spoken out loud but nevertheless was underlying the discussion about the preface was whose interests the ACIA should serve. This interpretation is supported by an interview about the scoping workshop in Washington in 1999, during the initial phase of the ACIA, where a representative of one of the Permanent Participants in the Arctic Council asked the question of who the assessment's client really is: the climate science community or the people living in the region.¹⁰⁸ This discussion also illustrates different views about the interface between science and policy. For the scientists and organization representatives on the Assessment Integration Team, the scientific credibility was the essential guiding principle, which was not allowed to be put at stake by political concerns. Or pushing the interpretation one step further, scientific independence was seen as essential for ACIA to have any policy impact. The Permanent Participants were in a position where a division of science and policy was not as necessary or even desirable. On the contrary, a closer interaction, including the participation in knowledge production, increased legitimacy for their constituency.

The question of legitimacy and ownership also came up in discussion, but from a different angle, during one of the lunch breaks at the Copenhagen meeting when there was a disagreement over who had the formal responsibility for the content of the overview: the Assessment Steering Committee or AMAP and CAFF.¹⁰⁹ In the words of ACIA's chair: "AMAP is worried ... about the political aspects of it and they are trying to solve the political aspects by suggesting that they might have some word changes. In my view, that would violate the scientific integrity of the document, so I am very strong in that position and I will not allow that to happen."¹¹⁰

The political aspects that came out clearly through the review process was the criticism from the United States national reviews on the content of the overview, which was described by one reviewer as "a host of problems" with a listing that included concerns about "statements contradicting what's in the underlying chapters" and issues that painted too negative a picture: "Frequently the impact of economic development are

¹⁰⁷ Observation notes March 22, 2004.

¹⁰⁸ Interview 27.

¹⁰⁹ Observation notes March 23, 2004.

¹¹⁰ Interview Robert Corell, March 24, 2004.

characterized in negative terms ... without noting the various ways such developments also enhance human well-being and reduces environmental problems.”¹¹¹

Even if there were no official US national review comments but rather a collection of several individual inputs, at this point it was clear that there were questions about the extent to which the United States would be willing to stand behind ACIA’s reports.¹¹² ACIA’s chair, however, continued to assert the scientific independence of the process. For example, it was his expectation that his presentations before the AMAP Working Group and CAFF Working Group, which are political bodies with national representatives, would be about how the process had been followed, and not on the content of the report.¹¹³ Three weeks later when he made his presentation at a joint AMAP-CAFF meeting in Oslo, this was also his emphasis. For example, referring back to ACIA’s implementation plan, he pointed out that the final version of the overview would go back to the lead authors of the science document, who would formally sign off that the content was in line with the scientific report.¹¹⁴

At the AMAP-CAFF meeting, the issue of “sign-off” generated a lengthy discussion. The tone was set by the US representative who made it clear that it was important to take things in “proper sequence,” i.e. they had to wait for the authors’ sign-off before they could do anything.¹¹⁵ One issue was that the overview was not ready in its final version, but a critical question was also on what the AMAP-CAFF sign-off would entail. In previous assessments, the AMAP Working Group had never adopted the scientific report. As one delegate expressed it: We can never get universal agreement on what is in the documents. That’s a scientific process.¹¹⁶ During an interview, one of the delegates at the meeting described the documents as follows: “These two documents are scientific documents prepared by scientific experts and indigenous experts so they stand on their merits as scientific documents.”¹¹⁷

The overview document was thus placed into the scientific realm, in contrast to the popular science versions of previous AMAP reports, which had been discussed in detail by the AMAP Working Group and presented as theirs. With that as the general understanding around the table, the discussion focused on how to formulate a cover letter or preface that described the process, specifically the role of AMAP and CAFF. In my interpretation, this was to create a certain distance between the overview (and science sphere) and the policy sphere. This task was forwarded to a small drafting team. An early draft of this transmittal letter, or preface, placed the sole responsibility for the content of the ACIA overview with the experts from the scientific and indigenous communities and stated that AMAP and CAFF accepted the ACIA science and overview

¹¹¹ Arctic Climate Impact Assessment Overview Report. Expert Review - Master Collection March 15, 2004, 7-8.

¹¹² The US delegate to AMAP in an interview described it as follows: “In the US, we did do a national review but it was in the form of finding additional peer reviewers that we selected independently of the ACIA, who commented in their capacity as experts. So there was no official US government review of either of these documents.”

¹¹³ Interview Robert Corell, March 24, 2004.

¹¹⁴ Observation notes April 15, 2004. Presentation at the Joint AMAP-CAFF Meeting Oslo, April 15, 2004 by Robert Corell.

¹¹⁵ Interview 24.

¹¹⁶ Observation notes April 15, 2004.

¹¹⁷ Interview 24.

documents based on how the ACIA process had been carried out. However, the exact wording became controversial and in a later version the phrasing creates a much more clear line of responsibility between the scientific and the policy communities: “We concur that the process described in the ACIA Implementation Plan has been followed, resulting in the two documents that were prepared by a large group of scientific and indigenous experts, who are solely responsible for the content of both documents. AMAP and CAFF have received acknowledgements by the lead authors that the final scientific document reflects their expert view, and that the overview Document is consistent with the Scientific Document.” There is no accepting or endorsing of the document, merely a “pleased to present these reports.”¹¹⁸

There was no clear decision at the meeting whether the text would be a preface or transmittal letter. In the final printed version of the overview there is no text including the negotiated paragraphs.

ACIA’s placing of the overview in a science-only domain was also apparent at an informal meeting of the Senior Arctic Officials in Nuuk, Greenland, just after the joint AMAP-CAFF meeting. The Nuuk meeting had been organized by the Danes as a way to get the policy process moving, but on the formal agenda was a presentation of the science in the ACIA and the overview. ACIA’s chair had brought two lead authors who were also members of the Assessment Integration Team. Their presentations laid out the connections between the overview and the science document.¹¹⁹

As the final version of the overview was completed, lead authors were asked to formally sign off on the document as laid out during the process discussed at the joint AMAP and CAFF Meeting. After this and the technical production of the document, it was ready in time for the ACIA Scientific Conference in Reykjavik November 9-12, 2004. The day before the conference, the document had been presented in press conferences in several Arctic Countries, with wide-ranging media coverage (see further discussion in section 5.5).

Analysis of the overview process

In contrast to both the IPCC and previous AMAP assessments, the ACIA placed the summary of the scientific report that was intended for a wider audience, including policy makers, apart from the policy domain and clearly with the scientific domain. For instance, the responsibility for the content was placed only with the lead authors of the scientific reports and not with the politically mandated AMAP Working Group and CAFF Working Group. The report was thus presented as attaining its credibility from science rather than from a political negotiation process. There appears to have been very little discussion about this point as judged by the formal record. The only apparent dissent comes late in the process and as an informal discussion among some members of the Assessment Integration Team.

The arrangement appears to have benefited both sides. The policy community, in particular the United States, did not have to take political responsibility for the scientific

¹¹⁸ Appendix 1. Annex 7. Minutes of the 3rd Joint AMAP- CAFF Meeting, Oslo, Norway 15-16 April 2004 in AMAP report 2004:1

¹¹⁹ Interviews 26, 27, 28, and 45.

outcome of the assessment. The scientific community, as it was embodied in ACIA's Assessment Steering Committee, could keep the controversies in the policy process and attempts from the United States to delay the process at bay. This action can be understood, as Gieryn uses the term, as effective boundary work, i.e. the attribution of selected characteristics to the institution of science for purposes of constructing a social boundary that distinguishes some intellectual activity as non-science.¹²⁰ In the case of the ACIA, policy makers may have wanted to be sure that they would not be forced by science into making policy decisions that were not the right ones within their sphere of analysis. Scientists, on the other hand, did not want to be limited by political sensitivities connected to either global climate negotiations or internal national politics when describing the impacts of climate change.

Such separation has been at the heart of the scientific endeavour since the scientific revolution. As Shapin points out, it has been a way to ensure the moral and political authority of science.¹²¹ It also reflects Latour's point that modernity has divided the authority to describe nature to science and made that distinct from the political sphere.¹²² Indigenous perspectives brought forward, in connection with discussing the possibility of a preface, provide a contrast to this norm of separating the authority between science and policy. It also illustrates that although the structure of the relationship between knowledge production and political decision making is a strong norm, it is not set in stone. In fact, the different models for constructing a synthesis of knowledge for policy makers, as exemplified by IPCC's summaries for policymakers, AMAP's popular science reports, and ACIA's overview document, illustrate how that boundary is constantly negotiated.

Lidskog and Sundqvist describe boundary work as a concept that can be used to enhance our understanding of how the value of knowledge is to be decided.¹²³ One way to interpret the strong US position of not "accepting" or "endorsing" the overview document could thus be that the United States did not give the knowledge provided value from a policy point of view. There was no commitment that it would inform policy. This role lies, instead, with the politically negotiated policy document (further described in section 5.4). Considering the controversial nature of climate politics, where many issues other than the impact of climate change are at stake, this playing down of science should not come as a complete surprise. Moreover, the AMAP Working Group and the CAFF Working Group are at a rather low level in the political hierarchy, with most delegates being administrators in government agencies. At the time of the overview's "approval process" there was an on-going policy process at the higher political level – among Senior Arctic Officials who were generally from the ministries of foreign affairs. This bowing to the higher policy level comes out very clearly in the AMAP-CAFF discussions at the April joint meeting about ACIA follow-up, when several countries

¹²⁰ Gieryn, "Boundaries of Science," 405.

¹²¹ Steven Shapin, *The Scientific Revolution* (Chicago and London: The University of Chicago Press, 1996), 164.

¹²² Latour, *We Have Never Been Modern*.

¹²³ Lidskog and Sundqvist, "The Roles of Science in Environmental Regimes: the Case of LRTAP," 184.

pointed out that AMAP and CAFF could not take any initiatives on their own because Senior Arctic Officials had taken over the policy process.¹²⁴

How does this division of responsibility between the Assessment Steering Committee on the one hand, and AMAP-CAFF on the other, affect the credibility of the overview? A long answer to this question would require questionnaires or interviews that were not conducted within this project. However, it is clear that the credibility formally rests with the scientific document and it thus became a problem for the overview when the science report was delayed and not available until over half a year after the overview was released. One senior climate scientist has mentioned this as a credibility problem that the IPCC have previously avoided by having the scientific reports ready at the same time.¹²⁵

5.4 The policy process

ACIA included a policy process, which eventually resulted in a policy document. Internationally, climate policy has been an issue for global negotiations, and regional arenas have not played a major role in framing policy concerns. However, with the progress being slow at the global level, regional arenas could potentially provide alternative negotiating opportunities. The Arctic is particularly interesting in this context as the Arctic countries are responsible for a large share of global emissions and include major international actors, such as the United States and Russia. Key questions are thus: What can one learn from the ACIA process about this potential? What dynamics were the most important for the eventual outcome of the process?

This section describes the ACIA policy process as it developed chronologically. Because of the nature of the process, including the confidential negotiations, there is only limited written documentation. Also, I was not present as observer at any of the policy document drafting meetings. This section, therefore, relies heavily on interview accounts. An effort was made to talk to a range of parties, including policy representatives of all major actors in the process.¹²⁶ However, several interviewees were in a position where they could not speak openly about their impressions or positions. In order to protect confidentiality, attribution of sources is often made only to interview numbers rather than to names.

The early phase

In documentation from early discussions about an Arctic climate impact assessment, there is no mention of a separate policy document. Rather, policy makers are seen as part of the process in producing a summary for policy makers, for example in an IASC discussion paper for successful assessments: “The selection of what’s to be included

¹²⁴ Annex 7 Minutes of the 3rd Joint AMAP- CAFF Meeting, Oslo, Norway 15.16 April 2004 in AMAP report 2004:1; Observation notes Joint AMAP-CAFF Meeting April 15-16, 2004.

¹²⁵ Interview Bert Bolin, September 15, 2005.

¹²⁶ All Arctic countries except Russia, Permanent Participants (Inuit Circumpolar Conference and Saami Council) as well as the chair of the Policy Drafting Team and the Senior Arctic Officials. A list of all people interviewed in the dissertation is included in Appendix II.

should preferably be done in co-operation with those having requested the analysis. This is important in order to involve the non-scientific community in order to make the summary as relevant as possible and to involve the non-scientific community and in particular politicians that may be involved in transforming policy into action.”¹²⁷ Records from the early meetings of the Assessment Steering Committee, which was established when the ideas of IASC were joined with initiatives in AMAP and CAFF, also do not indicate any discussion of a policy document. But the idea of such a document must have been on the radar, because it shows up in a presentation of the ACIA in an AMAP Working Group meeting in November 1999 and again in the presentations by ACIA’s chair for the Senior Arctic Officials in both Washington in November 1999 and in Fairbanks in April 2000 as one of three documents anticipated to come from the study: “A policy document that makes recommendations based on analysis.”¹²⁸

From the beginning, the exact relationship between the policy process and the scientific assessment are not clear. This is a politically sensitive issue that reappears in the final year of the assessment and illustrates the tension between policy and scientific spheres. However, as early as the Fairbanks meeting in April 2000, several delegates expressed a need for a clear distinction between the science assessment and policy recommendations. By June that year, the Assessment Steering Committee talked about policy recommendations as something that “AMAP and CAFF will make to the Arctic Council after the scientific assessment is complete.”¹²⁹ As working groups under the Arctic Council, AMAP and CAFF are bodies with national political representation and their negotiations are based on political mandates. In the beginning of September, the AMAP Working Group and CAFF Working Group held a joint meeting where the ACIA was a major task on the agenda. They agreed that AMAP and CAFF would jointly follow up the scientific assessment with policy recommendations and that there was a need to start thinking about the process for developing such a document.¹³⁰

In October 2000, the ACIA was on the agenda for the Arctic Council ministerial meeting in Barrow, with expectations of a formal go-ahead from the highest political level. As mentioned earlier, there were some questions about the relations of these recommendations to science, but from the perspective of the Permanent Participants, the issue appears to have been quite clear. Recalling the Barrow meeting, one indigenous peoples’ representative has described the inclusion of a policy document as a very deliberate strategy: “We knew very early on that we wanted to ensure that this wasn’t just some sort of academic assessment. We wanted to be able to utilize the Barrow Declaration to make sure we got in policy recommendations.”¹³¹ At the other end of the spectrum was the United States who, according to the written record, brought up the global arena in such a way that one could only interpret it as a scepticism towards the role of

¹²⁷ Some principles for conducting Scientific Assessments by IASC (A sketch by Bert Bolin). Discussion paper prepared for IASC’s Executive Committee January 28, 1999.

¹²⁸ Arctic Council Senior Arctic Officials Meeting, Fairbanks, Alaska, April 27-28, 2000. Minutes revised 10/12/00. Agenda Item 7.

¹²⁹ Summary Report of the 5th Assessment Steering Committee (ASC) Meeting, June 15-16, 2000, Danish Polar Center, Copenhagen, Denmark.

¹³⁰ Minutes from the Joint meeting between AMAP and CAFF regarding ACIA, September 4, 2000, Trondheim Norway.

¹³¹ Interview 27.

the Arctic Council in the context of climate policy: “The impact of climate change was predicted to be most serious in the polar regions and that is proving to be true. It will be fixable only with global action, not just by the people in the region.”¹³² However, the written documentation does not indicate any outspoken opposition to having a policy document, rather the opposite. Several country representatives mentioned the need for policy conclusions, albeit with different forces in their emphasis:

It is important to draw policy recommendations. (Finland)

We must use the information in the policy making process. (Denmark/Greenland)

We emphasize the political implication of this work by advocating strong ACIA-SAO [Senior Arctic Officials] links. (Norway)¹³³

The implementation plan adopted at the Barrow ministerial meeting indicates that there was agreement on the need for a policy document. Under the bullet point “Policy Document,” it sets out that

AMAP and CAFF will produce a final document and will relate the information from the synthesis and scientific documents to the policy needs of the Arctic Council and provide recommendations for follow-up actions. AMAP and CAFF will address the question of what strategies can be recommended to cope with the current environmental stresses, and possibly lessen the impact of these changes in the climate and ultraviolet radiation. These recommendations will include advice relevant to national and international policy as well as advice to inhabitants of the Arctic. AMAP and CAFF will present a plan for the SAOs [Senior Arctic Officials] on how this document shall be elaborated.¹³⁴

Compared to the early discussion of the ACIA within IASC, there had been a shift in focus from an assessment where policy makers could recognize that their knowledge needs are met to producing an additional document with policy advice. How should this transition be understood? For background, it is useful to look at previous reports produced by AMAP. They included politically negotiated executive summaries with policy recommendations, which several actors have pointed to as being important for shaping global environmental policy.¹³⁵ Even if there is no precedent for a separate policy document within the Arctic Council setting, it is still clear that there is a contrast between the executive summaries in the AMAP reports and the IPCC norms of being policy relevant but not policy prescriptive.¹³⁶ The executive summary of the first AMAP report features several examples of policy prescriptive advice, including recommenda-

¹³² Arctic Council. Notes from the Second Ministerial Meeting. Barrow, Alaska, U.S.A. October 12-13, 2000.

¹³³ Arctic Council. Notes from the Second Ministerial Meeting. Barrow, Alaska, U.S.A. October 12-13, 2000.

¹³⁴ Implementation Plan Version 3.7. as presented the Arctic Council Second Ministerial Meeting, Barrow, Alaska, U.S.A. October 12-13, 2000.

¹³⁵ AMAP, *Arctic Pollution Issues 2002*; Downie and Fenge, *Northern Lights Against POPs*.

¹³⁶ IPCC, *16 Years of Scientific Assessment in Support of the Climate Convention*, 2.

tions to establish a legally binding regime on persistent organic pollutants.¹³⁷ Experiences from the Arctic regime thus appear to have played a role in shifting the formula from a summary for policy makers (an IPCC model) into the more explicit policy recommendation domain. However, something else also made it important to separate the policy recommendations from the scientific report and the overview, in contrast to the previous AMAP model. As discussed in section 5.3 of this chapter, the highly contentious nature of climate policy may have played a role, especially in light of opposing positions among the Arctic countries. Another reason could be the influence of the IPCC norms to not mix science and policy prescriptive advice. The organizational structure of the ACIA process may also have played a role, where the Assessment Steering Committee was not a political body with national representatives, in contrast to the AMAP Working Group and CAFF Working Group. The ACIA would thus not have had any political mandate to negotiate a policy document.

The Policy Drafting Team

Despite some precedents from AMAP, it was unclear how the policy process should be set up. A complicating factor was that ACIA was a joint project between IASC, AMAP, and CAFF. At AMAP and CAFF's second joint meeting in Stockholm of August 2001, the task at hand was discussed and a decision made to: "use a handout developed at the meeting as a basis for a proposal to the SAOs [Senior Arctic Officials] for preparing the ACIA Policy Document. The AMAP and CAFF secretariats are charged with scoping out the proposal for review by the WGs before submission to the AC [Arctic Council] secretariat."¹³⁸

The end result of these discussions was a Policy Drafting Team that was to be co-chaired by the chairs of AMAP and CAFF. Each country was invited to nominate a person, as were each of the Permanent Participants, for a total of fourteen individuals.¹³⁹ One of the co-chairs of the Policy Drafting Team has described the group as consisting of three kinds of participants. Some countries had nominated climate negotiators while others had nominated science-policy oriented people, and the Permanent Participants were the watch-dogs over the process.¹⁴⁰ For example, Sweden, Finland, and Denmark had climate negotiators in the group while the United States had chosen a person outside the climate policy community.¹⁴¹ The organizations with observer status in the AMAP Working Group and CAFF Working Group had no representation in the Policy Drafting Team. This includes IASC but also the World Wide Fund for Nature (WWF). A representative for the WWF has commented that this made the process very closed, compared to the working groups. Representation would have ensured some transpar-

¹³⁷ Executive Summary in AMAP. *Arctic Pollution Issues* Oslo: Arctic Monitoring and Assessment Programme, 1997, xi-xii

¹³⁸ Minutes of the 2nd Joint AMAP-CAFF Meeting, Stockholm, Sweden, 31 August 2001.

¹³⁹ Background Paper. "Preliminary Science and Policy Perspectives from the ACIA" Prepared for the Informal Meeting Organized by the Norwegian Ministry of Foreign Affairs and the Senior Arctic Officials of the Arctic Council. Svalbard, Norway August 5-7, 2003.

¹⁴⁰ Interview 3.

¹⁴¹ Interviews 10, 25, 74, and 64.

ency and more semblance of democratic open process.¹⁴² The CAFF executive secretary and chair describe the process as a negotiation where important interests were at stake, which created a need to keep the process closed. The parties were represented by negotiators and so this was no longer only about science.¹⁴³ As seen by CAFF's executive secretary, AMAP and CAFF were facilitators of the process, which implies a more limited role than what the AMAP Working Group had previously had in formulating policy advice, i.e. when negotiating the executive summaries of earlier assessments.

The Policy Drafting Team met for the first time during the cross-fertilization meeting in New Hampshire in March 2003. At this meeting, the major issue was to define the task. Based on a draft table of contents presented by a representative for the Inuit Circumpolar Conference, the group produced an outline of what a policy document could contain.¹⁴⁴ Already clear at this early point was the US sensitivity to anything connected to the global climate negotiations. As a result any mention of the Kyoto Protocol was out from the start.¹⁴⁵ The team also agreed on a process in which the members were to deliver texts that the secretariat would compile into one document. The result of this was a rather extensive text, which served as a starting point for the next meeting of the Policy Drafting Team, in Copenhagen May 17, 2003. Key to the continued process was the troika that was appointed by the group to continue drafting together with the AMAP and CAFF secretariat.¹⁴⁶ After their efforts and internal work within the AMAP secretariat, a new draft was sent out July 8, 2003, to all lead authors of the ACIA to get their assurance that the policy recommendations had backing in the scientific document.

At this point, time pressures started to mount. Not only was there the deadline of the 2004 Arctic Council ministerial meeting and the ambition to have a policy report printed and ready for distribution together with the scientific and overview reports but there was also an up-coming informal meeting with the Senior Arctic Officials. At the Rovaniemi Arctic Council meeting, it had become clear that the Senior Arctic Officials wanted to keep up-to-date on developments in the ACIA. The AMAP co-chair of the Policy Drafting Team has described this as the Senior Arctic Officials wanting to have information on what policy issues would come on the table and the direction of the policy document, but without direct interference in the process.¹⁴⁷ Still in the background were also some questions about the line between the scientific, overview, and policy documents.

As a result of the expressed wish to be informed, Norway invited the Senior Arctic Officials to an informal meeting on Svalbard in August 2003, where the progress for ACIA's different documents would be presented. This was a closed informal meeting with no official record.¹⁴⁸ There was a suggestion about recording the chairman's notes,

¹⁴² Interview Samantha Smith, April 15, 2004.

¹⁴³ Interviews with Magdalena Muir, March 24, 2004 and Kent Wohl, April 15, 2004.

¹⁴⁴ Interviews 5, 10 and 27.

¹⁴⁵ Interview 5 and 10.

¹⁴⁶ Interviews 4, 5, 10, 74.

¹⁴⁷ Interview Policy Drafting Team co-chair Helgi Jensen, August 21, 2003

¹⁴⁸ Letter to members of the Arctic Council and Permanent Participants from the Norwegian Royal Ministry of Foreign Affairs (Kim Traavik). February 21, 2003; Rapport från möte angående Arktiska rådets ACIA-arbete (Arctic Climate Impact Assessment), Longyearbyen (Ny Ålesund, Svalbard, 5-7 augusti 2003. Miljödepartementet. PM 2003-08-08.

but this was met with resistance from several participants. The Policy Drafting Team co-chair from AMAP describes this discussion: "I was against it, because regardless of whether you say a paper exists, when it comes out, it does exist ... and even a non-paper will bind up part of the process."¹⁴⁹ This illustrates that there was awareness that the policy process could run into situations that might require some flexibility.

At the meeting, the work of the Policy Drafting Team was laid out in a three-page background document and in a presentation by the Policy Drafting Team co-chair.¹⁵⁰ His aim was to avoid detail but to discuss the overall structure of the document and he asked the delegations to funnel their reactions via their representatives on the Policy Drafting Team. He interpreted the reactions as generally positive, with some points for discussion, for example the balancing of the indigenous/non-indigenous issues in the presentation and also some input from climate negotiators on being clear about the need for emissions reductions.¹⁵¹

On one level, the work of the Policy Drafting Team thus got the go ahead from the policy makers. However, an event during the presentation of ACIA's scientific report turned out to be the early rumblings of future controversies in the policy work. The event was after a presentation on modeling when the US climate negotiator tried to discredit the models being used by ACIA and referred to a recent article that indicated that warming occurred in the Arctic in the 1920s and 1930s and that cooling followed.¹⁵² The ACIA chair has described these events: "I was happy with the outcome, but I tell you I was pretty scared 'cause he could have killed the whole meeting."¹⁵³ Two people from within the ACIA process, who were present at the meeting, viewed the impasse from the US climate negotiator as a way to obstruct the process, including making statements such as "just taking this opportunity to try to sandbag the process" and "it was clear that the idea was to use scientific arguments to undermine or to make the basis for any decision so weak that it would be possible to say that we don't know anything."¹⁵⁴ Was this an indication that the United States had woken up to the policy implications of the ACIA and had a need to get involved at a higher policy level than it had previously been? I suggest that it does. At Svalbard, the United States chief climate negotiator was present and a source privy to the US internal discussions indicated that the United States felt a need to get the process in line with the way climate was handled internationally.¹⁵⁵ Within the context of the policy process as a whole, a Nordic climate negotiator has described the situation as Washington waking up and obstructing the process because they didn't want policy recommendations, and another participant de-

¹⁴⁹ Interview Policy Drafting Team co-chair Helgi Jensen, August 21, 2003.

¹⁵⁰ Background Paper. "Preliminary Science and Policy Perspectives from the ACIA" Prepared for the Informal Meeting Organized by the Norwegian Ministry of Foreign Affairs and the Senior Arctic Officials of the Arctic Council. Svalbard, Norway August 5-7, 2003.

¹⁵¹ Interview Policy Drafting Team co-chair Helgi Jensen, August 21, 2003.

¹⁵² Rapport från möte angående Arktiska rådets ACIA-arbete (Arctic Climate Impact Assessment), Long-yearbyen (Ny Ålesund, Svalbard, 5-7 augusti 2003. Miljödepartementet. PM 2003-08-08; Interview ACIA's chair Robert Corell August 14, 2003.

¹⁵³ Interview Robert Corell, August 14, 2003.

¹⁵⁴ Interviews 1 and 3.

¹⁵⁵ Interview 25.

scribed the US actions at Svalbard indicating that they were hesitant about the process.¹⁵⁶

At the next meeting of the Policy Drafting Team – in London in the beginning of October 2003 – the conflict between its work and United States policy needs came to the fore. At the start of the meeting, the US delegate tabled a paper that showed that the United States wanted to stop the work of the Policy Drafting Team. Just previous to the meeting, an e-mail with the paper as an attachment had been sent to the Senior Arctic Officials.¹⁵⁷ After an expression of appreciation of the work of the Policy Drafting Team, the paper states:

As we have sought to review the draft Policy Document, we have come increasingly to the conclusion that there is a fundamental flaw in the process we are following – a process that is significantly different from that we have developed in the IPCC and other such efforts. Specifically, we are seeking here to develop the scientific assessment and its summary in tandem with the policy recommendations that logically should flow from them. Moreover, these policy recommendations should be developed only after governments have had an opportunity to consider the Scientific Document and the Synthesis Document on which they are based and draw their conclusions. In effect, we are putting the cart alongside the horse with the risk that neither cart nor horse will arrive at the destination.¹⁵⁸

A key point in the document was also that the IPCC reports have a different status than many reports developed by the scientific community. One informant has interpreted this as the United States wanting to review the science of the ACIA.¹⁵⁹ This shows that the controversies surrounding the policy document may not only have been from different views on what appropriate policy recommendations should be, which were well known from different positions in the global climate negotiations. Rather, the focus was on process and specifically the relations between science and policy. It brings to the fore a question of when and how science becomes policy relevant and the limits of the authority of science. For the United States, a key point appears to be that not only scientists, but also policy makers, should have a say in framing the issues. The US statement points out that “the IPCC process provides a number of opportunities for government review” and also that “IPCC summaries for policy makers are approved on a line-by-line basis.”¹⁶⁰ Policy recommendations are framed as an issue for policy makers that should begin after, and in a separate process from the scientific assessment.

In spite of it being clear that the United States was not happy about the policy process in its present form, the issues brought up in the paper were put to the side for the rest of the meeting.¹⁶¹ It was “business-as-usual” as one person, who was present, expressed it, adding that it was not their task to change course but to follow the Ministerial Decla-

¹⁵⁶ Interviews 64 and 10.

¹⁵⁷ Interview 31.

¹⁵⁸ US Statement on Policy Document, distributed at the Policy Drafting Group Meeting in London October 2003, with copies distributed at the Assessment Integrations Team meeting October, 14, 2003

¹⁵⁹ Interview 4.

¹⁶⁰ US Statement on Policy Document, distributed at the Policy Drafting Group Meeting in London October 2003, with copies distributed at the Assessment Integrations Team meeting October, 14, 2003.

¹⁶¹ Interviews 4 and 10.

ration from Barrow.¹⁶² Also from the indigenous peoples' representatives' perspective the ministerial mandate from Barrow was the guiding principle that they put forward, emphasizing that the United States should not be able to stop the policy process.¹⁶³ The meeting, instead, focused on producing text, making the document more to the point, and following up some of the comments received at the Svalbard informal meeting. Even if there had been some indication at the Svalbard meeting that the United States was hesitant about the process, it thus appears that the understanding of the group was that they should continue its work. Several people present have described the London drafting meeting as productive and that everyone present was working toward a common goal. The following quote captures the spirit of the meeting described in the interview material: "I don't think we would have been as productive if there hadn't been such a broad consensus about the task, and we were actually able to produce a very good document."¹⁶⁴ This document was called the "London draft."

However, the US paper had made it unclear what status the London draft would have and what would happen to the policy process. It was expected that the US paper would be formally tabled at the upcoming meeting of Senior Arctic Officials setting counteractions from the Permanent Participants into motion. The Inuit Circumpolar Conference Alaska wrote a letter to the US Senior Arctic Official stating that "it will surely appear to the Arctic Council that the United States intends to delay preparation and presentation of the policy document until after the presidential election. In doing so, the United States is opening itself to criticism that domestic political and electoral considerations override agreed ministerial direction."¹⁶⁵ The letter referred to the upcoming 2004 US presidential election that many people were speculating about informally. However, that did not appear to have any effect on the US position.

In the hands of the Senior Arctic Officials

When the Senior Arctic Officials met in Svartsengi, Iceland, a few weeks after the London Policy Drafting Team meeting, there was no longer any doubt about the US intention to stop the policy process in its present form. Most of the discussions went on behind the scenes. For example, the Permanent Participants prepared a formal statement of protest to be read by the chair of the Indigenous Peoples Secretariat, but this was neither tabled nor voiced because the chair of the Senior Arctic Officials reportedly made a behind the scenes plea to keep things together. An individual present at this discussion said that it was claimed that the Permanent Participants' statement would create too much conflict on the floor.¹⁶⁶ The presentations of ACIA's science and policy documents to the Senior Arctic Officials were post-poned while there were informal consultations between the Senior Arctic Officials' chair, the Senior Arctic Officials, and a rep-

¹⁶² Interview 4.

¹⁶³ Interview Terry Fenge, May 3, 2004. For a detailed account of the policy process as seen from the Inuit Circumpolar Conference, see Watt-Cloutier, et al. "Responding to Global Climate Change: The View of the Inuit Circumpolar Conference on the Arctic Climate Impact Assessment."

¹⁶⁴ Interview 10.

¹⁶⁵ Letter to Sally K. Brandel, Senior Arctic Official, US Department of State from Chuck Greene, ICC Alaska October 17, 2003.

¹⁶⁶ Interview 27.

representative of the Permanent Participants. The outcomes of these meetings were presented to the whole group in very short form and without any discussion.¹⁶⁷ In the draft protocol, this is reflected as follows: "The SAO-Chair informed the meeting of ongoing consultations among SAOs and Permanent Participants on the timetable of the policy documents and proposed to put forth a Chair's proposal as to how to take work forward as regards the timelines of the policy document. The Chair's proposal was met with approval."¹⁶⁸ According to one Senior Arctic Official, this way of carrying out sensitive discussions outside the formal meeting is in no way unusual for the Arctic Council, "where sensitive issues are not discussed at all at the table or only in coded form."¹⁶⁹

Although the document from the United States precipitated the change in process, other countries' policy representatives expressed that change was a necessary move on the part of the Senior Arctic Officials. There was nothing extraordinary about it and the reaction from the United States was in many ways expected to come sooner or later. It was more of a surprise that it had not come earlier. In the words of one policy representative, there was a sensitivity attached to the policy text that could not be addressed by the Policy Drafting Team. Also emphasized during this interview was that it was not uncommon in science-based processes and that there is a certain disconnect between the aspirations of science workers and the reality within which policy makers have to operate.¹⁷⁰ Another country's policy representative has said that it was a mistake that the Senior Arctic Officials did not take responsibility for the policy process earlier.¹⁷¹ A third comment was that: "This is a policy paper. Policy is decided in the ministries and at the political level, not at the level of government agencies."¹⁷² The shift in responsibility is also in line with comments earlier in the ACIA process of keeping a clear line of separation between science and policy.¹⁷³

As a result of the decision to discontinue the policy process in the present form, the Senior Arctic Officials' chair wrote a letter to the chairmen of AMAP and CAFF stating that:

Consultation among the SAOs and the Permanent Participants have revealed that there is no longer a common basis for continuing work on the ACIA policy document in accordance with the timetable presented by the AMAP chair. This means that the matter of continuance of the ACIA policy document now reverts back to the SAOs and that further meeting of the Policy Drafting Team, would be called through you only at request of the SAOs.¹⁷⁴

¹⁶⁷ Interview 11.

¹⁶⁸ Draft minutes of the Arctic Council Meeting of Senior Arctic Officials, Svartsengi, 23-24 October 2004 (sic) (in Agenda for Arctic Council Meeting of Senior Arctic Officials, Selfoss, Iceland, May, 2004.

¹⁶⁹ Interview 31.

¹⁷⁰ Interview 63.

¹⁷¹ Interview 61.

¹⁷² Interview 31.

¹⁷³ Arctic Council Senior Arctic Officials Meeting, Fairbanks, Alaska, April 27-28, 2000. Minutes revised 10/12/00. Agenda Item 7.

¹⁷⁴ Letter to Mr. Helgi Jensson, Chairman of AMAP and Mr. Kent Wohl, Chairman of CAFF from Gunnar Pálsson, Chairman of Senior Arctic Officials, November 10, 2003.

In addition, the letter requests that the London draft be transmitted to the Senior Arctic Officials' chair. They responded by sending the London draft and stating that all planned meetings of the Policy Drafting Team had been cancelled. Furthermore, the upcoming joint AMAP-CAFF meeting would no longer have the approval of the Policy Document on its agenda, unless the Senior Arctic Officials decided otherwise.¹⁷⁵ This letter illustrates how the Senior Arctic Officials used their higher policy positions compared to the AMAP and CAFF co-chairs of the Policy Drafting Team to assert their authority over policy matters. In the case of climate change, it is clearly important to mark the boundaries between science and policy in a more distinct manner than what had been done so far in the ACIA process by creating the Policy Drafting Team separate from scientific assessment group.

The Permanent Participants were less than happy with these developments and decided to turn the statement of protest, that was not read at the Svartsengi meeting, into a formal letter signed by the political leaders of all six Permanent Participants. The letter makes reference back to ACIA's mandate as it was adopted by the Barrow Ministerial: "Given that the mandate of this work comes from the Ministers of the Arctic Council countries, we have no option but to continue until that mandate is formally altered."¹⁷⁶ With reference to the Arctic Council Rules of Procedure and the value, both in substance and symbol, of having indigenous peoples involved in both the science and policy of the Arctic Council they stressed that "the Permanent Participants should continue to be involved in finalizing this important work and reviewing the potential proposals for changing how this work is to be carried out."¹⁷⁷ From their perspective, there was not just a policy document in danger, but also at stake was the model of cooperation in the Arctic region, i.e. the political legitimacy of the Arctic Council for the indigenous peoples in the region. This perspective became very clear in an interview with a representative of one of the Permanent Participants, who discussed how Permanent Participants, on several occasions, felt that the spirit of cooperation between member states and indigenous peoples was compromised, for example by situations that gave them less access to meetings because the meeting room was too small or that there were not enough seats booked on a flight. Formally they were only allowed one representative each while each member state was allowed two. The following quote illustrates his perception of the dynamics: "We were ill treated during the negotiation. It was obvious that it was more important that the seven other states had an opportunity to discuss with the United States. If we had something to add, it was seen as monkey wrenching."¹⁷⁸ The

¹⁷⁵ Letter to Mr. Gunnar Pálsson, Chairman of the Senior Arctic Officials from Helgi Jensson, AMAP Chair and Kent Wohl, CAFF Chair, December 2, 2003.

¹⁷⁶ Letter to Ambassador Gunnar Pálsson, Chair, Senior Arctic Officials from Michael Zacharof, President Aleut International Association, Joe Linklater, Chair Gwich'in Council International, Pavel Sulyandziga, Vice-President RAIPON, Cindy Dickson, Executive Director Arctic Athabaskan Council, Sheila Watt-Cloutier, International Chair Inuit Circumpolar Conference, and Geir Tommy Pedersen, President Saami Council, 8 December 2003.

¹⁷⁷ Letter to Ambassador Gunnar Pálsson, Chair, Senior Arctic Officials from Michael Zacharof, President Aleut International Association, Joe Linklater, Chair Gwich'in Council International, Pavel Sulyandziga, Vice-President RAIPON, Cindy Dickson, Executive Director Arctic Athabaskan Council, Sheila Watt-Cloutier, International Chair Inuit Circumpolar Conference, and Geir Tommy Pedersen, President Saami Council, 8 December 2003.

¹⁷⁸ Interview 69. A similar picture comes out in interview 34.

high priority to keep the discussion with the United States going was confirmed in an interview with one of the Nordic Senior Arctic Officials, who has said that this was one reason it was easy to sacrifice the Policy Drafting Team.¹⁷⁹ The chair of the Senior Arctic Officials saw the critique from the Permanent Participants as misguided. Asked to comment on the critique about unequal representation in parts of the policy process, he has said: "I cannot share the view, if that is what is being argued, that Permanent Participants should have a status in the Arctic Council equal to that of sovereign member states."¹⁸⁰

The Arctic Council records are rather silent about what happened in the policy process after the Senior Arctic Officials took over. However, the US position became public in the Washington-based newsletter *Inside EPA*, which reported that "some foreign officials and Native American groups suspect the Bush administration is seeking the delay to avoid addressing the politically tricky issue a month before the 2004 presidential election." Moreover, it asserted that US State Department representatives privately asked fellow members of the Arctic Council to delay drafting a policy of global warming in the Arctic until the following fall.¹⁸¹ It is impossible for me to judge to what extent this reporting actually reflects dynamics within the US State Department. A review comment called the information into question. However, one of my interviews support a picture of US internal politics at play.¹⁸²

In January 2004, the chair of the Senior Arctic Official sent a letter to the member states and the Permanent Participants suggesting that it was now "the prerogative of the SAOs [Senior Arctic Officials] to decide how the policy-work of the ACIA will be carried forward" including determining the form to be given to the recommendations.¹⁸³ To the Inuit Circumpolar Conference, this indicated a backing away from the principle of policy recommendations as had been agreed upon in the Barrow Declaration.¹⁸⁴

Meanwhile, the Danes had been discussing ways to get the process moving again by inviting the Senior Arctic Officials and Permanent Participants to an informal meeting.¹⁸⁵ Also discussions about major messages in the ACIA were becoming more and more public. For example, The US Senate Committee on Commerce, Science and Transportation organized a congressional hearing on climate change that featured ACIA's chair Robert Corell.¹⁸⁶

By March of the same year, the plans for an informal meeting took a more definitive form as an "ACIA Workshop to be held in Nuuk, Greenland, on 20-22 April at the invi-

¹⁷⁹ Interview 31.

¹⁸⁰ Interview Gunnar Pálsson, January 17, 2005.

¹⁸¹ "US Seeks Delay of Key Arctic Climate Report Until After 2004 Election," *Inside EPA* 24, no. 45 (2003).

¹⁸² Interview 11.

¹⁸³ Letter from Gunnar Pálsson, chair of the Senior Arctic Officials to Senior Arctic Officials and Permanent Participants of the Arctic Councils January 13, 2004, quoted in Watt-Cloutier, et al. "Responding to Global Climate Change: The View of the Inuit Circumpolar Conference on the Arctic Climate Impact Assessment," 63.

¹⁸⁴ Watt-Cloutier, et al. "Responding to Global Climate Change: The View of the Inuit Circumpolar Conference on the Arctic Climate Impact Assessment," 63.

¹⁸⁵ Interviews 11 and 64.

¹⁸⁶ US Senate, "Climate Change," Committee on Commerce, Science & Transportation, 108th Cong, 3 March 2004).

tation of the Kingdom of Denmark.”¹⁸⁷ This is a visible result of a number of informal meetings that were held to start the process moving.¹⁸⁸ The focus at Nuuk was the scientific aspects of the ACIA with an opportunity to address ACIA’s policy aspects informally at the margins of the meeting. At the meeting, the letter from the leaders of the six Permanent Participants was placed conspicuously on the table as a reminder of the political stakes the indigenous peoples had put into the process. “If they made a decision to get rid of the policy report, it would have turned into real politics of protest because of the PPs [Permanent Participants],” the Inuit Circumpolar Conference representative at the meeting has said in an interview.¹⁸⁹

The policy discussion was put off until the last two hours of the meeting. According to several accounts, each state was given an opportunity to voice their opinion about the policy process, with the United States at the end, because of the common alphabetical seating arrangement in Arctic Council meetings. Each state made it clear that they wanted a policy process and that the London document would be a reasonable starting point leaving the United States to voice its opinion and to come on board with the consensus without explicitly endorsing it.¹⁹⁰ According to one source, the United States never intended to completely stall the policy document, but felt that as a matter of principle that the science document must come first to follow the process and the format in the IPCC. The effort was to get the process harmonized with the way climate was handled internationally, with the Nuuk meeting providing an opportunity to review the science in its fullness. From the US perspective, the Nuuk meeting, in combination with a number of informal exchanges and meetings, helped loosen things up as it made people realize that the United States had the ambition to come up with something for the November ministerial meeting.¹⁹¹ Another perspective came forth during an interview with a Nordic climate negotiator: “We shouldn’t underestimate what happened in the media ... It really came out strong in the media and put the US in a very difficult position.”¹⁹²

The policy process was thus running again, now with the Senior Arctic Officials’ chair as its formal leader. What eventually got started was a round of negotiations that took the London document as the starting point.¹⁹³ One meeting was held in the Haag in August 2004. The negotiations were not moving forward, however, and there was a mounting frustration among the Permanent Participants. In September, the international chair of the Inuit Circumpolar Conference Sheila Watt-Cloutier testified before the US Senate Committee on Commerce, Science and Transportation. After connecting observations of Inuit hunters falling through the “depleting and unpredictable sea-ice” to “cars we drive, the industries we rely on, and the disposable world that we have become,” she not only asked committee members for solutions to the global debate on climate change but also to look closely at the role of the US State Department. Referring to the ACIA, she said: “... the Department is minimizing and undermining the ef-

¹⁸⁷ Letter to Senior Arctic Officials and Permanent Participants from Gunnar Pálsson Chairman of Senior Arctic Officials, 8 March 2004.

¹⁸⁸ Interviews 25, 61, 64, and 71.

¹⁸⁹ Interview Terry Fenge May 3, 2004.

¹⁹⁰ Interviews 27 and 64.

¹⁹¹ Interview 25.

¹⁹² Interview 64.

¹⁹³ Interviews 63, 64, 71.

fectiveness of this assessment process by refusing to allow policy recommendations to be published in a stand alone form just like the assessment itself."¹⁹⁴ The publicity led to "press guidance" by the US State Department assuring the press that the United States was not keeping the ACIA report under wraps, which in turn prompted three US senators to write US Secretary of State Colin Powell urging him to assure them that the United States had operated within decisions in the Barrow Declaration.¹⁹⁵ As a result of the hearing and the publicity it generated, pressure increased on the United States to come to some agreement in the policy negotiations.

The lack of progress in the policy negotiations was based on fundamental differences of opinion, not only with respect to what needed to be done to address the challenges posed by climate change, but also regarding the relation between science and policy. For example, according to one interview account, there was an unwillingness of one of the parties to paraphrase or draw in any way from the scientific results as it would be an interpretation that had not been done by the experts.¹⁹⁶ This is in contrast to the preference expressed by the Inuit Circumpolar Conference for a document that combined explanations of the impact of climate change based on the scientific assessment with clear policy recommendations.¹⁹⁷ Another disagreement was on the form that any policy recommendations should take, i.e. should they be in a stand-alone document.¹⁹⁸ The disagreements in principle and the public airing of them appears to have created a very tense atmosphere as exemplified by a letter from the chair of the Senior Arctic Officials that pointed out that the public disclosure of the closed meeting between Senior Arctic Officials and the Permanent Participants were fundamentally at odds with the practices in the Arctic Council. The response from the Inuit Circumpolar Conference chair was that her comments had been limited to "defending the integrity of the process."¹⁹⁹

Negotiations continued in October in Iceland. On October 30, 2004, the *New York Times* revealed the findings from the ACIA scientific process in a front-page article with the headline "Big Arctic Peril Seen in Warming," apparently based on a leak of the overview document.²⁰⁰

Just a few days before the ministerial meeting and after several meetings, the Senior Arctic Officials, most of them accompanied by the respective country's chief climate

¹⁹⁴ The Testimony of Ms. Sheila Watt-Cloutier, Chair, Inuit Circumpolar Conference given at the Full Committee Hearing: Impact of Climate Change, Wednesday September 15, 2004. SR253. US Senate, "Impacts of Climate Change," Committee on Commerce, Science & Transportation, 108th Cong. 15 September 2004).

¹⁹⁵ Watt-Cloutier, et al. "Responding to Global Climate Change: The View of the Inuit Circumpolar Conference on the Arctic Climate Impact Assessment," 64.

¹⁹⁶ Interview 63

¹⁹⁷ Watt-Cloutier, et al. "Responding to Global Climate Change: The View of the Inuit Circumpolar Conference on the Arctic Climate Impact Assessment."

¹⁹⁸ Interview 61, 63, and 64.

¹⁹⁹ Letter from Gunnar Pálsson, Chair of the Senior Arctic Officials to Senior Arctic Officials and Permanent Participants, October 1, 2004, and Letter from Sheila Watt-Cloutier, Chair Inuit Circumpolar Conference to Gunnar Pálsson, Chairman of Senior Arctic Officials to the Arctic Council, October 19, 2004; both as quoted in Watt-Cloutier, et al. "Responding to Global Climate Change: The View of the Inuit Circumpolar Conference on the Arctic Climate Impact Assessment," 65.

²⁰⁰ Andrew C. Revkin, "Big Arctic peril seen in warming," *New York Times* Page 1, Column 1, October 30, 2004).

negotiator, were able to agree on a text. This became part of the Reykjavik Declaration and the Senior Arctic Officials' Report and was also extracted into a separate document, which was presented publicly at the Arctic Council ministerial meeting in Reykjavik November 24, 2004. There was a collective sigh of relief. To summarize the many informal comments I received at the ministerial meeting, the document had less substance than had been hoped for but was nevertheless something that showed consensus about the importance of climate change for the Arctic and for the future of the Arctic Council.

The final negotiations of the ACIA policy document went on behind closed doors, but several people who participated in the process were willing to share their analysis of its dynamics in interviews. Based on the interviews, most of which were conducted in direct connection with the ministerial meeting, several patterns became apparent.

A dynamic that comes out very clearly is that pressure on the United States, because the contentious nature of the negotiations had come out in the media along side the high visibility of indigenous peoples in the media.²⁰¹ Added to this public pressure was the fact that the United States had no natural allies in the Arctic Council. The other seven countries and the Permanent Participants all wanted a policy outcome.²⁰² It was difficult to push it too far, however. Potentially, they could have walked away from the negotiations and left the United States on its own, as was done in the Kyoto Protocol negotiations at the global level. However building consensus, as a way of working in the Arctic Council, was an important value to the actors involved in the process, making it important to find some kind of compromise.²⁰³ Also, a small enough group allowed for frank discussions. This, in combination with informal contacts, helped move the process forward in a way that may have been more difficult in the global setting.²⁰⁴

The negotiations brought out two fundamental conflicts. One of them was the relationship between science and policy documents and the other was the relationship between the regional arena and the global climate policy scene, where the US position was that the Arctic Council was not an appropriate forum for making climate policy.²⁰⁵

Some of the toughest negotiations concerned the language to be used in referring to the findings of the scientific report. For example, should it "recognize concern" or "express concern," and should it "recognize global implications?"²⁰⁶ Negotiation of the final wording surrounding such issues continued until late the last night of negotiations and still required high-level policy approval before the United States could agree.²⁰⁷ A stumbling block earlier in the negotiations was that the United States was not represented at a high enough level in relation to climate policy, which made it difficult to move politically sensitive issues forward.²⁰⁸

²⁰¹ Interview 59, 64, and 73.

²⁰² Interview 61, 64, and 73.

²⁰³ Interviews 59, 61, 63, and 64.

²⁰⁴ Interviews 61, 63, and 64.

²⁰⁵ Interview 59.

²⁰⁶ Interview 64.

²⁰⁷ The final text of the policy document is available at www.acia.uaf.edu/PDFs/ACIA_Policy_Document.pdf. The Ministers of the Arctic Council meeting "Welcome with appreciation the scientific work," "Note with concern the impact throughout the region," and "Recognize that the Arctic climate is a critical component of the global climate system with worldwide implications." An analysis of the text is presented later in this chapter.

²⁰⁸ Interviews 59, 63, 64, and 73.

The political dynamics of the global climate arena played a major role in the ACIA policy process. Some countries brought in climate negotiators from the start and wanted to use the Arctic as a way of getting somewhere in climate policy that had not been possible at the global level.²⁰⁹ Others described it as a way to keep the dialogue with the United States open in a way that had been difficult at the global level.²¹⁰ The attempts to use the Arctic Council to push a global agenda was not appreciated by the United States, who saw climate policy as an issue that should appropriately be dealt with in the global climate negotiations.²¹¹ The United States was not alone in viewing the UNFCCC as the proper arena for climate policy negotiations, but it appears to have been the only actor who actively challenged using the Arctic Council in this context.²¹² The final high level negotiations with climate policy experts present also indicate that dynamics of the UNFCCC set the tone of negotiations.²¹³ One interviewee's account describes the final negotiations: "In the Arctic Council, ... we don't wait until the 11th hour. We work things out because we work on the basis of consensus ... But if you are in a competitive environment, the rules of the games are different, ... like this was like absolutely business as usual."²¹⁴

The policy document

The final policy document is a fairly short text – a total of eight pages including the cover page. It starts with a short description of what the Arctic Council is and its role in relation to climate change. This is followed by the parts of the Ministerial Declaration connected to the ACIA and a background that is extracted from the Senior Arctic Officials' Report to the Ministers. At the onset, the text is placed in relation to the UNFCCC and previous Arctic Council ministerial declarations rather than other multi-lateral agreements or international regimes:

The Arctic Council Member States are committed to exercising leadership within the Arctic and globally to address the sources and multiple Arctic impacts and consequences of climate change and ultraviolet radiation, in accordance with the UNFCCC, as well as the Barrow and Inari Arctic Council Ministerial declarations.²¹⁵

As a negotiated policy text, the style is quite different from the other two documents from the ACIA process but it is similar to earlier Arctic Council Ministerial declara-

²⁰⁹ Interviews 10 and 64.

²¹⁰ Interview 29.

²¹¹ Interviews 59, 61, and 71 and the US Statement on Policy Document, distributed at the Policy Drafting Group Meeting in London October 2003, with copies distributed at the Assessment Integrations Team meeting October, 14, 2003.

²¹² Interviews 61, 63, and 64.

²¹³ Several interview accounts point to the importance to not go below what had been achieved at the global level or to try to push the global agenda forward (e.g. 63 and 64)

²¹⁴ Interview 59.

²¹⁵ Arctic Climate Impact Assessment Policy Document. Issued by the Fourth Arctic Council Ministerial Meeting Reykjavik 24 November 2004.

tions. For example, it states that the ministers “Welcome with appreciation the Arctic Climate Impact Assessment (ACIA) and the scientific work completed in evaluating and synthesizing knowledge on climate variability and change and increased ultraviolet radiation in the Arctic.” The document clearly separates science and policy. For example, the background text stresses that responsibility for the final synthesis and scientific documents is with the authors. Moreover, the Ministerial Declaration emphasizes that the scientific findings are only part of what makes policy, as illustrated by the following statement:

Note the findings of the ACIA with respect to climate change and acknowledge that such findings, as well as the underlying scientific assessment, will help inform governments as they implement and consider future policies on global climate change,

Thus there is an expressed distancing that sets limits on the degree that scientific knowledge can influence policy decisions. Such boundary work illustrates how political actors assert their authority over the policy sphere and needed to do so explicitly. This provides an interesting contrast to the calls for more scientific knowledge before political decisions can be made.

The ministers make no specific commitments other than to promote global, national, and local awareness of the ACIA and any follow-up activities through appropriate outreach activities. Thus, they only “[a]cknowledge the need to consider the findings ... in implementing their commitments under the UNFCCC and other agreements, including through adoption of climate change mitigation strategies across relevant sectors.” Moreover, rather than agreeing to any specific action in relation to adaptation, the ministers “[e]ncourage member States to adapt and manage the environmental, economic and social impacts ...” In spite of the overall declaration of exercising leadership, this indicates that the Arctic Council was not ready to commit to an active role of its own in either adaptation or mitigation but placed the authority over these issues to the national level and with other international bodies as more appropriate arenas.

The background text extends a few more words on mitigation but the basic message is the same; placing responsibility with the member states and their commitments under the UNFCCC and other agreements. The Kyoto Protocol is not mentioned. On a general level, the text raises the issue that “there are important mitigation efforts in the region that would contribute to sustainable development and global emission reduction efforts.” The text also alludes to the member states’ disproportionate share of the total global greenhouse gas emissions in a stage-setting paragraph for recommendations on mitigation efforts. The mitigation efforts mentioned include US initiatives on the International Partnership for Hydrogen Economy as well as carbon sinks. In spite of these references to on-going efforts, the commitment is much weaker than in earlier Ministerial declarations relating to other environmental issues, which features language such as “we are committed to deal with,” “we therefore fully support,” “we call for full implementation, and “we agree to work vigorously for early completion and implementation of a protocol on the elimination and reduction of persistent organic pollutants ...”²¹⁶

²¹⁶ Quotes from Arctic Environmental Protection Strategy Alta Ministerial Declaration June 13, 1997.

A key question for a scientific assessment is whether it will become part of an on-going process or whether it will be a one-time effort. At the joint meeting of the AMAP Working Group and CAFF Working Group in April 2004, the ACIA chair wanted to discuss the continuation of the ACIA but this was met with reluctance because of the political sensitivities that had surfaced during the policy process.²¹⁷ Within the Ministerial Declaration the commitment to continue is weak. The ministers merely “[e]ncourage relevant national and international research bodies and sponsors to take into account the ACIA science recommendations in planning, development and implementation of their programmes.” The report from the Senior Arctic Officials goes a bit further by stressing the importance to intensify research on impacts and adaptation and by recommending that the ministers “[s]eek to expand and link circumpolar research and monitoring networks” and to “[r]ecognize the need to consider how to conduct further studies of climate change” including specific highlights on variability, socioeconomic impacts, vulnerabilities, modeling and the use of long-term data. There are also directives to Arctic Council working groups to “keep under review the need for an updated assessment” and to the Senior Arctic Officials to nominate a focal point to be responsible for ACIA follow-up.

During the policy process, the Permanent Participants pushed for the inclusion of text that would highlight the special role of the Arctic and the vulnerability of indigenous peoples in a global policy context, similar to the preamble to the Stockholm Convention on Persistent Organic Pollutants.²¹⁸ The ACIA final policy document does not go as far but does recognize “that the Arctic climate is a critical component of the global climate system with worldwide implications.”

The policy document does not emphasize the role of indigenous people as much as the scientific and overview reports. Rather it often refers to Arctic residents, which one could see as a shift in emphasis. In a word count, the proportion of *indigenous to residents* is 1.2:1 in the policy document compared to 4.7:1 in the scientific report and 9:1 in the overview document and in the London draft it was 1.6:1. The word *peoples* in the policy document is accompanied by a footnote indicating that “[t]he United States notes that the use of the term ‘peoples’ shall not be construed as having any implications as regards to the rights which may attach to the term under international law.” This further emphasizes the assumption from the negotiators of the document that the member states are the appropriate actors.

To summarize, in the policy document member states assert their authority over climate policy, while the role of the Arctic Council is downplayed in relation to the UNFCCC. The only solid commitment made is to promote awareness.

²¹⁷ Minutes of the 18th Meeting of the Arctic Monitoring and Assessment Programme (AMAP) Working Group. Oslo, Norway, 14-16 April 2004, including Annex 7: Minutes of the 3rd Joint AMAP/CAFF meeting, Oslo, Norway, 15-16 April 2004. AMAP Report 2004:1; Powerpoint presentation by Robert Corell: Status, Progress, and Next Steps For the Arctic Climate Impact Assessment (ACIA). Oslo, Norway April 14-16, 2004; Interview 26.

²¹⁸ E.g. “Acknowledging that the Arctic ecosystem and indigenous communities are particularly at risk because of biomagnification of persistent organic pollutants and that contamination of their traditional foods is a public health issue.” Extract from Preamble of Stockholm Convention on Persistent Organic Pollutants.

Analysis of the policy process

During the policy process, it became increasingly clear that the Senior Arctic Officials reasserted their prerogative to have the initiative when it came to policy recommendations. The United States drove this issue, but appears to have had agreement on the basic principle from several other countries. Supporting this interpretation is the fact that some countries sent high-level climate negotiators to the Policy Drafting Team from the beginning. One can speculate why the United States did not, but based on interviews with people involved in the process, it appears to have been a misjudgement of the role of this group. The shift came after the Svalbard informal meeting, at which the US chief climate negotiator was present and where the United States took several steps to keep from being bound by the ACIA scientists and indigenous peoples' presentation of how Arctic climate change should be framed. For countries whose climate policies were in line with the scientific findings, such a demarcation would obviously not have been as important, even if they agreed on the principle of separating science and policy.²¹⁹

As the process became unclear, the indigenous peoples lost some of their formal platform as Permanent Participants. Instead much of the action appears to have gone on behind the scenes in informal talks among the Senior Arctic Officials. The political tool that the Permanent Participants used, instead, was to threaten bad publicity for the Arctic Council, and in particular bad publicity for the US State Department. US senators were allies in this game of placing climate change on the political agenda and provided the indigenous peoples (by way of the Inuit Circumpolar Conference) with an alternative public political platform in a congressional hearing. This strategy played directly into the negotiations for the policy document and internal US politics and thus strengthened the negotiation position for the countries who wanted a strong policy statement. Thus there was close interactions between the international and internal US national dynamics.

The international dynamics were not only governed by the norms of the Arctic Council but rather the global climate politics in the UNFCCC took precedence. More than one state actor appears to have played a role in this. Initially, some of the Nordic countries sent climate negotiators to the Policy Drafting Team. Later, the United States pushed the process to a higher policy level emphasizing that the Arctic Council was not the right forum for climate policy.²²⁰ However, there was a limit to the global influence on the Arctic agenda – it was not allowed to kill the consensus-oriented Arctic regime and norms on dialogue that give a voice not only to states but also to the indigenous peoples independently of the states they live in.²²¹ This in combination with the dynamics between the Permanent Participants and media sets an important context for why there was a policy document, in spite of conflicts over its form and content. The conflicting interests that had to be balanced are articulated by the weak commitments and the placing of responsibilities with the member states rather than with the Arctic Council. Several people have said that the Arctic Council was at stake, but with different in-

²¹⁹ Interviews 59 and 61.

²²⁰ Interviews 24, 59, 61, and 71; US Statement on Policy Document, distributed at the Policy Drafting Group Meeting in London October 2003, with copies distributed at the Assessment Integrations Team meeting October, 14, 2003.

²²¹ Interviews 63 and 71.

terpretation of what that actually entailed. Representatives of the Permanent Participants emphasize the unique collaboration of states and peoples in the region. The chair of the negotiations perceived that to the United States it was also important to make sure that the Arctic Council remained a high-level discussion forum rather than a regime with legal status and forum for negotiating policy.²²²

The dynamics involving the Permanent Participants could be compared to a dual governance structure at the international level. Such dual governance has previously been discussed as part of the development of greater autonomy for the Arctic indigenous peoples within national borders as exemplified by indigenous political arrangements, such as tribal governments, that operate simultaneously with public governments in the same geographical area.²²³ In the Arctic, as an international arena, the indigenous peoples' international organizations have become trans-national actors that take on similar roles as states.²²⁴ The ACIA policy process illustrates that their status, as equal partners to states, is constantly on the line and the picture that emerges from this study is thus somewhat different from previous descriptions of this cooperation as "de facto equality" for the Permanent Participants.²²⁵ It appears that in a case where global politics are at play, it matters that indigenous peoples' organizations do not have the same formal status as the member states in the Arctic Council. At the same time, dual governance creates opportunities that may not be available to a member state. First, the indigenous peoples' organizations did not feel bound by the same norms of diplomacy and thus were free to publicly reveal the dynamics of closed negotiations. Second, they could exploit national political venues to compensate for their lack of influence in the international setting thereby increasing the pressures in the negotiations. Moreover, in the international setting they could collaborate with parties whom they would not have been normally able to exploit within the internal US policy dynamics.

What can be learned from the ACIA about the potential for regional international climate policy processes? The most important lesson is that any regional climate policy discussion is likely to be colored by the global climate policy dynamics. How that is moderated is likely to depend on the regimes within which the negotiations taking place, including both the norms for cooperation and which actors take part in the process. Based on the Arctic experience, there are clear limits to the prospect of using regional areas to overcome deep differences of opinion at the global level. It also shows how international climate politics are linked to national political dynamics, in this case within the United States. Such cross-level policy dynamics are discussed further in Chapter 7 (section 7.2) of this dissertation.

²²² Interview Gunnar Pálsson, January 17, 2005.

²²³ Else Grete Broderstad and Jens Dahl, "Political Systems," in *Arctic Human Development Report*, ed. AHDR, 85-100 (Akureyri: Stefánsson Arctic Institute, 2004).

²²⁴ Heininen, "Circumpolar International Relations and Geopolitics."

²²⁵ E.g. Young and Einarsson, "Introduction," 20.

5.5 Other activities

In addition to the three reports that are stipulated in ACIA's mandate, there were some additional tangible outcomes from the process. One was a scientific conference to present the ACIA results, which was intended to be the week prior to the ministerial meeting, but ended up being two weeks before due to a late rescheduling of the ministerial meeting. Modeled on previous AMAP conferences, the conference gave lead authors a venue to present their picture of ACIA's results in a different form than a report and also provided opportunities for discussion. The second and third day of the conference featured more detailed presentations on various topics, and the last day was devoted to panel discussions about the future. The purpose was to focus on the science and there was a great deal of discussion of how the ACIA fit into future plans for Arctic research such as the International Polar Year in 2007/08. At a stakeholder panel, political issues also came to the fore, with clear calls to the political community to take the ACIA results seriously and use them as a basis for climate policy. At the time of the conference, it was not yet clear whether the Arctic Council would approve the policy document. Although the ACIA conference was dominated by scientists, there was also a visible presence by indigenous peoples, and it included presentations by indigenous experts. Many speakers also alluded to the unique meeting between science and indigenous traditional knowledge that the ACIA represented.²²⁶ In a speech at the conference, the chair of the Inuit Circumpolar Conference publically criticized the way in which the policy process was handled, including how she had been reprimanded by the US State Department for statements about its role in trying to obstruct the policy outcome of the ACIA process.²²⁷

Coordinated with the scientific conference, the scientific journal *Ambio* released a special issue on climate change and UV-B impacts of the Arctic tundra and polar desert ecosystems, based on material from the scientific report.²²⁸ As mentioned in section 5.2 of this chapter, the final scientific report was not available at the time of the official release of the ACIA results at the scientific conference.

The overview document was released the day before the scientific conference in conjunction with press conferences in several Arctic countries. In the United States, the press activities were coordinated by a professional media organization, Resource Media, and financed by a private foundation. The home institution of the ACIA vice chair, Center for International Climate and Environmental Research in Oslo, provided some international coordination for press activities, including the production of fact sheets.²²⁹ Indigenous peoples' organizations also put out their own press releases. This study does not include any systematic analysis of the press coverage of the ACIA but the coverage

²²⁶ Arctic Climate Impact Assessment (ACIA), *The ACIA International Scientific Symposium on Climate Change in the Arctic. Extended Abstracts. Reykjavik November 9-12, 2004* (Oslo: Arctic Monitoring and Assessment Programme, 2004).; Observation notes November 9-12, 2004; Sound recordings of opening statement, science panel, and stakeholder panel.

²²⁷ Remarks given by Ms. Shiela Watt-Cloutier, Chair of the Inuit Circumpolar Conference at the Arctic Climate Impact Assessment (ACIA) Conference, Reykjavik, Iceland, November 12, 2004.

²²⁸ Callaghan Terry, V., ed., "Climate Change and UV-B Impacts on Arctic Tundra and Polar Desert Ecosystems," *Ambio* XXXIII, no. 7 (2004).

²²⁹ Tjernhaugen and Bang, *ACIA og IPCC. En sammenligning av mottakelsen i amerikansk offentlighet*.

appears to have been quite significant judging from comments made by the ACIA authors in informal conversations during the conference. A study of the media coverage in the United States shows that the ACIA made major TV network news and was mentioned 72 times in major US newspapers between September 2004 and February 2005. Tjernhaugen and Bang find that the coverage was slightly less than the third IPCC assessment but calls this considerable because of the smaller scope of the Arctic assessment compared to the IPCC. Moreover, the media coverage was less focused on scientific controversies.²³⁰ A search in a media database that covers Sweden and Norway reveals 21 mentions of “Arctic Climate Impact Assessment” during the same period.²³¹

In addition to the overview, another popular science document was released from the ACIA process, called *Impacts of a Warming Arctic: Highlights*.²³² As the title suggests, this document further condensed some of the information in the overview and presented it in a way intended to reach readers who may not read the entire overview. It is distributed free of charge. The cover looks very similar to ACIA’s overview documents and ACIA’s logo is prominently featured. It is written by the same science writer consultant who wrote the overview.²³³ At the conference, this document generated a highly contentious discussion among lead authors during a behind scenes-closed door meeting with ACIA’s chair. The lead authors claimed they had not had any opportunities to review this document or have input into how the highlights were selected. Some strong words were exchanged about the lack of due process for its production.²³⁴ According to ACIA’s chair, the funding for producing the document had come in at a very late stage and that there had simply not been enough time for consultations and review by the full Assessment Steering Committee. Moreover, in his view, the document’s content was based on the reviewed overview document. He explained that part of the controversy stemmed from the communications committee having a different view of what was important than the scientists.²³⁵ The report and the controversy that it raised illustrate three things. First is the tense atmosphere created by a policy process, including expectations that the science in the ACIA would be challenged. The second is a clash of priorities between reaching out to a large audience, which ACIA’s chair saw as vitally important, and the role of the lead authors as a guarantee for ACIA’s scientific integrity and credibility. The third point is how limiting insight over the process to a small group affected its credibility.

A third tangible outcome was a short video. There had been discussion in the Assessment Steering Committee to produce a film.²³⁶ In the end, however, the video became a product of a Norwegian national effort to bring the results of the ACIA to a

²³⁰ Tjernhaugen and Bang, *ACIA og IPCC. En sammenligning av mottakelsen i amerikansk offentlighet*.

²³¹ Search in Mediearkivet, covering 50 Swedish and Norwegian newspapers, magazines and wire services. In addition, a more general research was conducted using *Arktis* and *klimat* as search terms. This gave 65 hits in 2004, compared to 20 hits in 2003, 8 in 2002, and 11 in 2005.

²³² Available via <http://www.amap.no/acia/index.html> (Accessed: Oct. 12, 2005).

²³³ *Impact of a Warming Arctic. Highlights*, 17.

²³⁴ Interviews 50 and 60.

²³⁵ Interview ACIA’s chair Robert Corell, November 21, 2004.

²³⁶ Summary Report on the Tenth Assessment Steering Committee (ASC) Meeting, 15-16 October, London, U.K. and Observation notes London October 16, 2003.

wider audience.²³⁷ At the political level, communicating the ACIA results became one of the points on which the Senior Arctic Officials could not agree.²³⁸ In this case one can understand the Norwegian effort as a means to circumvent the lack of agreement and simply use the ACIA as a basis for national-sponsored activities that were not dependent on political consensus and ACIA's own financing.

5.6 Conclusions and discussion

The Arctic Climate Impact Assessment illustrates the role of a regional regime – the cooperation in the Arctic Council – and how it can be used by various actors in the process of producing knowledge about climate change. It also highlights the vertical interplay between regimes at the regional and global levels. In the early work of the Arctic political cooperation, the emerging global climate regime served as a motive to keep the question of a regional climate impact assessment low on the political agenda. It did, however, remain on the scientific agenda and resulted in a three sub-regional integrated assessments. When the need for regional knowledge was identified at the global level, actors connected to global climate science concerns and with Arctic science concerns could use the existing regional regime to provide a politically legitimate platform for a regional scientific assessment. And vice versa: for the Arctic Council and its working groups, the connection to the Intergovernmental Panel on Climate Change (IPCC) can be described as a way of creating a process that would also be legitimate from a global perspective.

With the meeting of two different regimes, it was not clear from the beginning what norms and decision-making procedures should govern the definition of the science-policy boundary. It was thus open for various actors to assert their views and make tactical political choices about the role of regional and global arenas in a climate policy discussion. While the Permanent Participants clearly wanted the Arctic cooperation to play an active policy role vis à vis the global discussions, the United States in particular challenged the legitimacy of the Arctic Council as an arena for climate policy and instead asserted the United Nations Framework Convention of Climate Change (UNFCCC) as the appropriate forum. The United States also actively challenged the notion that science should determine policy. The challenges by this strong actor in the international climate science and policy scenes were countered when those with other interests, including the scientific community, Arctic indigenous peoples, and actors within the United States critical of White House climate policy, brought it out into the open via the media. The ACIA illustrates how a regional setting can create quite different science-policy dynamics by bringing in new actors; in this case the indigenous peoples' organizations. It also illustrates that ambiguity in the structure of cooperation, which was produced by different norms and decision-making procedures at the global and regional level, created leeways for actors to assert their preferences.

²³⁷ CICERO (Center for International Climate and Environmental Research), "Impacts of a Warming Climate. Arctic Climate Impact Assessment (ACIA) – Key Findings," Oslo, October 2004 (CD).

²³⁸ Interview 61 and observation at the Arctic Council Meeting Reykjavik November 24, 2004.

The close relationship between actors and regimes in the ACIA process can also be compared to the role of knowledge brokers that Litfin highlighted in a study of ozone science and politics. Knowledge brokers are people who serve as “intermediaries between the original researchers, or the producers of knowledge, and the policymakers who consume that knowledge but lack the time and training necessary to absorb the original research.”²³⁹ The concept emphasizes the potential role of individual actors as major drivers in science-intensive policy making. Several interview accounts point to the ACIA’s chair as such a driver in connecting scientific and indigenous concerns.²⁴⁰ This role is also apparent in the formal documentation from the early part of the process. A key question in relation to the potential for future regional assessments thus becomes: what role do such knowledge brokers play in framing the idea of an assessment in a way that has both scientific appeal and appeal to the political stakeholders in the region?

The ACIA process shows also that a knowledge broker does not operate in a vacuum. In the Arctic, the individual initiatives were facilitated by a regional regime with similar norms about the importance of scientific knowledge on the impacts of environmental change on the region. The global climate science regime strengthened the scientific legitimacy of the project while the regional scientific cooperation in the International Arctic Science Committee (IASC) served as a bridge to the regional political cooperation in the Arctic Council. It is not likely that such an ambitious international assessment of Arctic climate change would have been conducted without the presence of some regional regime as a platform. Moreover, a wish from ACIA’s chair to involve indigenous peoples in the assessment fit well with the norms within the Arctic Council. Thus I argue that in the case of the ACIA, it is difficult to completely separate the importance of the individual actors versus the regimes but it appears as if the global and regional regimes were essential both to get the process launched and for its eventual structure and outcome.

The ACIA process also illustrates some limits of the influence of a knowledge broker as an individual actor. ACIA’s chair pointed to the close association between science and policy in ACIA as a unique opportunity to convey the message to policy makers that climate change is real and requires political action: “I think that this assessment, given that it had the obligation to create policy that was built on science, was a massive experiment. It’s not been done.”²⁴¹ In the global arena, science and policy are formally separated into two different processes, the IPCC and the UNFCCC, while the both the scientific and policy aspects of the ACIA were carried out under the Arctic Council. Nevertheless, the challenges with bringing them together became vividly apparent when the United States realized that national interests relating to global climate policy were at stake. The policy process was then moved to more policy-exclusive venues and the boundary between science and policy was reasserted, following the norms that were established at the global level. According to one Senior Arctic Official, the process may not have become as contentious if the scientific leadership had not pushed so hard to make the Arctic a showcase of global climate change. The promotion of the ACIA and

²³⁹ Litfin, *Ozone Discourses*, 4.

²⁴⁰ E.g. Interviews 27, 66, and 70.

²⁴¹ Interview Robert Corell, May 3, 2004.

its potential linkage to global climate change made it inevitable that the dynamics of the global climate negotiations would influence the process.²⁴²

What does the ACIA process say about how regimes shape knowledge production? In the ACIA process, the structure of the Arctic Council played a major role in changing the definition of what was considered legitimate knowledge in relation to climate change. Specifically, the political representation of indigenous peoples as Permanent Participants in the Arctic Council provided a venue for introducing traditional knowledge in a way that would have been very difficult to ignore politically. Moreover, it appears that the state cooperation in the Arctic Council, as the political platform, to a large extent kept sub-regional or local political stakeholders from participating in framing the assessment's task. Local business or political experiences were thus not introduced as legitimate sources of knowledge in the assessment. It was not sufficient that previous research on climate impacts in the Arctic had contained a sub-regional focus with involvement of local stakeholders. This could be one explanation as to why it proved difficult for the process to take on the task of assessing socioeconomic impacts. As discussed in more detail in Chapter 6 of this dissertation these impacts, to a large extent, became framed as impacts on the indigenous populations and their traditional livelihoods, which was in line with the interests of the indigenous peoples' organizations with voices in the Arctic Council setting. While there are specific measures in the ACIA to make the assessment process legitimate to the indigenous peoples' organizations, there are very few signs of attempts to make the process legitimate as well to local or sub-regional stakeholders that had no strong platform in the Arctic Council. Other contributing factors for the lack of emphasis on socioeconomic assessment appear to have been that the key organizations in the assessment had weak connections to social science communities that could have been engaged in this task. Moreover, social scientists engaged in Arctic issues communities did not view ACIA as a priority. Thus the actor networks further enhanced the bias against socioeconomic impact assessment.

²⁴² Interview 31.

Table 5.1. Selected events in the assessment of impacts of Arctic climate change.

Year	Arctic developments	Global developments
1988		Creation of the Inter-governmental Panel on Climate Change (IPCC)
1989	Start of the Mackenzie Basin Integrated Impact Assessment	
1990	Creation of the International Arctic Science Committee (IASC)	IPCC's First Assessment Reports
1991	Creation of the Arctic Environmental Protection Strategy (AEPS)	
1992		Signing of the United Nations Framework Convention on Climate Change (UNFCCC)
1993	Noting the existing global cooperation on climate change and ozone depletion, the AEPS tasks one of its working groups (AMAP) with reviewing programs and identifying knowledge gaps in relation to the Arctic	
1994	IASC publishes scientific plan for a regional research program in the Arctic on global change	
1995		IPCC's Second Assessment Reports
1996	Start for IASC-sponsored Bering Sea and Barents Sea Impact Studies	
1996	Arctic Council is created and subsumes previous AEPS working groups	
1997		IPCC publishes an assessment of regional impacts of climate change
1997 and 1998	AMAP publishes a chapter on climate change and ultraviolet radiation as part of circumpolar assessment on pollution	
1997	AEPS Ministerial recognizes the need to initiate monitoring and assessment activities focusing on the effects and interactions with other agents impacting the Arctic, and to forge linkages with other organizations.	
Dec. 1998	AMAP discusses plans for an Arctic climate impact assessment based on a US proposal. Decision to create ACIA's Assessment Steering Committee.	
Jan. 1999	IASC decides to focus an assessment on climate change and gives Robert Corell the task of developing an draft outline	
Feb. 1999	First draft of ACIA outline discussed by IASC	
Mar. 1999	First meeting of ACIA's Assessment Steering Committee	

Year	Arctic developments	Global developments
Apr. 1999	Workshop in Tromsø to identify needs and requirement for an assessment	
Nov. 1999	Presentation of a proposal for the ACIA to the Arctic Council	
Feb.-Mar. 2000	Large scoping workshop to discuss content of the ACIA	
Apr. 2000	Arctic Council approves ACIA's implementation plan	
Sep. 2000	First joint meeting between AMAP and CAFF regarding the ACIA	
2001		IPCC's Third Assessment Reports
Aug. 2001	Second joint AMAP-CAFF meeting decides on process for the ACIA policy document	
Mar. 2003	Cross-fertilization meeting among ACIA chapters and first meeting with science writer and with Policy Drafting Team. Initial list of key findings developed.	
Summer 2003	First draft of ACIA's scientific report for review	
Aug. 2003	Informal meeting on Svalbard with Senior Arctic Officials to present ACIA's major science results and work of Policy Drafting Team	
Oct. 2003	Policy Drafting Team produces its "London draft." United States calls policy process into question. Senior Arctic Officials dismantle Policy Drafting Team. Assessment Steering Committee discusses review of scientific report and initial draft of overview document	
Mar. 2004	The Assessment Integration Team discusses review of the overview document	
Apr. 2004	Overview document and scientific results presented to the AMAP Working Group and CAFF Working Group	
Apr. 2004	Informal meeting of Senior Arctic Officials in Nuuk to get the policy process moving again	
Summer 2004	Editing and production of scientific report and overview document. Circulation of chair's draft for a policy document for comments	
Aug.- Nov. 2004	Continued negotiation of the policy outcome	
Nov. 2004	Formal release of the overview document. ACIA Scientific Conference.	
Nov. 24, 2004	Arctic Council ministerial meeting, including presentation of ACIA's policy document	
Oct. 2005	ACIA's scientific report in print	
2007		IPCC's Fourth Assessment Reports

Chapter 6

The Scientific Framing of Arctic Climate Change

The purpose of this chapter is to discuss the framing of climate change in the scientific and overview reports of the Arctic Climate Impact Assessment (ACIA). What issues are brought to the fore, why, and by whom? It will analyze the framing in the context of the knowledge base that is used for the assessment and discuss what circumstances and drivers might explain why the reports place more emphasis on some issues and less on others. As background for a discussion on the role of regional climate impact assessments in a global context, the chapter also compares the ACIA scientific report to the 2001 assessment from the Intergovernmental Panel on Climate Change (IPCC). Two major arguments are put forth in this chapter. First is that the ACIA highlights the global role of the Arctic and that its role is also framed by the political context of the region as a bellwether for global climate change. The second is that this regional assessment provided a venue for assessing the human dimensions of climate change, particularly as they relate to indigenous peoples, rather than only exploring Arctic climate change in relation to its geophysical characteristics. It thus represents an emerging shift from a discourse focusing on global impact to one that pays more attention to how complex interactions of different factors will affect the local impacts of climate change and the capacity to adapt.

The chapter starts with a discussion of the materials and methods for the analyses. This is followed by a description of three major framing issues: the choices of spatial scale and geographic coverage, whose lives the assessment focuses on, and what is climate change about in the ACIA report. This is followed by a specific focus on how structures of international cooperation might explain some of the key framings in the report.

6.1 Materials and methods

In contrast to the focus on the process in Chapter 5 of this dissertation, this chapter focuses on the content of the ACIA reports. As a complement to the presentation of the research approach in Chapter 3 and to aid the reader in interpreting the results, this section describes in more detail the texts and the methods for the content analysis.

The texts

The ACIA texts used to analyze the framing of climate change are ACIA's full scientific report *Arctic Climate Impact Assessment*¹ and the so-called overview document, *Impacts of a Warming Arctic*.² In addition, the scientific reports from Working Group I and Working Group II from IPCC's third assessment were used: *Climate Change 2001. The Scientific Basis*³ and *Climate Change 2001. Impact, Adaptation and Vulnerability*.⁴ The third IPCC report, *Climate Change 2001. Mitigation*, was not considered as relevant since the topics covered were not key to the ACIA.

ACIA's scientific report is a book of 1042 pages with 18 chapters focusing on different topics, ranging from a description of Arctic climate in the past and present to analyses of impacts of climate change on ecosystems and local indigenous communities. Responsibility for the contents of the chapters rests with the lead authors. They, in turn, produced the chapters in cooperation with teams of contributing authors, consulting authors, and case study authors. The general style of the report is scientific in that it follows common norms of scientific writing, such as extensive use of references. The text has been peer-reviewed in a procedure that is discussed in more detail in Chapter 5 of this dissertation. The scientific report is for the most part an assessment of available knowledge rather than a research report focusing on presenting new knowledge. As the lead authors described in their interviews, the major knowledge base of the report is in the peer-reviewed scientific literature. Some authors have also used other published literature (e.g. institutional reports) and some chapters include case studies that were not published previous to the ACIA.

The ACIA overview document is a 145-page summary of the scientific report. It is framed as part of the scientific content of the ACIA but aimed at a different audience: policy makers and the broader public. It is specifically designed for these audiences, richly illustrated with graphic representations of issues and processes as well as a large number of photographs. It is written in language of popular science and references are made to chapters in the scientific report and are in summary form rather than the more traditional reference style used for the scientific report. The report is thus a different genre, even if the purpose is to convey the same base of knowledge as the scientific report. The author of the overview report is a professional science writer but its final content is also the result of collaborations with a graphics artist, the lead authors of the scientific report, and the Assessment Integration Team.

The overview has gone through national reviews but its wording has not been negotiated with policy makers or in meetings where the delegates were present with mandates from their respective countries. Rather, the overview obtains its credibility from ACIA's

¹ ACIA, *Arctic Climate Impact Assessment* (Cambridge: Cambridge University Press, 2005).

² ACIA, *Impacts of a Warming Arctic: Arctic Climate Impact Assessment* (Cambridge: Cambridge University Press, 2004).

³ IPCC, *Climate Change 2001. The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge and New York: Cambridge University Press, 2001).

⁴ IPCC, *Climate Change 2001. Impacts, Adaptation, and Vulnerability. Contribution of Working Group 2 to the Third Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge, UK, and New York: Cambridge University Press, 2001).

scientific assessment and the lead authors of the science report, as reflected in the following statement:

AMAP, CAFF and IASC have received written certification by the ACIA leadership and all the lead authors that the final scientific report reflects their expert views, and that this synthesis report is fully consistent with the scientific volume.⁵

The overview is organized quite differently from the scientific report. Rather than following the chapter structure of the scientific report, the major messages are highlighted as ten key findings that cut across the scientific framings in the different chapters. The key findings are initially presented very briefly on a two-page spread and later discussed more in depth under the section "Supporting Evidence for the Key Findings." It also includes a special section that highlights key impacts in four sub-regions of the Arctic. The report starts with an executive summary.

The IPCC reports belong to the same genre as the ACIA scientific report meaning they are assessments of existing knowledge and are presented in a scientific style with extensive use of references. The IPCC bases its assessments "mainly on peer reviewed and published scientific/technical literature"⁶ There are special procedures for ensuring access to non-published material that is cited.⁷ According to the norms of IPCC, responsibility for the content of each chapter rests with the chapter authors. This is accepted by the respective working groups signifying "that the material has not been subject to line by line discussion and agreement, but nevertheless presents a comprehensive, objective and balanced view of the subject matter."⁸ The IPCC reports were published in 2001 and written before the ACIA report. It is thus difficult to separate whether differences in framing are related to shifts in time or other differences to the contexts of the two assessment processes. As discussed in the background to the ACIA in Chapter 5 of this dissertation, the ACIA reports cannot be seen as independent of the IPCC. Rather, based on ACIA's history, one might expect the 2001 IPCC assessment to be seen as a starting point for the more in-depth regional assessment in the ACIA.

Qualitative content analysis of ACIA report

The aim of the initial text analysis was to explore the framings of climate change and the knowledge base in the chapters, rather than to test a specific hypothesis. The term framing is used to capture how certain aspects of an issue are highlighted.⁹ Frames are a way to describe basic cognitive structures that guide our perceptions of new information and how we represent an issue in communicating with others. In other words, they are the cognitive structures that guide what parts of the world around us that become visible.¹⁰ Some authors identify two different types of frames. At one level are the discursive

⁵ ACIA, *Impacts of a Warming Arctic: Arctic Climate Impact Assessment*, preface.

⁶ Quoted from www.ipcc.ch. Accessed October 27, 2006

⁷ Appendix A to the Principles Governing IPCC Work. Procedures for the preparation, review, acceptance, adoption, approval and publication of IPCC reports; www.ipcc.ch.

⁸ Appendix A to the Principles Governing IPCC Work. Procedures for the preparation, review, acceptance, adoption, approval and publication of IPCC reports; www.ipcc.ch.

⁹ Mitchell, et al. "Information and Influence," 315.

¹⁰ König, "Frame Analysis: A Primer."

sive structural frames, which we may use to organize information about a topic. At a more fundamental level are cultural frames that people use to make sense of new information. Fischer describe cultural frames “as loose, socially-generated structures in discourse which people use to organise information, and around which groups develop ideological and policy arguments.”¹¹ Searching for major framings of climate change in the ACIA reports is therefore a way to capture the overarching messages within the detail of scientific information. My emphasis has been on detecting patterns and the approach is best described as exploratory, interpretive and inductive, rather than confirmatory and deductive.¹² The qualitative analysis of the scientific report was carried out by reading each of the chapters with specific attention to the following questions:

- What are the major framings of Arctic climate change and key issues brought forth in the chapter?
- What knowledge is presented in the chapter?
- Whose knowledge is presented in the chapter?

The purpose of these questions was to get a picture of the knowledge base as the chapters themselves presented it. This can be viewed as a representation of the end result of the assessment process. It can then be compared to issues raised and to actors who were active during the process, as well as to be compared with the final integrated result of other assessment processes, such as the IPCC reports. The answers to the question were often explicit and can easily be illustrated by quotes. For example, a chapter could explicitly list important sources of information (emphasis added):

This chapter assesses information on interactions between climate, UV-B radiation levels, and ecosystems from a wide range of sources including *experimental manipulations* of ecosystems and environments in the field; *laboratory experiments*; *monitoring and observation* of biological processes in the field; *conceptual modeling* using past relationships between climate and biota (paleo-analogues) and current relationships between climate and biota in different geographic areas (geographic analogues) to infer future relationships; and process-based *mathematical modeling*. Where possible, *indigenous knowledge* (limited to published sources) is included as an additional source of observational evidence.¹³

Key to this chapter are several detailed *case studies* based on extensive research with indigenous communities in a number of arctic settings.¹⁴

Likewise, major framings were identified by the chapter authors and often presented in the introductions and summaries of the chapters. A framing could also be seen in how

¹¹ As reviewed by K. Fischer, "Locating Frames in the Discursive Universe," *Sociological Research Online* 2, no. 3 (1997): www.socresonline.org.uk/2/3/4.html.

¹² Pat Bazeley, "Issues in Mixing Qualitative and Quantitative Approaches to Research," in *Applying Qualitative Methods to Marketing Management Research*, eds. R. Buber, J. Gadner, and L. Richards, 141-156 (New York: Palgrave Macmillan, 2004).

¹³ Chapter 7. Arctic Tundra and Polar Desert Ecosystems, 248

¹⁴ Chapter 12. Hunting, Herding, Fishing, and Gathering: Indigenous Peoples and Renewable Resource Use in the Arctic, 650.

impacts are analyzed and what is seen as the logical point of departure, where some contrasting perspectives are represented by the following quotes. The first quote below takes its starting point in the physical consequences of global climate change and the second quote in the complex reality of an individual human being:

To assess climate change impacts on societies, ecosystems, and infrastructure, possible changes in physical climate parameters must first be projected. The physical climate change projections must in turn be calculated from changes in external factors that can affect the physical climate.¹⁵

Human health status is a result of the complex interaction of genetic, nutritional, and environmental factors. "Environment" in this context includes the socio-economic, cultural, and physical infrastructure and ecosystem factors.¹⁶

A framing can also be the authors highlighting what gives authority to specific knowledge claims, as in the following quote that gives indigenous peoples a special role:

Indigenous peoples in the Arctic have for millennia depended on and adapted to their environment. Their knowledge of their surroundings is a vital resource for their well-being. Their knowledge is also a rich source of information for others wishing to understand the arctic system.¹⁷

In addition to mining the summaries and introductions, I tried to identify key issues that reoccurred throughout the text that illustrated a certain framing. As in any qualitative analysis, there is risk of subjectiveness in the selection of key framings. However the selected passages, directly in the language used by the authors in the chapters, struck me as representative. To systematize observations from the text, quotes were tabulated for each question and each chapter. Author interviews were transcribed and analyzed in conjunction with text analysis and included special attention to the same key questions as the text analysis. Based on a combination of text and interviews, a summary analysis was then made for each chapter, which also included evaluating circumstances that might point to potential drivers behind the findings for that specific chapter. Special attention was placed on the possible role of regimes, actor networks, and scale.

Quantitative analysis of the ACIA reports

To complement the qualitative text analysis, the computer software *Concordance*¹⁸ was used to identify the most commonly used words in each chapter and to count frequency of selected key words related to framing and knowledge base. Both approaches can be described as classical text analysis or a "fishing expedition." They do not rely on any interpretive coding of the text and can be called representational in that they are based on the assumption that the authors say what they mean. The weakness is that this

¹⁵ From the introduction of Chapter 4. Future Climate Change. Modeling and Scenarios for the Arctic, 101

¹⁶ From the introduction of Chapter 15. Human Health, 865

¹⁷ From summary of Chapter 3. The Changing Arctic Indigenous Perspectives, 62.

¹⁸ Concordance Version 3.2.

method does not reveal how the words are used and what intention the writer had using the words.¹⁹

In addition, selected key words were chosen to look for specific patterns in the knowledge base, for example to capture issues of special interest to different scientific disciplines (e.g. biological, economic, cultural), specific discourses (e.g. rights, vulnerability, sustainable), the scale in focus (e.g. global, regional, local), or methods used (e.g. model, case study, monitoring). The analysis only included the chapters by the scientific authors and not the report preface and similar material.

The *Concordance* program uses text files, which were created by taking the Adobe Acrobat Reader files of the individual ACIA chapters that were downloaded from the ACIA website and saving them as text-files.²⁰ The files include all text, including those in figures, figure legends, and references. Except for text in figures, the graphics were not included in this analysis. Words without intrinsic meaning were either placed on a stop list, and thus not included in the word count, or deleted before creating lists of the most commonly used words for each chapter. Examples of deleted words are: and, as, be, for, which, and any number (1,2,3 etc.).

The program allows for looking at the context of each word usage, which would allow a more careful comparison. This feature was mainly used to check the major uses of words with possibly ambiguous meaning (e.g. radiation referring to UV radiation, solar radiation or ionizing radiation) and to further scrutinize “odd” results.

For the overview document, it was not possible to use the *Concordance* software because the document’s format did not allow saving it as a text file. Therefore, some selected words were searched and counted via the search function in Adobe Acrobat Reader.

There are inherent limitations to representational text analysis. First, it requires further work to explore the context in which the words occur. Second, it cannot easily capture concepts that are not explicitly mentioned. This includes framings that are so taken for granted that the authors do not consider them important to mention. Third, the program cannot read between lines, the way an observant human reader can do. Moreover, it is difficult to capture the flow of logic in a text. Therefore, the quantitative analysis should be seen as a complement to the qualitative analysis and vice versa. The strength in the quantitative analysis is that it can assist in detecting patterns that were not seen in the initial qualitative analysis. It can also be used to cross check whether patterns identified in the initial qualitative analysis are also apparent via frequency of words.

When comparing texts by different authors, a quantitative text analysis may provide results that represent more the linguistic idiosyncrasies of the authors than a change in a major scientific framing of an issue, which is the central question to do this study. However, the scientific writing style is rather formalized and both the ACIA and the IPCC reports, which were written by groups of authors, have gone through editing, including editing for consistency. Major differences in the frequency of key words are thus likely to indicate differences in framing.

¹⁹ Carl W. Roberts, “A Conceptual Framework for Quantitative Text Analysis,” *Quality & Quantity* 34, (2000): 259.

²⁰ www.acia.uaf.edu. Accessed Nov. 2005 – Mar. 2006.

To assist the interpretation of the quantitative data and to help in pattern detection, the frequency with which different words were used were statistically analyzed using principal component analysis. This method is useful for detecting patterns in multivariate data (i.e. when there are three or more variables) and where many of the variables are dependent upon each other. The object of the analysis is to take the variables and find combinations that are uncorrelated. The lack of correlation reveals different dimensions in the data, where the first dimension displays the largest amount of variation.²¹ For the analyses in this chapter, the variables are the number of times certain words are used in a specific chapter or report and the cases are either different chapters or different reports. The results are presented in two-dimensional graphics that provide a perceptual map of the location of each case (e.g. chapter) in the relation to the first two principal components.

Interviews with ACIA lead authors

To get a better understanding of the lead authors' own perceptions of the ACIA scientific report and its significance, semi-structured interviews were carried out with most of the lead authors (see Chapter 3 of this dissertation for method details). The interviews complement the content analysis of the documents by giving the lead authors an opportunity to highlight the major knowledge bases in their chapters and the scientific insights gained through the assessment process. In addition, some interview questions focused on connecting these issues to the structure of the ACIA process and to the issue of spatial scale. When relevant, the lead authors also compared their experiences with the ACIA to other scientific assessment processes, including the IPCC. The interview guide is available in Appendix III.

6.2 Global, local, and regional: a focus on spatial scale

One of the striking features from both the qualitative and quantitative analyses of ACIA's scientific report is that some chapters clearly frame Arctic climate change as a global issue while other chapters instead start their analysis from local issues, of which climate change is one of many interacting factors. In fact, a principal component analysis of 37 selected words in the chapters in the ACIA report shows the words *global* and *local*, along with words that closely correlate with global and local, describe much of the variation among chapters, see Box 6.1. and Box 6.2. The circumpolar spatial scale is not as prominent in the individual chapters of the scientific report, but is more prominently featured in the overview document, together with a message that the Arctic is a bellwether for what is in store globally. This section explores how global, regional, and local spatial dimensions are featured in the ACIA reports and possible factors behind different preferences. It also includes a discussion of the assessment's geographical coverage.

²¹ Bryan F. J. Manly, *Multivariate Statistical Methods. A Primer* (London: Chapman and Hall, 1986), 59.

Global perspectives

A framing that comes to the fore in both the qualitative and quantitative text analysis is that the Arctic is part of the global climate system. An example is the second key finding in the overview: “Arctic warming and its consequences have worldwide implications.” A number of similar statements also appear in the scientific report. The following quotes illustrate this emphasis on the Arctic as part of a global system:

The transport of water, heat, and salt by inflows are important elements of the global climate system.²²

The Arctic is connected to the global climate, being influenced by it and vice versa.²³

Changes in arctic ecosystems and their biota are important to arctic residents in terms of food, fuel, and culture (Chapter 12) and are likely to have global impacts because of the many linkages between the Arctic and more southerly regions. Several hundreds of millions of birds migrate to the Arctic each year and their success in the Arctic determines their success and impacts at lower latitudes (section 7.3.1.2). Physical and biogeochemical processes in the Arctic affect atmospheric circulation and the climate of regions outside of the Arctic (section 7.5).²⁴

The Arctic plays a unique role in the global context and climate change in the Arctic has consequences that extend well beyond the Arctic.²⁵

Looking at the quantitative analysis of selected words, the word *global* is more frequently used than the words *regional* or *local* in ten of the eighteen chapters, notably in frame-setting chapters such as the introduction, the description of Arctic climate past and present, and the summary and synthesis. It is also used frequently in chapters that discuss various aspects of the physical environment (temperature, precipitation, ice) or carbon flows (terrestrial ecosystems, forests). i.e. aspects where feedbacks between the Arctic and global system play a role.

The global framing is also apparent in the chapter on modeling and scenarios of future climate change. Here, a choice is made to rely on global climate models rather than emerging regional climate models (RCMs), which has implications for the report as a whole, since the scenarios are used for many of the chapters on impacts:

The current status of arctic regional climate modeling did not allow RCMs [Regional Climate Models] to be employed as principal tools for the ACIA. Present scenarios of future arctic climate change are therefore based on results from global AOGCMs [Atmosphere-Ocean General Circulation Models].²⁶

²² Chapter 2. Arctic Climate. Past and Present, 27.

²³ Chapter 2. Arctic Climate. Past and Present, 23.

²⁴ Chapter 7. Terrestrial Ecosystems and Polar Deserts, 247.

²⁵ Chapter 18. Summary and Synthesis of the ACIA, 990.

²⁶ Chapter 4. Future Climate Change. Modeling and Scenarios for the Arctic, 136.

To the extent that the other lead authors depended on model outputs, the assessment as a whole thus became limited by the spatial resolution in global climate models, at least in discussing future climate change.

Although there are many references in ACIA to the word *global* as well as to the connection between the Arctic and the global, *global* is less emphasized here than in the IPCC reports, as shown by the total number of times that the authors use the word *global* and its relative frequency to the word *local*. What emerges when comparing the frequency of the words *global*, or *regional*, and *local* or *community* is a pattern where the local and community level is more emphasized in the ACIA scientific report than in the IPCC reports, see Box 6.2. This may reflect a more general shift in interest towards local vulnerability in climate change but still warrants a closer look at where and how the local scale preference is introduced in the ACIA.

Box 6.1 Mapping the chapters in ACIA’s scientific report

To get an overview over differences in how frequently different selected words were used in the chapters of ACIA’s scientific report, a principal component analysis was used to generate a two-dimensional map. It is based on the following words: global, regional, local, community, people, indigenous, political, temperature, precipitation, ice, snow, permafrost, ecosystem, species, marine, terrestrial, freshwater, atmosphere, physical, chemical, economic, social, biology, cultural, impact, adaptation, vulnerability, sustainable, conservation, management, resource(s), ultraviolet or UV, biodiversity, carbon, model, scenario, monitoring, observation(s) case study(ies), and IPCC. The frequency by which they are mentioned in each chapter has been corrected for the size of the chapter. The analysis was carried out by the categorical principal component analysis in the SPSS statistical package, using a numeric scale and grouping the variables to achieve a normal distribution, making the procedure analogous to a standard principal component analysis. Numbers in the graph refer to chapter numbers in the ACIA scientific report, see list on the following page. The first dimension (x-axis) accounts for 28.5 percent of the variance, and the second dimension (y-axis) accounts for another 15.8 percent.

1. An Introduction to the Arctic Climate Impact Assessment
2. Arctic Climate: Past and Present
3. The Changing Arctic: Indigenous Perspectives
4. Future Climate Change: Modeling and Scenarios for the Arctic
5. Ozone and Ultraviolet Radiation
6. Cryosphere and Hydrology
7. Arctic Tundra and Polar Desert Ecosystems
8. Freshwater Ecosystems and Fisheries
9. Marine Systems
10. Principles of Conserving the Arctic's Biodiversity
11. Management and Conservation of Wildlife in a Changing Arctic Environment
12. Hunting, Herding, Fishing, and Gathering:
Indigenous Peoples and Renewable Resource Use in the Arctic
13. Fisheries and Aquaculture
14. Forests, Land Management, and Agriculture
15. Human Health
16. Infrastructure: Buildings, Support Systems, and Industrial Facilities
17. Climate Change in the Context of Multiple Stressors and Resilience
18. Summary and Synthesis of the ACIA

Component loadings > 0.5 or < - 0.5

Dimension 1

people	0.918
social	0.870
local	0.867
political	0.864
resource(s)	0.794
indigenous	0.787
cultural	0.782
community	0.735
economic	0.728
sustainable	0.717
adaptation	0.616
vulnerable	0.604
management	0.603
case study/ies	0.594

Dimension 2

species	0.728
biological	0.726
ecosystem	0.720
biodiversity	0.699

global	-0.511
model(s)	-0.576
precipitation	-0.627
atmosphere	-0.702
temperature	-0.713

case study/ies	-0.606
snow	-0.610
observation(s)	-0.675

Box 6.2 Global, regional, and local

Scale words in ACIA’s scientific chapters

The table shows the significant correlations between mentions of some words referring to spatial scale (global, regional, local) and selected words in the chapters of the ACIA scientific report (0.01 confidence levels) based on Kendall’s tau. The number of mentions in each chapter has been corrected for the size of the chapter. The following words were included in the analysis: global, regional local, community, people, indigenous, political, temperature, precipitation, ice, snow, permafrost, ecosystem, species, marine, terrestrial, freshwater, atmosphere, chemical, economic, social, biology, cultural, impact(s), adaptation, vulnerability, sustainable, conservation, resource(s), ultraviolet or UV, biodiversity, carbon, model(s), scenario, monitoring, observation(s) case study(ies), and IPCC.

	Positive correlations	Negative correlations
Global	IPCC 0.630 model 0.582 atmosphere 0.551	community 0.490
Local	cultural 0.661 adaptation 0.660 indigenous 0.630 social 0.593 people 0.581 political 0.509 economic 0.503 resource(s) 0.477	atmosphere 0.459

Comparing ACIA and IPCC

The bar graph illustrates how often the words global, regional, and local are mentioned in the ACIA scientific report and the 2001 reports from IPCC’s Working Groups I and II. The number of mentions have been corrected for the size of the reports with the ACIA report as standard.

A local focus

The local focus of the ACIA scientific report is prominent in chapters that also frequently use words such as cultural, adaptation, indigenous, social, politics, economic, and resources (see Box 6.2). Three of these chapters rely heavily on case studies and feature an active involvement of indigenous peoples. There thus appears to be a connection between indigenous peoples, the local scale, and social sciences. There are at least two potential drivers in this connection that should be discussed. First is that indigenous knowledge is often site-specific and thus local in its character, in contrast to modeling for example. In the ACIA process, there was a push to include indigenous observations, which may have strengthened the emphasis on the local compared to the IPCC, where indigenous knowledge is hardly referred to at all. A second explanation could be that a focus on indigenous people has provided a venue for scientific knowledge traditions with a local focus into the assessment process. Not only were indigenous peoples' organizations active in pushing for the inclusion of their perspectives, some of them were also active in recruiting authors from their existing networks. There are, for example, references in a protocol from the Assessment Steering Committee about asking aboriginal leaders for help in making connections at the International Arctic Social Science Association meeting.²⁷ Not all of the social sciences are equally represented in the ACIA. Rather, the emphasis is on knowledge traditions that have taken an interest in indigenous cultures, e.g. anthropology, or have had experience of working with traditional ecological knowledge, e.g. in the management of natural resources. A third factor that further strengthened local and indigenous perspectives was the late addition of a chapter that brought a vulnerability perspective to the report.

To summarize, the dichotomy between global and local scale preferences seems to follow research traditions in different fields and could be a sign of new research fields, i.e. social sciences, with a local perspective, entering the knowledge production to a greater extent than in the IPCC. This interpretation is supported by the results from a principal component analysis where the polar chapter of IPCC's Working Group II report is more similar to the ACIA chapters that focus on the global scale and atmospheric science than to chapters with a more local scale preference and social science emphasis, see Box 6.3. This interpretation also matches the qualitative analysis of the primary knowledge base for each chapter.

The qualitative analysis also shows that the local also appears to be important in chapters with a strong biological focus (i.e. *Chapter 7. Arctic Tundra and Polar Desert Ecosystems* and *Chapter 8. Freshwater Ecosystems and Fisheries*). In these chapters the local scale is not as dominant, especially not in the chapter on tundra ecosystems and polar deserts, and is better described as part of a range of scales from local to regional and global. In fact, the chapter is organized to explicitly address dynamics at different spatial scales. In the freshwater ecosystem chapter, the inclusion of the local perspective was partly the result of the historic lack of international collaboration in this research field, which forced the authors to rely heavily on isolated case studies.²⁸

²⁷ Summary Report on the Seventh Assessment Steering Committee Meeting (ASC), 19-20 April 2001, Reykjavik, Iceland.

²⁸ Interview Fred Wrona, November 11, 2004.

Box 6.3 Comparing ACIA and IPCC

A: ACIA's scientific chapters and IPCC's chapter on polar regions

A perceptual map of chapters 1-18 in the ACIA scientific report and chapter 16 (Polar Regions) in IPCC's Working Group II report based on a principal component analysis of frequency of use of the following words: global, regional, local, community, people, indigenous, political, temperature, precipitation, ice, snow, permafrost, ecosystem, species, marine, terrestrial, freshwater, atmosphere, physical, chemical, economic, social, biology, cultural, impact, adaptation, vulnerability, sustainable, conservation, management, resources, ultraviolet or UV, biodiversity, carbon, model, scenario, monitoring, observation(s), case study(ies), and IPCC. The statistical treatment is the same as in Box 6.1. The analysis shows that the IPCC chapter on polar regions less frequently uses words such as resources, people, politics, local, and social. The analysis does not reveal to what extent this relative lack of emphasis is because IPCC's polar chapter includes both Antarctica and the Arctic. In relation to the second dimension, described by words such as species and biological, IPCC's polar chapter is at the center of ACIA's chapters.

Comparing ACIA's chapters and IPCC's polar chapter, selected words

B: Whole reports ACIA and IPCC

A perceptual map of the chapters in the ACIA scientific report as a whole compared to IPCC's 2001 reports from Working Group I and II. The map is generated by a principal component analysis based on the frequency of the same selected words as in the analysis of chapters on the previous page, except for exclusion of the word biodiversity as this was not mentioned in all three reports. Dimension 1 (x-axis) accounts for 67 percent of the variation in the model and dimension 2 (y-axis) for 33 percent. The analysis shows that the ACIA report as a whole more frequently uses the words people, biological, political, and local, and words closely correlated with them, especially as compared to IPCC's Working Group I report. It less frequently uses the words impact(s), adaptation, global, and vulnerability, and words correlated with them, especially as compared to IPCC's Working Group II report. Compared to both IPCC reports, the ACIA report more often uses the words ice, terrestrial, and snow and words closely correlated with them .

The regional perspective

In discussing spatial scale preferences, one might have expected a stronger emphasis on the regional in the ACIA than in IPCC's reports, but if anything the use of this word is less frequent. This is somewhat surprising considering that the ACIA is a regional assessment. The major exception was *Chapter 4. Future Climate Change: Modeling and Scenarios for the Arctic*, where the circumpolar scale is prominent because of attempts to adapt the global climate models so that they would be more useful in the Arctic context. This chapter also refers most frequently to the IPCC. Thus the regional framing may be connected to the general discussion in the IPCC about the need for more regional scale assessments. This discussion was an important driving force for initiating the ACIA (see Chapter 5 of this dissertation) and to the ongoing efforts of downscaling within the climate modeling community. However, the regional models were not ready for use in the ACIA. One factor behind the preference for either global or local perspectives in ACIA's science chapters rather than a regional perspective could thus be that the limits of modeling technology made it difficult to connect model results to local concerns. This might have created a void between an emphasis on global scale preference in the atmospheric sciences and the local or sub-regional focus in some of the impact studies. The conclusion that the lack of model resolution was a major issue is supported by the fact that the ACIA report itself identifies poor model resolution and inadequate treatment of sub-regional or small-scale physical processes as a gap in knowledge and as a future research need. The development of regional climate models since the ACIA continues to be carried out and the results may be quite different for future assessments.

The interviews with the lead authors suggest that those writing the assessment did not feel bound to use the circumpolar region as the only appropriate choice of spatial scale, and most followed what they saw as logical in the context of their chapter. In some cases, this created a more local focus and in other cases a more global focus than only looking at the Arctic. However, for some chapters, interviews indicate that the lack of resolution of the climate models used by the ACIA made it impossible to focus on what the authors considered to be the appropriate scale. There was only one lead author who clearly stated that the circumpolar scale was the scale of choice (*Chapter 5. Ozone and Ultraviolet Radiation*). Thus it appears that the authors chose the scale that they considered most relevant in relation to their scientific questions, without feeling limited by ACIA's regional scale.

Even if the regional scale is less prominent than the global and local scale preferences, there appears to have been some normative pushes towards the regional scale. For example, most lead authors recounted attempts to widen the scientific networks to scientists from other parts of the Arctic. This was not seen as a contradiction to scientific concerns, rather the opposite as it created the potential for a wider geographical coverage and comparisons. An example of a deliberate effort to search for circumpolar patterns within the local data is *Chapter 3. The Changing Arctic. Indigenous Perspectives*, which highlights that there are local indigenous reports about changing weather

and changing weather predictability from every region of the Arctic.²⁹ In *Chapter 14. Forests, Land Management and Agriculture*, the lead author highlighted the key role the ACIA had played in creating a scientific network that allowed improved comparative studies of tree ring data.³⁰

Even if the circumpolar context of the assessment did not play a major role in relation to scale preference, or could not overcome the technical limitations in featuring the regional scale, the Arctic is the common denominator for the report as a whole. The Arctic focus is further accentuated in the overview document. On the other hand the local and community levels are less prominent in the overview than in the scientific report.

An illustration of the different scale preferences came to the fore during the internal ACIA review of the overview document. The overview presents maps on past temperature changes that integrate measurements from several local sites but “smears” out the data to fill in gaps, basically creating contours between actual data points. The lead author of the scientific chapter dealing with past and present changes was very critical of this choice, and preferred other maps that showed the individual locations where the measurements had been taken. Although validation of the different data sets was one issue for this discussion, equally important was the different preferences in scale.³¹

We used the misoplot diagrams because ... [they] show you in a very descriptive way ... where there is data and where there isn't. You can take those data sets and put them into a contouring package that draws nice contours ... between places where there is data and over places where there is no data. And you would often give the impression that we have more data than we really have. My view was that we should be honest, if there is not enough data points per grid square, we don't put any for that grid square. When you do contouring plots, you can't do that.³²

Thus it appears that the regional context of the assessment came to play a more important role in the overview than in the scientific framings and scale preferences that came to the fore in the scientific report.

Both the overview and some chapters in the scientific report, especially in *Chapter 18. Summary and Synthesis of the ACIA*, also highlight sub-regions of the Arctic. The geographic range of the sub-regions is interesting for the discussion of regional perspectives because of how the issue of scale affects the framing of climate change, most importantly in the tension between global versus local perspectives. The sub-regions were chosen based on commonalities in their climate characteristics, rather than similarities in cultural, social, or economic structures. For example, sub-region 1 consists of East Greenland, Iceland, Norway, Sweden, Finland, Northwest Russia, and adjacent seas. This means that the sub-regions do not represent the same approach of start-

²⁹ Also discussed in interviews with lead authors Henry Huntington, December 21, 2004 and Shari Fox Gearhard, November 12, 2004.

³⁰ Interview Glenn Juday, November 11, 2004.

³¹ Compare *Impacts of a Warming Arctic*, 23, and Chapter 2. Arctic Climate Past and Present, 37-38 figures 2.7 and 2.8; Observations notes from meeting of the Assessment Integration Team in Copenhagen, March 2004.

³² Interview Gordon McBean, November 10, 2004.

ing research in the local or site-specific context that is common in many social sciences and that rely heavily on case studies and emphasize complexity, e.g. anthropology. Rather, it is a perspective that has its starting point in the global and then tries to scale down – a framing that can be found in climate sciences. It therefore appears that this attempt at sub-regional impact assessment is driven by the dominance of the global framing in climate science and policy, but this attempt is moderated in a way that may be more useful than global or circumpolar averages and generalizations. This interpretation is supported by the fact that scientific approaches from sub-regional integrated assessments that had been carried out previous to the ACIA, such as the Mackenzie Basin Impact Study and the Bering and Barents Sea impact studies, were not extensively used in the ACIA and only one of the people who had led these sub-regional integrated assessments came to play an active role in the ACIA. According to a comment by the leader of the Mackenzie Basin Impact Study, an initial workshop in the early phase of ACIA probably contributed to the idea of looking at sub-regions as a way of explicitly considering the unique social context of each region. However, this cross-cutting issue did not have a separate team of lead authors that were active during the entire assessment but relied on summarizing the material that had already been brought up in the other chapters. This may have contributed to the difficulties in meeting the original intention of a sub-regional synthesis.³³

Highlighting the Arctic

Even if the regional scale was not a prominent point of departure for the analyses in ACIA's scientific chapters, the Arctic was still very much featured as a region with its own identity. As an illustration, the quantitative analysis revealed that the three most common meaning-bearing words in ACIA scientific report are *Arctic*, *climate*, and *change*. These words also occur among the top 20 words in almost all chapters, see Table 6.1. *Climate* and *change* are also among the most frequently used words in the IPCC reports, but *Arctic* is not. In the IPCC context, the relevant subdivision of the world into regions does not give the Arctic an identity of its own but treats it, alongside the Antarctic, in the chapter on polar regions. Even if the Arctic is discussed within the IPCC reports, the frequent use of the word *Arctic* signals a special framing of an "Arctic" rather than just part of a polar focus.

This framing is most likely connected to the fact that the assessment was mandated by a political regime covering the whole circumpolar region, the Arctic Council, as opposed to a global regime. Beyond this obvious observation are also the political developments related to the end of Cold War that led to the creation of a circumpolar political regime in the 1990s. The ACIA assessment and its highlighting of "Arctic" climate change can thus be seen as part of the on-going initiatives to create a regional identity, or region-building, which has been discussed by a number of authors.³⁴ As early as the

³³ Review comment by Stewart Cohen, written communication March 3, 2007.

³⁴ E.g. Young, *Arctic Politics. Conflict and Cooperation in the Circumpolar North*; Carina Keskitalo, *Negotiating the Arctic. The Construction of an International Region* (London: Routledge, 2004); Heininen, "Circumpolar International Relations and Geopolitics."

Table 6.1. The 20 most frequently used words in the ACIA scientific report and IPCC's Third Assessments Reports from Working Group I and Working Group II. The numbers refer to how many times a word is mentioned in the entire document. The emphasis on Arctic, climate, and change in the ACIA report remains even if mentions in page headers are omitted.

ACIA scientific report	IPCC Working Group I	IPCC Working Group II
ARCTIC 7833	CLIMATE 5086	CLIMATE 7635
CLIMATE 5607	CHANGE 2613	CHANGE 6806
CHANGE 4056	MODEL 2286	WATER 2705
CHANGES 2917	MODELS 2244	IMPACTS 2507
SPECIES 2900	CHANGES 2175	CHANGES 2457
SEA 2431	FORCING 2168	GLOBAL 2000
ICE 2241	GLOBAL 2092	ADAPTATION 1509
LIKELY 1996	TEMPERATURE 1746	INCREASE 1321
TEMPERATURE 1912	ATMOSPHERIC 1442	EFFECTS 1312
WATER 1643	CO2 1421	UNITED 1220
NORTHERN 1520	VARIABILITY 1313	TEMPERATURE 1145
NORTH 1475	SURFACE 1304	COASTAL 1103
INCREASE 1455	SEA 1263	SCENARIOS 1079
AREAS 1428	OCEAN 1252	IMPACT 1073
EFFECTS 1377	RADIATIVE 1232	USA 1038
RADIATION 1374	ICE 1210	SPECIES 1015
FISH 1366	DATA 1096	CLIMATIC 1013
RESEARCH 1343	RES 1056	RESOURCES 1004
MARINE 1234	CARBON 1004	WARMING 999
YEARS 1138	GEOPHYS 952	ENVIRONMENTAL 986

mid-1980s, Young coined the concept “the Age of the Arctic” to capture the growing significance of this region in a global political context.³⁵ That context was dominated by the growing military and industrial significance of the region, but the article also cites a statement about the importance of the Arctic to the entire global physical system in the context of climatic change.³⁶ With the end of the Cold War, the push for creating a regional identity has grown with political initiatives both at the circumpolar and sub-regional level. Keskitalo has discussed how the Arctic in the past decades has been constructed as an international region.³⁷ Today, the Arctic Council is the most significant political forum for this regional identity.

In the overview document, the focus on the Arctic comes to the fore because the text gives the Arctic a special role as the linchpin of climate change. This is a role it has had in connection with other environmental issues, especially persistent organic pollutants.³⁸ It is explicitly stated in the following passage:

³⁵ Young, “The Age of the Arctic.”

³⁶ June 1982 statement in the journal *Arctic* by a US State Department polar affairs specialist.

³⁷ Keskitalo, *Negotiating the Arctic. The Construction of an International Region*.

³⁸ For a discussion of the linch-pin image of the Arctic, see Young and Einarsson, “Introduction.”

Just as miners once had canaries to warn of rising concentrations of noxious gases, researchers working on climate change rely on arctic sea ice as an early warning system.... In recent years, the rate of retreat has accelerated, indicating that the canary is in trouble.³⁹

This image goes beyond the established climate science discourse of looking at the Arctic because of its importance for the global climate system and connects directly into a political discourse of the urgency of climate policy action.

A focus on the regional Arctic regimes and region building should be complemented by the recognition that the global climate science community has also highlighted the Arctic in recent years. It has become increasingly clear that climate modelers need a better understanding of the polar regions, which has spurred a number of international research initiatives focusing on the Arctic and its role in the global climate system, e.g. Arctic Climate Systems Study (ACSYS) and the Climate and Cryosphere Programme (CliC) under the auspices of the World Meteorological Research Program (WCRP). The global climate regime plays a role through the priorities of WCRP. Since this research is important for climate modeling, it is also connected to the needs of the IPCC for its assessment of climate change and its global impacts, which in turn provides a knowledge base for the United Nations Framework Convention on Climate Change (UNFCCC). The global climate science community is thus a rather strong actor network that is backed by the structure and norms of a global climate regime. However, these research efforts have been aimed at the science community and could not have had the same impetus as the ACIA to highlight the Arctic as a canary in a mine.

What is the Arctic? Notes of geographic coverage

What areas does the Arctic cover in ACIA's framing? There are numerous definitions of the Arctic, such as the area north of the polar circle, north of 60°N. or north of the treeline.⁴⁰ The ACIA, as a whole, covers an area that was defined by the Arctic Monitoring and Assessment Programme (AMAP) in the mid-1990s, where each country set the boundary within national borders and international marine areas were decided by consensus.⁴¹ The area is much larger than many people think of as the Arctic, see Figure 6.1. For example it includes large areas of boreal forest south of the tree line, as well as sub-arctic regions such as Iceland and the Faroe Islands. The driver for this rather wide definition of the Arctic no doubt results from the political context of the Arctic Council. The definition is, for example, different from the one used in the IPCC (area north of the Arctic Circle) and also does not follow the norm within any one scientific discipline. The history behind the encompassing definition of the Arctic is discussed further in Chapter 4 of this dissertation and can be summarized as a combination of geopolitical concerns and wishes for countries that do not border on the Arctic Ocean to be included in an emerging scientific cooperation.

³⁹ ACIA, *Impacts of a Warming Arctic: Arctic Climate Impact Assessment*, 24.

⁴⁰ AMAP, *Arctic Pollution Issues: A State of the Arctic Environment Report*, 6-7.

⁴¹ See Chapter 1. Introduction, 2.

Figure 6.1. Map of ACIA's Arctic as defined by the Arctic Monitoring and Assessment Programme (Reproduced from *Arctic Pollution Issues*, 1997).

The Arctic Ocean makes up about two thirds of the Arctic area, as defined by the ACIA. Russia accounts for the largest share of the land, followed by Canada, Greenland, United States, Norway, Iceland, Sweden, Finland, and the Faroe Islands. The largest number of people in the Arctic live in Russia, followed by Alaska, Norway, and Iceland, see Table 6.2.

How does the ACIA cover the different parts of the Arctic? In terms of marine versus terrestrial systems, the frequency of words indicates a fairly strong emphasis on the marine environment, which is consistent with the polar chapter of the 2001 report from IPCC's Working Group II.

In terms of different Arctic countries, several author interviews indicate that it was difficult to gather data from Russia and that they were not satisfied with the coverage of Russia in their assessments. During the review, concerns were raised that several chapters had too strong a North American focus, at the expense of discussing other parts of the Arctic. A number count of how many times different countries are mentioned in the ACIA report confirms the poor coverage of Russia relative to its size, and the emphasis on North America. Most frequently mentioned is Greenland followed by Alaska and Canada, and Russia. Alaska is, in fact, mentioned almost 2.5 times more often than Russia (Table 6.2.). The discrepancy is not quite as large if one adds mentions of Siberia to the Russian count but is still substantial.

Table 6.2. Number of times countries (or regions) are mentioned in ACIA's scientific report.

GREENLAND	1013
ALASKA	923
CANADA	770
ICELAND	441
RUSSIA	379
NORWAY	369
SIBERIA	215
FINLAND	169
SWEDEN	140
FENNOSCANDIA	121
FAROE	54
DENMARK	49

What could account for the differences in geographic share and mentions in the ACIA? The emphasis on Greenland could possibly be accounted for by its significance in a global climate context but this can hardly be said for the relatively low rating of Russia. Even Iceland is mentioned more often than Russia. The extent of present or projected future climate change also offers no clue since some of the largest changes have occurred in or are projected for parts of Siberia along with Alaska. A clue to the strong emphasis on Alaska and Canada and to the uneven distribution of coverage of other countries could possibly be explained by the distribution of nationality of lead and contributing authors, see Table 6.3.

Table 6.3. Country representation by authors in ACIA's scientific report and various indicators for each country's potential relevance to the ACIA. Data based on authors listed in Appendix 2 in *Impacts of a Warming Arctic* and the *Arctic Human Development Report*, chapters 2 and 4.

	Canada	Denmark Greenland Faroe Is.	Finland	Iceland	Norway	Russia	Sweden	USA	Other
Lead or contributing authors	38	10	11	7	23	20	15	58	12
Land area, rank	2	3 Greenl. 9 Faroe Is.	8	6	5	1	7	4	
Population rank	8	7	6	4	3	1	5	2	
Ind. pop, rank	3	5 Greenl.	4*	-	4*	2	4*	1	
Gross Arctic Product, rank	7	8	3	6	5	1	4	2	
Gross Arctic prod. % of GDP, rank	7	6	3	1	4	2	5	8	

* based on estimate for the Nordic Saami

One might also argue that more research on climate change impacts has been done in the United States than in the other countries, but it is difficult to find numbers to test such an argument. Moreover, it would also be difficult to judge what research to include. As late as the mid-1980s, Russia was described as a leader in Arctic research making lamentations about the limited efforts in the United States.⁴² Since then much has happened regarding Arctic research in North America. Also, the Bering Sea Impact Study generated information specifically regarding climate change, which might have helped to emphasize Alaska. However, no similar signals came from the Barents Sea Impact Study. One contributing factor could be the placement of the secretariat in Fairbanks, Alaska, and the scientific networks it was able to muster for the assessment.

Research funding and infrastructure in Russia suffered hard during the reorganization of Russian society since the fall of the Soviet Union and this is likely to also have played a role concerning the relative lack of emphasis on Russia. It is noteworthy that the circumpolar cooperation in the Arctic Council has not been able to completely overcome the difficulties of accessing Russian data or the lack of scientific networks that cross the old East-West political boundary. It may be significant that the Arctic cooperation is a soft law regime in that obtaining information related to Arctic Council needs depends on the good will, priorities, and capacity of its member states to report data and sponsor participating scientists. This is in contrast to the legally binding commitments to provide country reports with data, such as carbon sources and sinks, in the Kyoto Protocol. Lack of Russian data or access to data that probably do exist is not unique to the ACIA but has been a recurring shortcoming in several scientific assessments in the Arctic. In the ACIA process, there were several initiatives to strengthen the coverage of Russia, including workshops in Russia to involve more Russian scientists, financial sponsorship of Russian scientists participating as authors, and trips by lead authors to Russia to make connections and access data. Nevertheless, it appears that old geopolitical structures still play a major role in knowledge production about the Arctic.

Does the emphasis on North America have any consequences for the framing of Arctic climate change? In some parts of the assessment, it probably does. For example, the lead author of *Chapter 14. Forests, Land Management and Agriculture* has pointed to the North American emphasis on unexploited forests compared to an emphasis on their economic role in Fennoscandia. This is also apparent in the map of ACIA chapters created by the principal component analysis (see Box 6.1.), where chapter 14 appears more closely related to the different ecosystem chapters than to the chapters dealing with resource management. In the chapters dealing with conservation and biodiversity, one of the lead authors pointed to a difference between the European emphasis of conservation and the North American emphasis of management of resources and the role of co-management that includes involvement of indigenous peoples. Moreover, the strong voice of indigenous peoples in the assessment could be the result of the stronger emphasis on indigenous rights in North America and longer tradition of research on indigenous people compared to Fennoscandia or Russia. At least one of the lead authors argues that these factors are important to the availability of a knowledge base to present indigenous perspectives.⁴³ It is more difficult to judge whether the overall framing

⁴² Young, "The Age of the Arctic."

⁴³ Interview Henry Huntington, December 21, 2004.

would have been different with another distribution of knowledge input. Would, for example, the economic impact of climate change be more emphasized if Russia was more represented, considering the importance of the Russian North for Russia's economy? Not necessarily, because ACIA's scientific networks had weak connections to scientists who might have been able to conduct such an assessment. The answer may also depend on what issues different member states consider appropriate competence for the Arctic Council in relation to national sovereignty issues. Impact on the military would, for example, be very sensitive as military issues are explicitly excluded from the current cooperation in the Arctic Council.

6.3 Who is in focus?

The Arctic is home to approximately 4 million people with a range of lifestyles and economic activities. The ACIA highlights the impact of climate change on the indigenous peoples of the Arctic while non-indigenous residents and major economic activities of the region are hardly discussed at all. This section attempts to describe and analyze the choices the ACIA made about whom the assessment should highlight.

Indigenous perspectives

An important theme that is revealed by the qualitative text analysis is a focus on indigenous people, both as observers of climate change and as vulnerable to its impacts. The quantitative comparison to the IPCC reports also show that the words *indigenous*, *people*, and *peoples* occur more often in the ACIA scientific report. Moreover, indigenous peoples' issues are explicitly in focus in several of the ACIA chapters, i.e. *Chapter 3. The Changing Arctic: Indigenous Peoples Perspectives*, *Chapter 12. Hunting, Herding, Fishing, and Gathering: Indigenous Peoples and Renewable Resource Use in the Arctic*, and *Chapter 17. Climate Change in the Context of Multiple Stressors and Resilience*. In these chapters, indigenous peoples worked as active participants in the framing of climate change. The following quotes illustrate the level of their participation:

The case studies are based on extensive work in partnership with indigenous communities, and the chapter as a whole has developed with significant advice, guidance, and input from the Permanent Participants to the Arctic Council.⁴⁴

The Finnmark example provides a more in-depth analysis of Sámi reindeer herding developed through a collaborative effort involving scientists and herders, a subset of whom are authors of this chapter.⁴⁵

Indigenous people's observations also play a role in several other chapters, but as a complement to data from the natural sciences and usually taken from published literature. The picture that emerges from the text analysis is consistent with ACIA's own

⁴⁴ Chapter 12. Hunting, Herding, Fishing and Gathering. Indigenous Peoples and Renewable Resource Use in the Arctic, 686.

⁴⁵ Chapter 17. Climate Change in the Context of Multiple Stressors and Resilience, 946.

framing of the relationship between science and indigenous knowledge, which is a portrait of a partnership. Figure 6.2. is an example of how the ACIA chair presents the cooperation. The relationship is also described in the following quote from the preface of the overview document:

The ACIA is a comprehensively researched, fully referenced, and independently reviewed evaluation of arctic climate change and its impacts for the region and for the world, and also includes the special knowledge of indigenous peoples.⁴⁶

Figure 6.2. The connection between science and indigenous knowledge as it was represented in a presentation by the ACIA chair Robert Corell.

Indigenous knowledge and perspectives are not used equally in all chapters. In some chapters they are almost absent. Therefore it is of interest to analyze where they occur and what perspectives they bring to the report. In the principal component analysis of selected key words, the words *indigenous*, *people*, and *peoples* are clustered with *case studies* and words that relate to social sciences, such as *social* and *cultural*. Both the qualitative and quantitative analyses show that common to all these chapters are the local perspectives that are focused at the community level.

What then are the potential drivers behind the emphasis on the local/indigenous/social science cluster? One factor could be the regime of the Arctic Council as the policy home of the assessment and where there is a norm to ensure indigenous participation in scientific assessments. However, the ACIA ensures this to a

⁴⁶ ACIA, *Impacts of a Warming Arctic: Arctic Climate Impact Assessment*, preface.

greater degree than previous assessments under the auspices of the Arctic Council. As suggested earlier this could partly be explained by a strong preference to include indigenous knowledge from the ACIA chair. As one of the lead authors for a chapter focusing on indigenous issues expressed: "This chapter and the material were actively solicited from the beginning and again I credit Bob Corell and the others for their leadership in making this one of the focal areas of the assessment."⁴⁷ There was also a push by the representatives of the Permanent Participants, throughout the process, for assessment members to pay attention to indigenous perspectives. An example of this is seen from a meeting of the Assessment Steering Committee where the protocol notes a "contention by Native communities that insufficient attention is being paid to their experiences and knowledge."⁴⁸ A lead author, who has previously been involved with AMAP assessments, also pointed out that there was more research on indigenous observations available.⁴⁹ The push from the ACIA chair was based on the failure to bring indigenous perspectives into the US national assessment and the need to do a better job this time.⁵⁰ He, therefore, consciously worked to get indigenous perspectives into the ACIA. For example, he worked actively to get indigenous people involved in a chapter with a focus on vulnerability: *Chapter 17. Climate Change in the Context of Multiple Stressors and Resilience*, which includes a case study of Saami reindeer herders.

In addition to the Arctic Council norms and the interests of the ACIA chair, I suggest that the emphasis on including indigenous perspectives is connected to broad-scale political developments of decolonization in the Arctic and an increasingly strong recognition of indigenous peoples' rights. And in fact, words like *rights* and *political* are used more frequently in the chapters in the local/indigenous/social science cluster than elsewhere in the report. The inclusion also follows a growth of indigenous-initiated activities to document local observations, sometimes in collaboration with scientists, which has created paths for this knowledge into the published, citable literature.⁵¹ The coverage of indigenous knowledge is stronger in North America than Fennoscandia and Russia because of the stronger political focus on devolution and indigenous rights in North America. IPCC's Working Group II report also uses the words *indigenous*, *political*, and *rights*, but not to the same degree as the ACIA, which supports a conclusion that this cluster is part of a larger general political development. Even if it is difficult to separate the influence of the Arctic Council from more general trends, it should at least be seen as part of a global discourse with the possibility that the framing gains extra strength in knowledge production about the Arctic than globally because of the norms of the Arctic Council.

⁴⁷ Interview Henry Huntington, December 21, 2004.

⁴⁸ Summary Report on the Sixth Assessment Steering Committee (ASC) Meeting, October 15-18, 2000, Seattle, Washington, USA.

⁴⁹ Interview Henry Huntington, December 21, 2004.

⁵⁰ Interview Robert Corell, November 21, 2004.

⁵¹ Pointed out to me by Terry Fenge, see also Watt-Cloutier, et al. "Responding to Global Climate Change: The View of the Inuit Circumpolar Conference on the Arctic Climate Impact Assessment."

Non-indigenous people, city dwellers, and economic activities

As the report itself points out, there is very little assessment of the impact of climate change on the non-indigenous population of the Arctic. Specifically, in a listing of what needs to be improved in future assessments, the scientific report states that “A critical self-assessment of the ACIA shows achievements as well as deficiencies.... Impacts on people’s lives covered indigenous communities but had little information concerning other arctic residents.”⁵² This lack in the assessment can not be accounted for by the size of the non-indigenous population. Except for Greenland and parts of Canada, non-indigenous people are in majority and overall, non-indigenous people make up over 90 percent of the population.⁵³ Rather, it appears to be the result of a conscious focusing on indigenous people in several of the ACIA chapters. In addition to the chapters that were designed to specifically address indigenous issues (*Chapter 3. A Changing Arctic: Indigenous Perspectives* and *Chapter 12. Hunting, Herding, Fishing and Gathering: Indigenous Peoples and Renewable Resource Use in the Arctic*), indigenous people receive special attention also in *Chapter 11. Management and Conservation of Wildlife in a Changing Arctic Environment*, *Chapter 15. Human Health*, and *Chapter 17. Climate Change in the Context of Multiple Stressors and Resilience*. The human health chapter discusses this choice in terms of focusing on the most vulnerable populations.

There is also relative silence about impacts on city dwellers. The only specific urban issue that is assessed is how thawing permafrost will affect buildings and other types of infrastructure. Again, the explanation is not apparent from demographics, as two thirds of the Arctic population live in settlements of over 5000 people. This population pattern varies across the Arctic, ranging from over 80 percent in Russia to only one third in Greenland.⁵⁴

The impact on Arctic economies also receives relatively limited attention, and is only treated extensively in a chapter focusing of fisheries. As for non-indigenous people, this also comes out in the report’s own discussion of the need for future assessments: “Impacts on the environment were covered very extensively, but the assessment has only qualitative information on economic impacts, and this must be a priority for future assessments.”⁵⁵ The chapter-specific qualitative analyses also show that coverage of economic issues is very patchy. The patterns cannot easily be understood based on indicators of economic importance (in this case as share of overall economic activity). While fisheries and hunting and herding are treated rather extensively, there is limited analysis of the impacts on large-scale hydrocarbon or mineral exploitation, which is very important economically in many parts of the Arctic.⁵⁶ Impacts on the growing tourism industry are also not assessed in any detail. Although there may have been some conscious choices to leave oil and gas out of the ACIA assessment because of an upcoming

⁵² Chapter 18. Summary and Synthesis, 1018.

⁵³ Dmitry Bogoyavlenskiy and Andy Siggner, “Arctic Demography,” in *Arctic Human Development Report*, ed. AHDR, 27–41 (Akureyri: Stefansson Arctic Institute, 2004).

⁵⁴ Bogoyavlenskiy and Siggner, “Arctic Demography.”

⁵⁵ Chapter 18. Summary and Synthesis, 1018.

⁵⁶ Gérard Duhaime, “Economic Systems,” in *Arctic Human Development Report*, ed. AHDR, 69–84 (Akureyri: Stefansson Arctic Institute, 2004).

AMAP assessment on these issues, it still does not account for lack of assessment of potential impacts on either mining and mineral processing or tourism.

What could account for this lack of presence in the assessment? The shortcoming could hardly be from lack of awareness. The need for a socioeconomic assessment was brought up repeatedly during the assessment process and was, for example, discussed in connection with the review of the scientific report.⁵⁷ Several circumstances point instead to the lack of scientific networks in the social sciences. For example, chapters that had an emphasis on social, economic, or cultural issues also have at least one lead author with such a background. One of the most striking examples is a comparison between the chapter on fisheries versus the chapter on forests, agriculture and land management. In the fisheries chapter, one of the lead authors is an economist and it has, by far, the most frequent use of the word *economic*; it is used more than five times more often than in the forests chapter, where the framing is centered on biology rather than on the potential economic impact on forestry. It is indicative too that the chapter title refers to forests rather than forestry. Similarly, the word *cultural* is most frequently used in chapters with a lead author with a background in anthropology. This can be placed in contrast to *Chapter 16. Infrastructure: Buildings, Support Systems and Industrial Facilities*, which is mostly based on an engineering and natural science knowledge base in spite of the fact that it may have been the major venue available to do an assessment of economic impacts relating to issues that were not directly covered by specific chapters (e.g. *Chapter 13. Fisheries and Aquaculture*).

The lead author of the summary and synthesis chapter did attempt to include economic analysis from previous sub-regional climate impact assessment but was met with resistance from the Assessment Steering Committee and the Assessment Integration Team on the grounds that this information was not based on the previous chapters and therefore not credible enough scientifically.⁵⁸ This might come from the fact that the ACIA, on the whole, had weak scientific networks in social science disciplines, which could have given an economic analysis a stronger scientific base and thus credibility.

With the exception of the extensive discussions about indigenous peoples, the lack of connections to scientific networks in the social sciences may even involve some resistance or reluctance from the social science community in connecting to an initial framing of the ACIA. Several comments in protocols from meetings of the Assessment Steering Committee suggest such division. The following protocol note paraphrases one of the lead authors and social scientists in the assessment: "To date, social scientists had given a disappointing response to his invitation to participate in ACIA. His impression is that social scientists do not yet feel welcome in ACIA."⁵⁹ In the ensuing discussion there was an idea to form a social science consultative group to provide social science perspectives to all the chapters, but in the end no group was established and lead authors were urged to recruit more social scientists as contributing or consulting authors.

⁵⁷ Observation notes from the meeting of the Assessment Steering Committee, October 2003; Summary Report on the Tenth Assessment Steering Committee (ASC) Meeting, 15-16 October 2003, London, U.K.

⁵⁸ Observation notes. Meeting of the Assessment Integrations Team, Copenhagen March 2004. Interview Günther Weller, November 11, 2004.

⁵⁹ Summary Report on the Seventh Assessment Steering Committee Meeting (ASC), 19-20 April 2001, Reykjavik, Iceland.

Regime structure may also have been at play in the relative silence surrounding social and economic impacts. Early in the ACIA process, the Senior Arctic Officials of the Arctic Council several times introduced the need to cover socioeconomic impacts, but the Arctic Council working groups responsible for the assessment, AMAP and CAFF, lacked the mandate and expert networks to deal with these issues and no other working group pushing the issues was present in the ACIA process (see Chapter 5 of this dissertation for details). In relation to regime structure, the lack of influence of local decision makers and industry or sector interests in the Arctic Council may also have played a role. The ACIA, itself, explains the lack of discussion of economic impact by stating that “the necessary information is not presently available.”⁶⁰ There is also an emphasis on lack of *quantitative* data in this area, and part of the lack of socioeconomic assessment may thus also be a mirror of differences in natural science and social science research traditions and methods.

In contrast to the scientific report, the overview document brings several issues related to economic impacts to the fore. Examples of this come from the following statements from the key finding about how reduced sea ice is very likely to increase marine transport and access to resources: “Reduced sea ice is likely to allow increased offshore extraction of oil and gas, although increasing ice movement could hinder some operations,” and “Sovereignty, security, and safety issues, as well as social, cultural, and environmental concerns are likely to arise as marine access increases.”⁶¹ The knowledge base from which these statements are built come from the physical and engineering sciences and do not include any explicit economic, social or political science assessments. The weakness of the knowledge base can also be illustrated by the number of pages of supporting evidence. For this key finding and for another key finding focusing of societal impacts, there are only four pages, as compared to 12 each for the first three key findings and 20 for the fourth, which all discuss either observations of present climate change, future climate change, or impacts on the physical systems and on ecosystems. As a result, the overview document emphasizes socioeconomic impacts more than the science document. The driver for highlighting these issues may be that it shows the potential policy implications and thus should be of interest to the intended audience of the report. If so, the policy context acts as a counter driver to the strong natural science framing in the parts of the scientific reports that do not discuss indigenous peoples, but as one that is also limited by the weak social science knowledge base in the scientific report.

In summary, it appears that with the exception of the fisheries chapter, the role of social science in the ACIA was limited to the assessment of impacts on indigenous peoples. I have previously discussed the lack of scientific networks as a potential reason for this relative silence, and the lack of mandate in the AMAP and CAFF working groups. The latter explanation raises questions about regime structure that should be further explored. And in this, there may indeed lay some additional clues. In the Arctic Council, socioeconomic issues are mainly discussed in the Sustainable Development Working Group. It is the newest working group in the Council and has a history of controversies

⁶⁰ ACIA, *Impacts of a Warming Arctic: Arctic Climate Impact Assessment*, iv.

⁶¹ ACIA, *Impacts of a Warming Arctic: Arctic Climate Impact Assessment*, 11.

surrounding what its focus should be.⁶² Many of its projects and reports have been much more limited in scope compared to e.g. AMAP's assessment. Until 2004 and the publication of the *Arctic Human Development Report*, there was no overall assessment of issues related to the economic, social, or cultural sides of sustainable development.⁶³ One could thus argue that the social sciences have had a rather weak base in the Arctic Council, both institutionally and in relation to the knowledge base. This may have further accentuated the lack of scientific networks within the ACIA.

The relative silence about many socioeconomic issues thus may be caused by the interplay among the weak structures of the Arctic Council relating to the social sciences, and the fact that scientific knowledge production is separated into different scientific disciplines, each with their own separate networks. If there had been strength in one of these potential drivers, the outcome for socioeconomic issues in the ACIA may have been different. One could make the comparison with climate science, where the Arctic Council previous to the ACIA did not have a very strong engagement or knowledge base. However in this case, the weakness of the previous engagement was well compensated for by other strong networks pushing the issues and the global climate regime providing norms about their high priority. One could argue that the lack of coverage was the result of the relevant research fields lagging behind climate science that focuses on physical and biological aspects. The question is, can such a lag also explain the difference between how the ACIA treats socioeconomic impacts on the indigenous and non-indigenous populations in the Arctic, and how it can highlight socioeconomic impact on fisheries but not on other economic activities. A conclusive answer would require a concerted assessment of socioeconomic impacts of climate impact to then compare to the ACIA.

A third potential explanation for the low coverage of socioeconomic issues, possibly acting in combination with the lack of scientific networks and a less developed research field, is that the ACIA was initially planned when there was still a discussion whether anthropogenic climate change was real. Part of the priorities may therefore have been set by a strong wish to use the Arctic as a showcase for highlighting that climate change was happening here and now rather than actually assessing impacts.

Silence on gender

Another issue that the ACIA leaves largely out of the assessment is gender, i.e. to what extent women and men are impacted differently by climate change or have different adaptive capacities. There are a few mentions of the fact that impacts may be different on different groups in society, including men and women, but very limited analysis of how and why that may be the case. Words like *gender*, *women* and *men* are used very sparingly. It is only the health chapter, in a discussion on rapid change and psychosocial health, which has more than an occasional mention. One explanation could be that gender analysis is not very well established in Arctic studies and thus not part of the scien-

⁶² Oran R. Young, "The Internationalization of the Circumpolar North: Charting a Course for the 21st Century," Stefansson Arctic Institute, www.thearctic.is; Keskitalo, *Negotiating the Arctic. The Construction of an International Region*, chapter 4.

⁶³ AHDR, *Arctic Human Development Report*.

tific consciousness among the experts involved in the assessment. The lack of strong norms to discuss gender came out very clearly during preparation of the *Arctic Human Development Report*, where a chapter on gender issues discusses several, sometime conflicting, views of the usefulness of such a lens instead of making a comprehensive assessment. This quote from its introduction can serve as an illustration to the status of the gender discourse in the Arctic: “In Arctic research, gender is still an emerging topic, and there is not a fully developed body of literature available for assessment.”⁶⁴ The silence on gender in the ACIA can be compared to the high awareness about indigenous perspectives and how they appear in many chapters and as a framing for the assessment as a whole. Based on simple counts of the words *gender*, *women*, and *men*, gender issues do not appear to be a major issue in IPCC’s assessments either. There was thus hardly any impetus from the global climate change discourse that could have encouraged more discussion of gender in the Arctic context.

6.4 What is climate change about?

One aspect of framing climate change is what issues are included in or excluded from the discussion and how climate change is described in relation to other issues. This section explores some additional features of the ACIA reports that became apparent in the qualitative and quantitative text analysis.

Interconnectedness and context

A recurring theme in ACIA’s scientific report that is brought out by the qualitative analysis is the complex interconnectedness of many factors that have to be taken into account when assessing the impacts of climate change. This emphasis is particularly visible in chapters that deal with either ecosystems or with human activities. The following examples illustrate this theme of interconnectedness:

Many of the examples of indigenous perspectives of climate change presented here illustrate how the impacts of climate change are connected, interacting to produce further changes.⁶⁵

Even among global factors, climate change is one of an array of drivers, such as eutrophication, often working in synergy with climate change and reinforcing the effect.⁶⁶

Many arctic freshwater systems are exposed to multiple environmental stressors or perturbations including point- and/or nonpoint-source pollution (e.g., long range aerial transport of contaminants; section 8.7); altered hydrologic regimes related to impoundments and diversions; water quality changes from landscape alterations (e.g., mining, oil and gas exploration); and biological resource exploitation (e.g.,

⁶⁴ See Chapter 11. Gender issues in AHDR, *Arctic Human Development Report* for an introduction to a variety of views on gender issues in the Arctic; quote from 187.

⁶⁵ Chapter 3. The Changing Arctic: Indigenous Perspectives, 94

⁶⁶ Chapter 7. Arctic Tundra and Polar Desert Ecosystems, 290.

subsistence and commercial fisheries and harvesting of waterfowl and mammals; section 8.5), to name a few. These stressors, along with climate variability, can synergistically contribute to the degradation of biological diversity at the species, genetic, and/or habitat–ecosystem levels ...⁶⁷

Even when changes in fish populations are predictable to a high degree of accuracy, there is no deterministic relationship between these changes and those in society. Social change is driven by a number of different forces; with climate change only one of a number of natural factors.... In addition, societies have the capacity to adapt to change. Changes in fish stocks, for example, are met by adjustments in fisheries management practices and the way fisheries are performed.⁶⁸

Health is a multifactorial concept, influenced by a variety of determinants, climate change being one of many environmental factors.⁶⁹

Climate change occurs amid myriad social and natural transformations. Understanding and anticipating the consequences of climate change, therefore, requires knowledge about the interactions of climate change and other stresses and about the resilience and vulnerability of human–environment systems that experience them.⁷⁰

Without a corresponding qualitative analysis of the IPCC's reports, it is difficult to judge whether this focus on interconnections and complexity is unique to or more prominent in the ACIA report. A look at the frequency of words such as *interaction(s)*, and *interconnection(s)* reveals no obvious patterns, neither does the word *complex*.

Looking at the ACIA report, interactions and complexity are especially highlighted in the chapters on terrestrial and freshwater ecosystems, in a chapter on climate change in the context of multiple stressors, and in a chapter discussing impacts on indigenous peoples and renewable resources. They are less prominent in chapters focusing on the physical environment. Common to the chapters that highlight complexity is also a focus on local or sub-regional spatial scales or a range of scales. These are essentially the same chapters that also have their knowledge base in either biological or social sciences. The physical science chapters, on the other hand, often have an emphasis on the global or circumpolar scale or are built upon a logic that takes its starting point in global climate change and then discusses the potential impacts at the regional level.

While it is difficult to tell whether this focus on the interconnectedness of many factors and contexts sets the ACIA apart from IPCC Working Group II report as a whole, nevertheless there appears to be more attention paid to complexity and context in ACIA than in the polar chapter of the IPCC's Working Group II report. Part of this can probably be explained by the fact that IPCC's chapter on polar regions has only 42 pages to summarize issues, compared to the ACIA report's 1045 pages. However, there is also a different pattern in how often different words are used. Words like *social*, *socioeconomic*, and *cultural* are used more frequently in the ACIA report than in IPCC's polar

⁶⁷ Chapter 8. Freshwater Ecosystems and Fisheries, 384.

⁶⁸ Chapter 13. Fisheries and Aquaculture, 694.

⁶⁹ Chapter 15. Human Health, 898.

⁷⁰ Chapter 17. Climate Change in the Context of Multiple Stressors and Resilience, 946.

chapter. For words like *physical* and *atmosphere*, the relationship is inverted and so they receive a stronger emphasis in IPCC's polar chapter. In a way, the ACIA has brought the description of climate change in the Arctic more in line with the global discussion of climate change impacts. The role of people comes more to the fore. This is connected closely to the previous discussion about the emphasis on indigenous peoples in the ACIA and the drivers are probably similar. Moreover, during the ACIA process, indigenous peoples' organizations pushed to make this assessment relevant to people in the Arctic and not just to climate scientists.⁷¹ In addition, one should note that there was a push from the Arctic Council during the ACIA process to include socioeconomic analyses. Even if the assessment has less about socioeconomic impacts than about physical and biological impacts, the Arctic Council context and the needs for this knowledge among national policy makers may therefore also be at play.

The trend or pattern described here is not a strong one: it is not that one framing has replaced another. It might however indicate a slight shift in the current framing. This shift may become stronger with time since ACIA, itself, identifies the treatment of socioeconomic impacts as insufficient and calls for more efforts in this area.

Species, biodiversity, and conservation

A word that ranks very high in frequency in ACIA is *species*. It is used much more often in the ACIA report than in either of the IPCC reports. For example, relative to the size of the report, it is used five times more often in ACIA's scientific report than in the polar chapter of IPCC's Working Group II report. This indicates an emphasis on biological framings that warrants a closer look. Is this an indication of biological knowledge being more in focus or is the word *species* connected to some particular issue? It appears to be a combination. The word is used frequently in the three chapters focusing on ecosystems but also appears in a chapter on the principles of conservation of biodiversity and in a chapter on fisheries. Looking at the word *ecosystem*, which might also indicate a focus on biology, the ACIA still comes ahead but not as much in comparison to the IPCC's Working Group II report.

The strong focus on *species* also comes through in the overview document. For example, in the key finding that highlights the global importance of the Arctic, biodiversity is mentioned as an issue alongside a focus on physical aspects of the climate system. Moreover, it appears in the fourth key finding: "Animal species' diversity, ranges, and distribution will change."

What are the circumstances that could have driven the increased emphasis on *species*? Are there different scientific networks involved in the ACIA than are involved with the IPCC? Or could the context of the Arctic Council have created a stronger emphasis on these issues than the IPCC? One observation is that the emphasis on *species* is particularly strong in *Chapter 7. Arctic Tundra and Polar Desert Ecosystems* and *Chapter 10. Principles of Conserving the Arctic's Biodiversity*. These are also the two chapters that explicitly discuss biodiversity, followed by *Chapter 8. Freshwater Ecosystems and Aquaculture*, which also scores high on biodiversity. At a rather late stage in the ACIA process the concern was raised that biodiversity issues were not treated enough in the

⁷¹ Interview Terry Fenge, May 3, 2004.

assessment and a consequent push from the Arctic Council working group on Conservation of Arctic Flora and Fauna (CAFF) to strengthen this discussion. In fact, *Chapter 10. Principles of Conserving the Arctic's Biodiversity* was added late in the process, after the scientific review of the whole report, because the Assessment Integration Team was not pleased with the framing of conservation that had come forth so far. In particular *Chapter 11. Managing and Conservation of Wildlife in a Changing Arctic Environment* has a focus on wildlife management rather than on conservation and biodiversity as was originally intended.⁷² The CAFF push had an effect. It is noteworthy that ACIA uses the word *conservation* much more frequently than the IPCC reports. Interviews from the spring of 2004 also indicate that CAFF was now happier with the coverage of their issues.⁷³ In highlighting *species*, *biodiversity*, and *conservation*, the structural context of the assessment, i.e. CAFF as one of the formal leaders, thus appears to provide an explanation for the framing. CAFF is mentioned explicitly several times in the chapter on principles of conserving biodiversity, as well as in the chapters on management and conservation of wildlife, Arctic tundra, and freshwater ecosystems.

The fact that the emphasis on species came in late has two explanations. First is that CAFF was not very active in the initial phase of the assessment. A CAFF representative has described it as "They [AMAP] sort of ram butted a lot of things and they sort of dragged others with them. In the ACIA process, we were almost an afterthought."⁷⁴ The second explanation is that the lead authors worked independently up until the review. Thus it was only then that it became clear that the lead author who was assumed to cover biodiversity had not taken CAFF's priorities and concerns into account.

To what extent does the global United Nations Convention on Biodiversity also play a role as a driver? There are not many explicit references to the convention in the report. Most of references are in relation to definitions. The convention's role thus appears to be most important in the general framing of biodiversity. There may also be an indirect connection via CAFF, which has a similar integrative approach as the Convention on Biodiversity.⁷⁵ Protocols and other documentation of the ACIA process do not reveal any efforts to establish links to this convention.

Ultraviolet radiation

Unique to the ACIA compared to the IPCC reports is that it includes a discussion of ozone depletion and impacts of ultraviolet (UV) radiation under the overall rubric of climate change. For example, there are frequent references to the word *radiation*, which for the most part refers to UV radiation. This is hardly a surprise as it was part of ACIA's mandate to also assess the impact of increasing UV radiation in connection

⁷² Interview Magdalena Muir, March 24, 2004; Interview Pål Prestrud, April 15, 2004; Observation notes London meeting of the Assessment Integration Team and the Assessment Steering Committee October 2003.

⁷³ Interview Magdalena Muir, March 24, 2004; Interview Pål Prestrud, April 15, 2004.

⁷⁴ Interview 20.

⁷⁵ Interview Magdalena Muir, March 24, 2004. Also, the Convention on Biodiversity (CBD) is mentioned in CAFF's workplan in connection with its Circumpolar Protected Area Network (CAFF 2002-2004 Progress Report and 2002-2006 Work Plan. Presented to the Senior Arctic Officials and the Arctic Council Ministers at the Fourth Ministerial Meeting November 2004).

with depletion of the ozone layer while this task is not central to IPCC's mandate but is handled in joint efforts by United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO).

The reasons for including UV radiation issues in an assessment that mainly focuses on climate change impacts are far from obvious. There are no signs of any push for such an assessment from global policy or assessment processes. In fact, during the ACIA process, there were substantial difficulties in connecting with WMO's global assessment on ozone depletion and ultraviolet radiation.⁷⁶ Moreover, the scientific communities dealing with the different issues only overlap to a limited extent. A main driver appears to have been the default organization of issues, where UV and climate change had been treated in the same context in the first Arctic assessment of these issues, from 1997/98. Both issues were relatively low on the Arctic agenda, with reference to existing global regimes, and the political mandate of the working groups had mainly been to assess issues related to core activities of pollution and conservation, and to raise specifically Arctic issues in relation to the global regimes. IASC had also treated UV and climate issues under the same umbrella, so this common frame was in no way odd to the Arctic science community. In addition to this "default" framing, a major point in the 1997/98 AMAP assessment was that the two issues are connected in the Arctic via the region's special atmospheric dynamics where warming creates colder conditions and more ozone depletion in the upper parts of the atmosphere.⁷⁷ The previous scientific framing of Arctic ozone depletion and increased UV radiation was thus closely connected to climate change. Early in the ACIA process when one of the lead authors raised the concern that UV issues were not given sufficient emphasis, she says she was assured that use of "climate change" in the assessment title included ozone and UV issues.⁷⁸ There is also a statement from one of the Arctic Council meetings that illustrates a strong framing of UV and climate as part of the same issue in the Arctic: "ACIA will show the connection between UV-B and climate change."⁷⁹ This supports the idea that before the ACIA, climate and UV issues fell within the same scientific and policy framing in the Arctic Council, or at least much more so than they have been in the global discourse.

But is the connection between climate and ultraviolet radiation present in the ACIA reports or are they treated as separate issues? In most of the chapters, they are separate issues. The main exceptions are the chapters on terrestrial and freshwater ecosystems, the introduction and the summary, and to a more limited extent the chapter dealing with the atmospheric dynamics of UV radiation and the chapter on multiple stressors. In other chapters, UV is under a separate heading or mentioned hardly at all. These results from the qualitative analysis are further supported by a quantitative text analysis counting how many times the words *ozone*, *UV*, or *ultraviolet* appears within ten words of

⁷⁶ Observation notes 10th meeting of the Assessment Steering Committee, London, October 2003; Interview Elisabeth Weatherhead, November 8, 2004.

⁷⁷ Elisabeth C. Weatherhead, "Climate Change, Ozone, and Ultraviolet Radiation," in *AMAP Assessment Report. Arctic Pollution Issues*, AMAP Assessment Report. Arctic Pollution Issues, 717-774 (Oslo: Arctic Monitoring and Assessment Programme, 1998).

⁷⁸ Interview Elisabeth Weatherhead, November 10, 2004.

⁷⁹ Notes from the Second Ministerial Meeting, Barrow, Alaska, US, October 12-13, 2000, which is not a full transcript of the meeting.

climate. In several chapters the count is zero. Early in the ACIA process, the Assessment Steering Committee decided that UV issues should be treated in relevant places in the various chapters of the assessment.⁸⁰ This outcome shows that connecting these issues was left to the lead authors. It was up to them to decide how to include UV impacts or whether to include them at all. A lead author, who was with the process from the beginning, describes this situation as follows:

The original mandate was for us to assess the effects of climate change and UV radiation in the Arctic ... We met early on in Washington to give ourselves a name ... And through long discussions, it was proposed that it would be Arctic Climate Impact Assessment instead of Arctic Climate, Ozone and UV Assessment, strictly to keep it down to a simple moniker. I was okay with that change and they were very clear that climate for their context would mean both the temperature, humidity, precipitation, and wind, and radiation fields ... Several of us have noted that since that point, ozone and UV have gotten hardly any attention.⁸¹

In the overview document, the separation of UV and climate becomes even more apparent. For example, a subheading in the overview's introduction states that "Stratospheric ozone depletion is another issue."⁸² Moreover, the integration that comes out in some of the science chapters is barely visible in the overview. The only connection made between the issues in the overview is that the recovery of the Arctic ozone layer is likely to be delayed because of greenhouse warming. The separation may have been further accentuated by the need to simplify the scientific explanations in a popular science account. The following statement from the supporting evidence section illustrates this point: "Many people confuse the issues of ozone depletion and climate change. While the two are interrelated in a number of ways, they are driven by two different mechanisms."⁸³ Observations during a meeting of the Assessment Integration Team also support that it was a struggle to find ways of treating the UV material in the overview documents as it did not fit well with how the report was structured.

What circumstances might have contributed to this explicit separation in the overview and the de facto separation in many of the chapters of the scientific report? One factor may be the political organization of knowledge production and global governance of these issues by two separate sets of regimes: a climate regime represented mainly by the UNFCCC and the IPCC and an ozone regime represented organizationally by WMO/UNEP. From the documentation of the ACIA process, it is clear that there were difficulties in connecting to the WMO ozone/UV assessments, which is in sharp contrast to the close connections and coordination with the IPCC. For example, during early modeling workshop the lack of coordination with an ongoing international assessment in the WMO was identified, forcing the ACIA chair to request alternatives at the following Assessment Steering Committee meeting because information from WMO's as-

⁸⁰ Summary report of the 5th Assessment Steering Committee (ASC) Meeting, June 15-16, 2000, Danish Polar Center, Copenhagen, Denmark.

⁸¹ Interview Elisabeth Weatherhead, November 10, 2004.

⁸² ACIA, *Impacts of a Warming Arctic: Arctic Climate Impact Assessment*, 2.

⁸³ ACIA, *Impacts of a Warming Arctic: Arctic Climate Impact Assessment*, 98.

assessment would be “too late.”⁸⁴ The lack of coordination with the WMO was a sore point between one of the lead authors of the UV chapter and the ACIA chair up until the very end of the ACIA process.⁸⁵ It is difficult to judge to what extent “personal chemistry” among some key actors contributed to the lack of coordination, but the end result was that UV issues were not highlighted as much as climate change.

The governance separation of climate and UV issues may in turn have kept the scientific fields apart, unless there were special circumstances to merge them. The two main common denominators in the chapters that do not treat them as separate in the ACIA scientific report are either a preference for the local level with a focus on complexity and a knowledge base in ecology, or some commitment to the initial framing (i.e. introduction, UV chapter, and the summary). The norms of the Arctic Council were obviously not strong enough to impose a framing that combined the issues in the ACIA report as a whole.

Author interviews also suggest that ozone depletion and UV radiation are often seen as “solved” issues and thus do not have the same political priority as climate change.⁸⁶ The urgency to call attention to climate change in the Arctic may therefore also have been at play when placing the impacts of UV radiation in the background. This also might provide context as to why UV issues are even more placed in the background in the overview. Since the overview is aimed at an audience of policy makers and the broader public, the priority may well have been to provide a clear message on climate change.

Silence on anthropogenic emissions

The ACIA does not assess anthropogenic emissions of greenhouse gases from the Arctic. According to interview material about the initial framing of what the assessment should be about, emissions were considered a global issue and thus naturally a part of IPCC’s global assessments, but there is no explicit discussion of this topic in the formal documentation.⁸⁷ The overview document also places emission assessments and mitigation with the global arena. It states that “mitigation, to slow the speed and amount of climate change by reducing greenhouse gas emissions,” is not evaluated as part of the report because it is addressed by the UNFCCC and other bodies.⁸⁸ In view of the fact that impacts on hydrocarbon resource exploitation are not analyzed much either, one could also speculate that there was a wish to stay away from politically sensitive issues with high national interests at stake for several Arctic countries.

In the scientific report, there is also a general “black-boxing” of the emission scenarios that are used for the climate models in the assessment. Only occasionally do authors discuss the fact that different assumptions in the emission scenarios will have implications for the severity of the impacts of climate change in the Arctic. By contrast, the overview takes the opportunity to explicitly inform policy makers that they have the

⁸⁴ Summary Report of the Seveth Assessment Steering Committee (ASC) Meeting, 19-20 April 2001, Reykjavik, Iceland.

⁸⁵ Interviews Elisabeth Weatherhead, November 11, 2004, and Robert Corell, November 21, 2004.

⁸⁶ Interviews Elisabeth Weatherhead, November 11, 2004, and Aapo Taskanen, December 13, 2004.

⁸⁷ Interview Robert Corell, November 21, 2004.

⁸⁸ ACIA, *Impacts of a Warming Arctic: Arctic Climate Impact Assessment*, 3.

opportunity to influence the future. The following statement is an example of this: “Their scenarios encompass a range of possible futures based on how societies, economies, and energy technologies are likely to evolve, and can be used to estimate the likely range of future emissions that affect the future.”⁸⁹ The overview thus frames climate change in a way that gives policy makers a potential role. It also explicitly discusses the importance of the rate of change, a factor that is only raised by a few of the chapters of the scientific report.

6.5 Governance arrangements and actor networks

As a complement to the discussion of the framings of climate change in the ACIA reports, this section discusses the role of international governance arrangements and actor networks. It is an attempt to analyze more in depth when and how they might be important in shaping the knowledge base used in the assessment and thus some potential mechanisms for *how* the policy contexts influence knowledge production.

A number of governance arrangements and organizations appear with specific references in the ACIA reports. They include the Arctic Council and its working groups, organizations involved in global knowledge production on climate (i.e. IPCC and WMO), the policy-oriented cooperation under the umbrella of the UNFCCC and the Kyoto Protocol, as well as some international scientific collaborations that played key roles in creating a knowledge base for the ACIA.

The Arctic Council

The Arctic Council and its working groups AMAP and CAFF, together with the International Arctic Science Committee, are the core of the formal context of the ACIA. The role of the Arctic Council appears to vary substantially between the different chapters. A major influence appears to be that the norms and structure of the Arctic Council created a position from which the Arctic Council’s Permanent Participants were able to express their knowledge and priorities. This is most clear in *Chapter 3. The Changing Arctic: Indigenous Perspectives*, and in *Chapter 12. Hunting, Herding, Fishing and Gathering: Indigenous Peoples and Renewable Resource Use in the Arctic*. For example, in ACIA’s Chapter 3, the Permanent Participants are visible in the chapter structure as well as through the affiliations of many of the case study authors. Moreover, one of the lead authors attests to the balancing act between providing such dedicated space in the chapter and the scientific aspects of doing an assessment.⁹⁰ For ACIA’s Chapter 12, the role of the Permanent Participants is explicit in the acknowledgements: “The chapter as a whole has developed with significant advice, guidance, and input from the Permanent Participants of the Arctic Council ...”⁹¹ In addition, an interview with a representa-

⁸⁹ ACIA, *Impacts of a Warming Arctic: Arctic Climate Impact Assessment*, 26.

⁹⁰ Interview Henry Huntington, December 21, 2004.

⁹¹ Chapter 12. Hunting, Herding, Fishing, and Gathering: Indigenous People and Renewable Resource Use in the Arctic,” 687.

tive of one of the Permanent Participants indicates that they had an active role in recruiting and finding financial resources for a lead author whom they trusted.⁹²

The Arctic Council norms, mirrored in the ACIA, were also important for including indigenous knowledge in some other chapters. For example, the lead author for *Chapter 7. Arctic Tundra and Polar Desert Ecosystems* mentioned that it was an important factor for his chapter, including the practical help from the secretariat to involve a scientist with background in anthropology to strengthen this aspect of the discussion.⁹³ I argue that the extensive inclusion of indigenous peoples in the ACIA is an example of how the policy context of an assessment can play a major role for the knowledge that is included. Based on the previously discussed connection between indigenous perspectives, a local scale preference, and a focus on issues of interconnectedness, I also argue that it shows how the policy context and the people who are active in the assessment can play a role for what framings are brought to the fore. It is not that the ACIA has replaced one framing of climate change with another, but that Arctic Council policy setting appears to have been important in giving a human dimension to the science of Arctic climate change in addition to the well-established focus on physical aspects of the Arctic climate.

The Arctic Council is also visible in the ACIA scientific report through its working groups, i.e. the groups of politically mandated experts that are in charge of the scientific work of the Arctic Council, such as assessment activities. As discussed earlier, CAFF appears to have played a major role in bringing an emphasis on biodiversity and conservation issues to what became *Chapter 10. Principles on Conserving the Arctic's Biodiversity*. Moreover, this chapter highlights the importance of a circumpolar biodiversity monitoring network, which is one of CAFF's priorities. This push late in the process cannot be explained by a change in norms within CAFF. Rather, the change comes when the CAFF secretariat gets a new executive secretary and thus may have more to do with CAFF's organizational capacity to be an effective actor in the ACIA process. An interview with the new executive secretary reveals that she found it important to push CAFF's priorities and that she put efforts into finding a new lead author at a very late point in the process.⁹⁴

AMAP plays a role in the ACIA report because its two major assessments of pollution in the Arctic serve as a key knowledge base in any discussion of contaminants, specifically in *Chapter 8. Freshwater Ecosystems and Fisheries* and *Chapter 17. Climate Change in the Context of Multiple Stressors and Resilience*. The use of AMAP as a knowledge base is not unique to the ACIA. It is also apparent in the polar chapter of IPCC's Working Group II. In the ACIA scientific report, the inclusion of contaminants is very spotty. Chapter 9 on marine systems hardly discusses contaminants at all, in spite of the fact that the lead author has a long history of involvement with AMAP. There thus may not have been a strong normative push from within the Arctic Council to include contaminant issues in the assessment, i.e. contaminants were not assumed to be important in relation to climate change. Rather, the major policy influence might be a result of the fact that previous efforts and priorities have created a strong knowledge

⁹² Interview Terry Fenge, May 3, 2004.

⁹³ Interview Terry Callaghan, November 10, 2004.

⁹⁴ Interview Magdalena Muir, March 24 2004.

base, which was available for the authors who chose to use it. Contaminants are also discussed in *Chapter 15. Human Health*. Here both actor networks and norms are at play. The network is visible through the presence of AMAP's human health group, who initially developed the chapter. The norms are visible in the way in which health is discussed, similar to an earlier AMAP report highlighting how health integrates a number of different aspects. This would illustrate how a long-term policy commitment, in this case of the Arctic Council and AMAP to human health issues, can help build actor networks with common norms that become important for how an issue becomes framed in a future assessment.

IPCC and WMO

The IPCC plays a key role in a number of the ACIA chapters. It is most prominent in the *Chapter 4. Future Climate Change. Modeling and Scenarios for the Arctic*. In this case, both text and lead authors interviews identify the IPCC as the point of departure, frame of reference, and the standard setter in the field. "The IPCC report was the starting point for everything we did. That's where we started," said one of the lead authors.⁹⁵ It appears that IPCC has served as a connection point for much of the inter-comparisons and validation of climate models. Moreover, the ACIA relies on emission scenarios developed by the IPCC, without any independent analysis of the scenarios. One could say that the IPCC provided the basic context for how these issues are discussed. IPCC is also an important data source for the description of the physical environment (temperature, precipitation, ice etc). Although the IPCC does not itself gather data, it appears to have a central role in assessing climate data and thus giving certain data sets credibility. As one lead author expressed: "And because of the IPCC process, we largely built on data sets that were constructed for that reason." Another similar data set was not selected because it "was not so internationally described and mandated."⁹⁶ For ozone depletion and UV radiation, the WMO plays a similar role through its assessment processes.

The key role of the IPCC in the knowledge base for the ACIA illustrates how a global regime can come to "own" an issue to the extent that it is difficult to use any other starting point for a high-profile international impact assessment. The regime becomes *the only* appropriate arena for certain questions, which comes with the risk that attempts to take a radically different approach are stifled. Interview comments suggest that at least one author felt that the assessment was an example of "thinking inside the box."⁹⁷ At the very beginning of the process, there were connections to previous sub-regional integrated assessments in the Mackenzie Basin and the Bering and Barents Sea regions but this approach appears to have been left behind.⁹⁸ As a counter argument to the emphasis on the hegemonic role of the IPCC, one should note that the ACIA did depart from the gist of the IPCC reports by providing a stronger emphasis on the local scale and indigenous peoples. This suggests that strong norms and actors at the regional

⁹⁵ Interview Erland Källén, November 30, 2004.

⁹⁶ Interview Gordon McBean, November 10, 2004.

⁹⁷ Interview James Reist, November 8, 2004.

⁹⁸ *Impacts of Global Climate Change in the Arctic Regions. Report from a Workshop on the Impacts of Global Change. 25-26 April 1999. Tromsø, Norway* (International Arctic Science Committee 1999).

scale can help balance IPCC's central role in providing policy relevant knowledge about climate change.

The WMO also plays a role as a coordinator of the gathering and sharing of climate data. The WMO dates back over 30 years as an organization under the United Nations and even further as a network of national meteorological centers. It appears to have a central role in the framing of climate change as changes in temperature and precipitation averages over large regions. In the words of one lead author:

We are fairly fortunate in that most of the weather data, which is accumulated in the climate data base, is exchanged internationally because the daily weather projections require global coverage, so there is a free exchange.⁹⁹

Without the data gathered and shared under the auspices of the WMO, it would be impossible to get large-scale pictures of climate variability and change. Similar to the IPCC, the WMO has played a role in structuring the knowledge in a certain way. Its global focus is a contrast to a local focus and a lack of overview about many parameters related to the *impact* of climate change where there has been no similar systematic international coordination of data gathering and data sharing. Freshwater ecosystems are a case in point.

The IPCC also plays a role in *Chapter 17. Climate Change in the Context of Multiple Stressors and Resilience*. This chapter originally had the title "Assessing vulnerabilities" and the first lead author was brought on board because he had been part of an IPCC effort to advance the understanding of the concept of vulnerability and to also include discussions of adaptive capacity. "Although this was pretty well established in some sort of scholarly literature on vulnerability, the risk-hazards literature, it's something that hadn't really been in the climate impact assessment type discussion," he explained in the interview.¹⁰⁰ ACIA's chapter on multiple stressors was not part of the original outline of the ACIA report but driven by the ACIA chair. IPCC alone can not therefore be described as a driver but previous work within IPCC can nevertheless be seen as providing the basic framing from which to start the analysis. Vulnerability was part of the global discourse of climate change, for example in the title of the report from IPCC's Working Group II: *Impact, Adaptation and Vulnerability*. A bibliometric analysis of the literature on vulnerability, resilience, and adaptation has in fact identified the the IPCC report as a key node in the scientific networks in the knowledge domains vulnerability and adaptation.¹⁰¹ In the Arctic Council, the call from policy makers had often been to focus on the interaction of multiple stressors but without the explicit vulnerability framing. The extensive discussions about the chapter and the change in title could be a sign of the struggle over how this focus should be framed. Indigenous peoples sometimes voice opposition to the term *vulnerability* as it can be perceived as giving them a role as victims.

⁹⁹ Interview John Walsh, November 8, 2004.

¹⁰⁰ Interview James McCarthy, November 12, 2004.

¹⁰¹ Marco A. Janssen, Michael Schoon, Ke Weimao, and Katy Börner, "Scholarly Networks on Resilience, Vulnerability and Adaptation Within the Human Dimensions of Global Environmental Change," *Global Environmental Change* 16, (2006): 240.

It is quite clear that vulnerability as a concept, which is more prominent in IPCC's Working Group II report than in the ACIA, would not have been very foremost without this particular chapter. In the 2001 IPCC Working Group II report, *vulnerability* is mentioned 877 times. Adjusted for the size of the text, this is more than four and a half times more often than in the ACIA report. In the ACIA report, Chapter 17 accounts for 78 percent of all the times the word *vulnerability* is used. A similar pattern, but not quite as prominent, is visibility of the word *adaptation*. According to ACIA's overview document, assessing adaptation was not part of ACIA's scope because it, together with mitigation, was addressed by the UNFCCC.¹⁰² The addition of Chapter 17 thus brought the discourse on Arctic climate change more in line with the global discourse on the impacts of climate change. This is both in relation to the other ACIA chapters and in relation to the polar chapter of the Working Group II report. During the process of developing ACIA's Chapter 17, the authors were criticized for doing one of their case studies without involving local people and later adjusted the thrust of the chapter towards a case study with strong local involvement. Thus, in addition to framings from the IPCC, Arctic Council norms of indigenous participation in knowledge production were also at play in this chapter.

In terms of the policy influence on knowledge production, the eventual framing of vulnerability in the chapter on multiple stressors of the ACIA report illustrates the interplay of global and regional regimes, where an imposed framing from a global context has to confront and manage political sensitivities at the regional scale. In the Arctic context, it led to strong focus on indigenous participation in knowledge production. It suggests that the regional policy context of an assessment is important when efforts of scaling down impact assessments are now increasing and when issues such as vulnerability come to the fore.

UNFCCC and the Kyoto Protocol

The UNFCCC and its Kyoto Protocol do not figure prominently in the ACIA scientific and overview documents, except for one issue: carbon flux and storage. The connection is explicit in *Chapter 18. Summary and Synthesis of the ACIA* and is probably also important for the extensive treatment of carbon flux and storage in *Chapter 14. Forests, Land Management and Agriculture* and in *Chapter 7. Arctic Tundra and Polar Desert Ecosystems*. Documentation of the ACIA process illustrates that this emphasis is not only driven by scientific interests, but by a perception that the policy community needed to know how climate change might affect carbon stores in the Arctic. Specifically, meeting notes from the discussion on cross-cutting themes in the Assessment Steering Committee quotes participants saying that "This is not simply a scientist-to-scientists issue." The cross-cutting themes also were raised with reference to what "policy makers want or need" and what could potentially be important topics for the ACIA policy document.¹⁰³

¹⁰² ACIA, *Impacts of a Warming Arctic: Arctic Climate Impact Assessment*, 3.

¹⁰³ Summary Report on the Tenth Assessment Steering Committee (ASC) Meeting, 15-16 October 2003, London, U.K.

The UNFCCC could also be seen as making an important context in the efforts to attribute Arctic climate change to anthropogenic impact, which was another cross-cutting theme that was raised at the same meeting. The issue of attribution figured prominently in IPCC's second assessment, with a statement that: "The balance of evidence suggests a discernible human influence on global climate."¹⁰⁴ New stronger evidence was released in the third assessment showing that most of the warming observed over the last 50 years is attributable to human activities.¹⁰⁵ This focus on attribution is in turn linked to UNFCCC's definition of climate change: "'Climate change' means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods."¹⁰⁶ A lively discussion during the ACIA process was whether the ACIA could make a similarly strong statement about the Arctic as the IPCC had done with the global signals. For example, at one of the Assessment Steering Committee meetings, there was a clear wish from ACIA's chair to have a strong statement on attribution of Arctic climate change, while several scientists saw problems because of the large natural climate variability in the Arctic.¹⁰⁷ In the scientific report, the difficulties of detecting such a signal in the Arctic come out very clearly, as the following quotes illustrate:

The combination of a sparse observational dataset and high variability makes it difficult to distinguish with confidence between the signals of climate variability and change.¹⁰⁸

These climate changes are consistent with projections of climate change by global climate models forced with increasing atmospheric GHG [greenhouse gas] concentrations, but definitive attribution is not yet possible.¹⁰⁹

The question is whether there is definitive evidence of an anthropogenic signal in the Arctic. This would require a direct attribution study of the Arctic, which has not yet been done.... In climate model simulations, the arctic signal resulting from GHG-induced warming is large but the variability (noise) is also large.¹¹⁰

The wish to still come up with some strong statement was very clear during one of the meetings of the Assessment Steering Committee.¹¹¹ It is also apparent in *Chapter 18. Summary and Synthesis of the ACIA*, which uses similar wording as the IPCC:

¹⁰⁴ IPCC, *Climate Change 1995. The Science of Climate Change. Summary for Policymakers*.

¹⁰⁵ IPCC, *Climate Change 2001: Synthesis Report. A Contribution of Working Groups I, II, and III to the Third Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge: Cambridge University Press, 2001), Summary for Policymakers.

¹⁰⁶ United Nations Framework Convention on Climate Change. Article 1. Definitions.

¹⁰⁷ Observation notes Assessment Steering Committee Meeting London Oct 15-15, 2003; Summary Report on the Tenth Assessment Steering Committee (ASC) Meeting, 15-16 October 2003, London, U.K.

¹⁰⁸ Chapter 2. Arctic Climate: Past and Present, 22.

¹⁰⁹ Chapter 2. Arctic Climate: Past and Present, 54.

¹¹⁰ Chapter 2. Arctic Climate: Past and Present, 38.

¹¹¹ Observation notes, meeting of the Assessment Steering Committee, London, October 2004. Interview Erland Källén, November 30, 2004.

The IPCC stated that most of the global warming observed over the last 50 years is attributable to human activities (IPCC, 2001), and there is new and strong evidence that in the Arctic much of the observed warming over this period is also due to human activities.¹¹²

It is also apparent in the overview:

Examining the record of past climate conditions indicates that the amount, speed, and pattern of warming experienced in recent decades are indeed unusual and are characteristic of the human-induced increase in greenhouse gases.¹¹³

In relation to the impact of climate change, this is not a central concern, but it definitely is central to the political responsibility of reducing anthropogenic emissions of greenhouse gases. The IPCC statement has been subject to intense debate and I argue that the framing of climate change in the UNFCCC, as well as a wish to influence policy in the UNFCCC, was an important context for the discussions of this topic. In this sense, the ACIA was influenced by the political processes related to the UNFCCC. However, in the ACIA scientific process, the Arctic context and the in-depth assessment of this particular region instead lead to a focus on variability. In fact, one of the lead authors highlights this variability focus as one of the major conclusions of the assessment in his chapter and something that was not clear beforehand.¹¹⁴ Based on interviews with the lead authors and observations, I suggest that a key factor behind this difference was that the lead authors asserted their scientific independence in relation to the policy sphere. In the overview, on the other hand, the larger context of the UNFCCC process appears to have favored a focus on human-induced change. The issue of attribution illustrates how the policy context of an assessment can put pressure on the scientists to assess certain issues that may be more important to global climate politics than to issues of regional and local impacts and adaptation.

Other governance arrangements and international collaborations

Several governance arrangements and international scientific collaborations are important in relation to specific assessment chapters. They include the International Council for Exploration of the Sea (ICES) for structuring fish stock data, the International Whaling Commission (IWC) for data on marine mammals, and the Food and Agricultural Organization (FAO) for forestry data. In these cases, standardized reporting requirements and procedures for national data reporting create an easily accessible data base that may not have been otherwise available. The role of intergovernmental regimes becomes apparent both in that the data are often structured in relation to nation states and in norms for what countries are expected to report.

In relation to permafrost issues, the Global Climate Observing System plays a role in ensuring that observations become available. This program is sponsored by both scien-

¹¹² Chapter 18. Summary and Synthesis of the ACIA, 991.

¹¹³ ACIA, *Impacts of a Warming Arctic: Arctic Climate Impact Assessment*, 23.

¹¹⁴ Interview Erland Källén, November 30, 2004.

tific organisations (International Permafrost Association and International Council for Science (ICSU) and UN organizations (WMO, International Oceanographic Commission, UNESCO, and UNEP). In relation to biodiversity, the UN Convention on Biodiversity is mentioned. It provides a definition of biodiversity and adds to the knowledge base in the form of a report on the interlinkages between biological diversity and climate change. In the context of biodiversity, the International Biosphere Program should also be mentioned. This large-scale effort appears to have had a key role for the knowledge base about microbial biodiversity. International regimes and collaborations thus appear to be important in strengthening research in certain areas. By contrast, subject matters that are not governed by any international collaboration often lack a strong comprehensive data base and have to rely more on individual scientific initiatives, local case studies or experiments, and national priorities. A typical example is *Chapter 8. Freshwater Ecosystems and Fisheries* and the same is true to some extent for *Chapter 7. Arctic Tundra and Polar Desert Ecosystems* when discussing ecosystem impacts. The following quote from a lead author interview illustrates the point:

We found that in a lot of cases, we could get information that maybe was case studies or whatever at someone's field location in Sweden or someone doing work in northern Canada, but the amount of medium or long-term data out there that is integrated with hydrology, biogeochemistry responses, ecological responses are extremely scattered and weak.¹¹⁵

The lack of synthesized circumpolar knowledge is apparent in several of the chapters concerned with impact on indigenous peoples. The international collaboration for knowledge production on indigenous peoples is recent and only beginning to emerge as a usable database for an assessment. In this area, the ACIA may, in fact, be playing a role in fostering Arctic-wide knowledge production as a complement to a previous focus on local case studies. This is especially true for *Chapter 3. The Changing Arctic: Indigenous Perspectives*, which tries to draw some Arctic wide-conclusions based on available local observations.

The role of specific governance arrangements should also be seen in light of the geopolitical structure of the Arctic region. The most obvious change relevant for the ACIA's knowledge base was the opening up of the Arctic from the East-West division during the Cold War. Before this, there was very limited circumpolar scientific activity in the Arctic region. The tundra experiment of the International Biosphere Program was an exception.¹¹⁶ In fact, the post-Cold War thaw was a driver and a prerequisite for today's Arctic Council cooperation, without which an assessment of impacts of climate change would not have been very likely. The thawing of Cold-War tensions also made new data available from the Arctic Ocean, which are part of the knowledge base for assessing changes in sea ice extent.

¹¹⁵ Interview Fred Wrona, November 11, 2004.

¹¹⁶ Heininen, "Circumpolar International Relations and Geopolitics."

Summarizing the influence of governance arrangements

In summary, different governance arrangements play two important roles in the ACIA. First, they ensured international data gathering as well as the sharing and standardization of measurements in some areas. This is often a prerequisite for making statements about climate trends over a larger scale than local. Thus they can play a role in emphasizing the regional or global scale. Second, they can privilege certain types of knowledge or framings. This is most clearly illustrated by the Arctic Council norms of including indigenous knowledge and priorities in the assessment. The fact that a circumpolar assessment occurred at all should be seen within the historical perspective of breaking up of the East-West division in the polar region and the rise of a pan-Arctic identity. These developments underpin the key norms of the Arctic Council, such as environmental cooperation and attention to indigenous peoples.

This analysis highlights how international regimes can play a major role in structuring knowledge production and in creating or maintaining certain ways of observing the world. The next section focuses on the actor networks that are visible in the ACIA, but which are not as easily identified as formal governance arrangements.

Actors and actor networks

The most prominent actor networks in the ACIA are the scientific disciplinary networks from which the lead authors identified contributing and consulting authors. In some cases, those networks were pan-Arctic or global before the assessment, while in other cases, the assessment process itself served as a network-building or network strengthening activity. In the latter case, the ACIA becomes a potential driver for the structure of future knowledge production. The following quote from a lead author interview illustrates ACIA's role for network building.

In my mind one of the single most valuable aspects of participating in the ACIA process was the comprehensive international collaborative focus and approach, so that all of us put together, all these stories, so that we could begin to ... rather than just isolated pictures ... synthesize a picture of change ... and we now come in contact with one another to attempt an international tree-line monitoring effort and organization.¹¹⁷

In such cases, the influence of the existing scientific networks was moderated by the Arctic-wide scale and the Arctic Council setting of the assessment. Several lead authors have also pointed to the ACIA as a venue for bringing different scientific networks together that were previously separate. The goals of the chapters made it necessary to work across national and also narrow disciplinary boundaries. Several lead authors mentioned the cross-disciplinary nature of the assessment as a key learning experience, especially during the regular meetings of lead authors in the Assessment Steering Committee. It may be that although an assessment is dependent on existing scientific disciplinary networks, its tasks can help widen these networks and foster new personal linkages among researchers creating a wider understanding of issues.

¹¹⁷ Interview Glenn Juday, November 11, 2004.

States are not prominent actors in the ACIA scientific and overview reports but are nevertheless present. This is especially true where states have reporting requirements under some international treaty or convention and where the data are thus organized along national boundaries. This, for example, includes data on fisheries, biodiversity, and forestry. The structuring of data collection is thus steered by the fact that international governance arrangements view states as the relevant actors. In the chapters that deal with activities that have national economic significance, i.e. fisheries, and forestry, states may also have had more of an actor role. For example, one of the lead authors for the fisheries chapter suggested that it was important for Iceland to have a leading role in one chapter and that this chapter was the natural choice.¹¹⁸ For the chapter on forests, the lead author interview suggests that countries where forestry is economically important pushed the authors to also look at forestry aspects.¹¹⁹

The indigenous peoples' organizations were important in pushing for the inclusion of indigenous peoples' knowledge. Particularly active was the Inuit Circumpolar Conference. In this example the relationship between actors and regimes becomes clear. A regime may provide the structures that create space for an actor (e.g. the position of Permanent Participants), but for anything to happen, there also have to be individuals or organizations who use that space to push their agendas. *Chapter 17. Climate Change in the Perspective of Multiple Stressors and Resilience*, was not driven by the Permanent Participants. According to ACIA's chair, the initial attempt to bring in indigenous perspectives to it failed in spite of the structural framework of the Arctic Council and the presence of networks that included indigenous peoples' organizations. To him, the breakthrough came in a meeting with reindeer herders in connection with an Arctic Council meeting in northern Finland, where he could "engage the people, more at sectorial level where you can talk about the interaction between what they do and the environment and how climate affects it."¹²⁰ This was a different network than the organizations with a formal position as Permanent Participants in the Arctic Council. In fact, when discussing a draft, the Permanent Participants questioned the inclusion of this chapter based on the lack of involvement of local people in one of the case studies. Part of the solution to this conflict was to involve a lead author from one of the chapters with strong indigenous participation, so that he could help bridge the gap between the indigenous peoples and academia.¹²¹ The chapter was later revised to try to take the indigenous peoples' concerns into account.

In science and technology studies and especially in actor-network theory, there is an emphasis also on physical objects as actors (or actants), be they aspects of the natural environment or technology. Technology has been responsible for many observations in areas that are sparsely populated and it is no coincidence that technological developments have played an important part in providing new data for the ACIA. For example, the role of satellite technology is apparent in all chapters that discuss sea ice extent. The original launching of this technology in the 1970s was politically driven ("satellites for

¹¹⁸ Interview Hjalmar Vilhjalmsón, November 11, 2004.

¹¹⁹ Interview Glenn Juday, November 11, 2004.

¹²⁰ Interview Robert Corell, November 21, 2004.

¹²¹ Observation notes. London meeting of the Assessment Integrating Team and the Assessment Steering Group, October 2003. Interview 18.

peace”). As discussed previously, limits in computer modeling technology can be seen as a context that hindered assessment of impacts on a sub-regional level. In discussing biodiversity, gene technology has revolutionized the discussion of microbial biodiversity. However, in the Arctic the actual knowledge about Arctic microbial biodiversity is more connected to research from the International Biological Programme that was done before the advancements in gene technology. These three cases illustrate the concept of actor or actant as one of relationships. The technologies do not have intentions but their use creates new relationships between the observed nature and various social actors. When connected with practices of individual scientists or networks of scientists, they give the biogeophysical environment a role in relation to society that it would not have had without technology.

This is also where I see it as necessary to complement the actor-network analysis with one that also pays attention to the role of political structures. Appropriate questions include: What political dynamics has driven the development of a particular technology and what has allowed or limited its use? For example, would satellite technology be used in science to the extent that it is used today had the Arctic still been divided by Cold-War conflicts? To what extent has internationalist science politics after World War II favored the development of global climate models at the expense of methods that take their starting point in the regional, sub-regional, or local? To what extent will the current Arctic regime favor development and use of different technologies that can bring other aspects of Arctic change to the fore?

There is also a need to analyze actor networks at different levels, from every-day scientific practices to the coordination of research efforts by international organizations, as well as the vertical interactions between different levels. The empirical material in this dissertation does not allow connection to the micro-level. However it does illustrate that it is fruitful to include an analysis of actor networks that focus on not only on the creation of new relationships between nature and society in the micro-practices of science, but also on the role of political structures such as nation states, international regimes, and the relations among them.

A theoretical framework that includes non-human actors also entails asking how the physical nature of the Arctic has shaped the framing of climate change in the ACIA. There is no question that there are physical features of the Arctic environment that are discussed more frequently in the ACIA than in the IPCC reports as a whole. They include the prominent role of snow and ice, as well as the importance of low temperatures and short growing seasons in relation to plants and animals. The high variability that is highlighted in several ACIA chapters could also be placed here, and maybe also the relative sparseness of human population compared to other parts of the globe. However, attention to key physical features of the Arctic environment, such as ice and snow, is not unique to the ACIA. In fact, this emphasis has long been part of the scientific discourse of climate science because of their role for the global climate system. An illustration of this is that this emphasis is prominent in the polar chapter of IPCC’s Working Group II report. In fact, based on how often words related to the physical environment are used; the conclusion is that physical aspects of the Arctic environment have not been as dominating in the ACIA as in previous global climate assessments of climate change in polar regions. What emerges, instead, is that Arctic environment speaks not only

through scientific instruments that measure temperature, precipitation, and ice extent, but also through people living in the Arctic, especially indigenous people.

6.6 Conclusions and discussion

The analysis of the ACIA scientific and overview reports shows that there are two different framings of Arctic climate change that can be described as a global-local dichotomy. At one end, there is an emphasis on physical aspects of the Arctic, such as ice, snow, and permafrost, as key components of the global climate system. Therefore, any change in the Arctic is likely to have repercussions for global climate change. Some biological aspects, especially carbon cycling, are also part of this discourse. At the other end, there is a focus on the complex interaction of different factors that will be important in determining the impacts of climate change at the local or sub-regional scale, be it micro-climate in ecosystems, engineering design for damage from degrading permafrost, global market forces for fisheries economy, or political influence for determining local vulnerability.

The focus on global impacts and physical systems was well established in the international science arena before the ACIA, for example by the Intergovernmental Panel on Climate Change (IPCC) and by major research programs in the World Climate Research Program. At this point, the ACIA may have provided a more in-depth assessment of specific issues but hardly any new framings of climate change. It illustrates how various organizations in the global regime can play a role in a regional assessment and how a regional regime provides a new arena for global scientific actor networks. For future research, networks that developed during the assessment may contribute to a better understanding of issues where the international scientific networks were not as well developed, e.g. new connections being made among people working with understanding the dynamics of tree-line movement in relation to climate change. Depending on decisions by funding agencies, the identification of major data gaps could potentially also improve data gathering and reporting in fields that previously have not been as coordinated as, for example, meteorological data gathering. Here the assessment process and its connections to a specific regime provides a more efficient funneling of demands for resources than if individual scientists acted on their own, and thus potentially mustering new resources into specific research areas.

The focus on the local level and the complex interactions of various factors might represent a new framing in relation to the view of the Arctic in global climate science, especially an introduction of the importance of cultural and political factors to the impacts of climate change. In the ACIA, these social science perspectives are closely related to indigenous peoples' participation in the assessment process and shows that the political context of a scientific assessment can have a major influence on what knowledge and perspectives are considered legitimate.

During the interviews, many of the lead authors described the ACIA as a platform for interdisciplinary discussions. However, the ACIA is very limited in its discussion of social and economic impacts on non-indigenous people and city dwellers. It appears that the assessment, with the exception of one chapter, did not connect to social scientists who could have provided input to such discussions. Neither was there any structural

support for such perspectives within the Arctic Council working groups responsible for the assessment. It thus illustrates how structures such as scientific networks and governance arrangements can also create barriers for knowledge production. In this case, the open request by policy makers to include socioeconomic issues in the assessment was not a strong enough driver to overcome structural barriers set by the previous organization of knowledge production.

In the scientific assessment, the regional perspective was partly lost in the global-local dichotomy. However, in the overview document, the pan-Arctic region is given a much stronger emphasis and also given a symbolic role as the “a canary in the mine” warning system for what could be in store globally. As this framing is not as prominent in the scientific report, the immediate drivers appear to be the team that was responsible for the production of the overview and their wish to be policy relevant within the context of the global climate negotiations. A popular science genre, including attempts to draw general conclusions from an Arctic assessment, would also favor regional summaries over highlighting local complexity. An additional context that may have played a role for the regional framing is the building of a regional Arctic identity, in particular the voice of indigenous peoples in the Arctic Council and the role they have created for themselves as spokespeople for the Arctic environment.¹²² Thus the regional perspective is the result of an interplay between the structures of the Arctic Council and the indigenous peoples organizations as actors and, in this case, their linking to scientific actors.

In interviews, almost all lead authors of the scientific report described the work with their chapters as separate from the policy sphere, albeit they wished that their assessment would influence policy. The overview document is also organizationally set apart from the policy sphere. Nevertheless, as the analysis in this chapter has shown, the ACIA reports and the knowledge base presented are in many ways influenced by political structures. Similarly to Young’s proposal for mechanisms by which institutions influence knowledge production, the ACIA illustrates how regimes privilege certain types of knowledge claims.¹²³ The most prominent examples are the norms and decision-making procedures of the Arctic Council in relation to indigenous knowledge and the key coordinating function played by the IPCC in relation to climate modeling. Looking at ACIA’s knowledge base, it is also clear that regimes play a role in the production of knowledge by framing research agendas. The most prominent example is how World Meteorological Organization (WMO) and the IPCC played a role in the coordinated gathering of meteorological data. Young’s highlighting of how regimes can direct knowledge production to special policy concerns is illustrated in the ACIA by its foci on attribution and carbon, which are key issues in the United Nations Framework Convention on Climate Change (UNFCCC).

The ACIA also illustrates some limitations of formal political cooperation in structuring knowledge in ways that make it policy relevant. This includes the difficulties in overcoming the poor communication and networks across different scientific disciplines, as exemplified by the lack of coverage of socioeconomic issues. These point to the role of structures in academia, which are usually not part of the analysis in international relations. It also includes the difficulties of overcoming the historic East-West

¹²² Nuttall, “Indigenous Peoples, Self-Determination and the Arctic Environment.”

¹²³ Young, “Institutions and the Growth of Knowledge.”

division of the Arctic, as exemplified by the relative lack of Russian data. To better understand how different governance arrangements influence knowledge production, it is thus important to focus also on large-scale political development and on actor networks, including their interplay with formal international cooperation. For example, the political clout and resources provided by the formal intergovernmental collaboration can strengthen existing actor networks, and the lack of strong governance arrangements can hamper the development of other networks because the political structures needed to muster the necessary resources are not there.

IV. Conclusions and discussion

Chapter 7

Regional Knowledge Production and the Politics of Scale

In the previous chapters I have tried to answer the initial research question of how climate change is framed in the Arctic Climate Impact Assessment (ACIA). Relying on documentation of the ACIA process, I have also attempted to answer to what extent different framings relate to specific structures of international cooperation. This chapter summarizes the main findings of my analysis of the ACIA and relates them to the overall aim of the dissertation: to examine how the interplay between policy and knowledge production affects the framings of Arctic climate change. I will also revisit my analytical framework to discuss the relationship between actors and structures in the ACIA.

The chapter is organized as follows. The first section is a summary of the main results from the empirical study of the history, process, and content of the ACIA. The focus is on how structures of international cooperation have influenced the framing of Arctic climate change, including some mechanisms of regime influence. The second section relates these findings to notions of fit and proper spatial scale in structuring the science-policy interface. It emphasizes the politics of scale and how the context of a regional regime brought new actors, with new scale preferences, into climate knowledge production and policy. The third section also focuses on the science-policy interface but this time in relation to actors and how the regime context and the assessment structure made the ACIA salient, credible, and legitimate to different actors. The fourth section revisits the regime concept and argues that studies of knowledge production benefit from a structural focus that pays attention not only to regimes but also to the influences of primary institutions of international society and to actor networks. The chapter concludes with a discussion of what the ACIA might teach us about the role of regional arenas in international climate policy.

A cross-cutting theme in this concluding chapter, as in the dissertation as a whole, is that science and knowledge production are intimately intertwined with political power relations. This is not a new insight, having been highlighted in discourse analysis, actor-network theory, and research on the co-production of science and policy. This study illustrates the relevance of highlighting the knowledge-power relationship also for understanding international environmental policy and international scientific cooperation and how they can shape the framing of an environmental problem.

7.1 The framing of Arctic climate change

How is climate change framed in the ACIA? How do different framings of Arctic climate change relate to structures of international cooperation? This section summarizes the main findings from the literature review of the historical context of the ACIA and the ACIA case study in an attempt to connect key framings to mechanisms by which structures of international cooperation can influence knowledge production. This section pays special attention to the possible role of different regimes.

The ACIA features two general framings of Arctic climate change. One is an image of the Arctic as a key component of the global system. The other is climate as one of many interacting factors that will influence the impacts of climate change.

An example of the Arctic as part of the global system is the emphasis in the ACIA reports on physical processes in the Arctic that play a pivotal role in global climate change, such as the changes in ice in relation to the freshwater budget and ocean currents or changes in Arctic carbon fluxes in relation to the global carbon budget. Another example is concerns about how Arctic habitats for migratory birds are connected to global biodiversity. A third example, and one closely connected to climate policy, is that the Arctic is a bellwether or “a canary in the mine” warning about what may happen globally if nothing is done politically to reduce emissions of greenhouse gases.

Several nodes in the global climate regime have been important in promoting this framing. They include the World Meteorological Organization (WMO) and the World Climate Research Program (WCRP) since they have promoted and coordinated research that seeks to understand the role of the Arctic processes in a global context. In doing so, they have also created strong scientific communities or actor networks of both people and technology. Two other nodes are the United Nations Framework Convention on Climate Change (UNFCCC) and the Intergovernmental Panel on Climate Change (IPCC), which have generated and funneled policy demands for knowledge on specific issues, where the Arctic is mainly of interest because of its global role. The fact that the WMO dates back to the 1950s and that it has also played a critical role in the IPCC and via the IPCC in relation to the UNFCCC further emphasizes how formal international cooperation around an issue can come to structure whole fields of knowledge production.

The emerging regional Arctic regime, as expressed in the Arctic Council, also plays a role in presenting the Arctic as globally important. In relation to the history and process of the ACIA, the mechanisms here relate to the creation of a globally relevant regional identity. A question for the future is how the Arctic Council, in combination with other regional initiatives can create new foundations for promoting and coordinating research, creating research communities or actor networks, and funneling policy demands for knowledge. The ACIA process itself attests to its role in funneling policy concerns and there are some signs of new networks being formed. If I had continued to follow the process since the ACIA reports were launched in 2004, I might have been able to document signs of research coordination, but the WMO teaches us that the long-term results are easier to judge in a historical perspective.

The second major framing of Arctic climate change in the ACIA is that it is only one of many interacting factors that will affect the impacts of climate change. An example

of this is the emphasis on multiple environmental stressors, such as interactions with pollutants and physical disturbances of ecosystems. Another example is the notion of human health as a concept that integrates influences ranging from the physical environment to cultural, community, and family surroundings to genetic dispositions. A third example is how discussions about impacts of climate change on indigenous peoples highlight connections to political rights. Especially when discussing impacts on indigenous peoples, the regime context of the Arctic Council appears to have been important in allowing new perspectives into knowledge production about Arctic climate change. Here, the norms and decision-making procedures of the Arctic political cooperation created a formal role for indigenous peoples throughout the assessment process. This allowed them to not only voice their priorities but also to ensure that indigenous voices became included in a formal scientific document and thus in the knowledge base that is available to audiences concerned with the science of climate change.

In summary, the ACIA case illustrates how regimes can influence knowledge production by *promoting and coordinating research* in certain fields, by *funneling policy demand for knowledge*, and by *creating space for new actors* in the knowledge production process. This raises questions about what research and understandings that current international regimes have not highlighted and where we might consequently lack knowledge that is relevant in understanding climate change and in furthering society's capacity to cope. The same issue has come to the fore in the general discussions about adaptation to climate change, where Pielke, Prins, Rayner, and Sarawitz have recently argued that a serious discussion of adaptation has been prevented by a framing of climate change that has been dominated by global mitigation issues. With reference to the UNFCCC and the Kyoto Protocol and their lack of involvement with adaptation that goes beyond the issue of mitigation, they phrase it as the "missed opportunities of an international regime."¹

The ACIA case illustrates how a regional context can help bring out some of the complexity regarding adaptation. However, it also shows that regional knowledge production is highly dependent upon the global political context. The next section discusses the relationship between regimes and knowledge production in context of the political preferences of different actors and a need to consider the politics of the concept fit, interplay, and scale.

7.2 The politics of scale

A key dimension to the framings of climate change in the ACIA is preferences for different spatial scales: the global and to some extent a regional preference being emphasized by the Arctic climate systems' global role and by the local being in focus when complexity and interacting factors are emphasized. This section relates this finding to the analytical concepts of fit, interplay, and scale from the literature on institutional dimensions of global environmental change.² The ACIA case shows that these concepts

¹ Roger Pielke Jr., Gwyn Prins, Steve Rayner, and Daniel Sarawitz, "Lifting the Taboo on Adaptation," *Nature* 445, (2007): 597.

² Young, *The Institutional Dimensions of Environmental Change. Fit, Interplay, and Scale*.

need to be rescrutinized in relation to how power relations may influence what scale is seen as appropriate and therefore how one should look at fit between environmental problems and governance structures. In short, this section argues that to analyze the relationship between power and knowledge (or policy and science), a discussion about fit should include a scrutiny of the politics of scale. Such a scrutiny will also make more apparent the role that international regimes and actors play in knowledge production.

Does one size fit all?

Climate change is most often framed as a global issue that has to be managed at the global level through international agreements. The climate system is seen as a truly global phenomenon that cannot be understood using only site-specific knowledge. Because emissions of greenhouse gases mix well in Earth's atmosphere, claims are often made that it does not matter where they come from. The logic has, therefore, been that climate change should be managed through a global convention. With such a framing, the question of fit between the governance system and the problem at hand could be neatly wrapped up as a case of perfect fit between the spatial scale of the problem, as seen through the eyes of natural science, and the governance solution. However, my review of the historical developments of climate science provided in Chapter 4 of this dissertation shows that the global scale should not be accepted as an unchallenged given. Rather, it is a framing that has historically gained power because it co-developed with conscious efforts, on behalf of the United States in particular, to internationalize science in the post-World War II era. It has also gained power by its co-evolution with the growth of international governance within the framework of the United Nations. For climate science, the creation of the WMO in 1950 and its subsequent initiatives to create global observation networks and promote research important for global-scale modeling is a critical example. The global view is further reinforced with visions of "Only One Earth" for the international environmental governance, starting at the United Nations Conference on the Human Environment in Stockholm 1972. Thus, the development of modern climate change research should be seen not only as the result of internal scientific drivers but also as a consequence of a shift in the spatial scale preference within the international political landscape – from a focus on the nation state to an increasing emphasis on global governance, especially concerning issues related to the environment.

There is no doubt that the global framing has been productive in the sense of increasing our understanding of the climate system. Without it, the IPCC would hardly have been able to say with such confidence that the global climate is changing and that anthropogenic emissions of greenhouse gases are an important part of the explanation.³ But politically it has been challenged, especially by the global South with arguments about the historical debt of the global North and requests for equity. These challenges are by now recognized and embedded in phrases in the UNFCCC such as "common but differentiated responsibilities."⁴ More recently, the global framing is also being challenged from below by an increasing number of local and regional initiatives to limit

³ IPCC, *Climate Change 2007: The Physical Science Basis. Summary for Policymakers*.

⁴ United Nations Framework Convention on Climate Change, preamble, articles 3 and 4.

emissions that are not immediately dependent on international agreements.⁵ Moreover, the global framing of climate change is being challenged by increasing recognition that knowledge production that focuses only on global scale processes is not sufficient for addressing how society should adapt to climate change. There are, for example, major ongoing efforts to scale down global climate models in order to be able to provide better resolution for national studies of impacts and needs for adaptation. The two latter challenges are not in opposition to a global scale preference, but nevertheless represent an ongoing shift in focus in climate science and governance. The launching of the ACIA in 2000 can be seen as an expression of this shift and one which highlights a need to better understand regional processes in the Arctic. But the shift in scale preference actually goes further than this in the ACIA. The analyses in Chapter 6 of this dissertation show that the global framing is also starting to be challenged by knowledge traditions that have the local scale in focus. They often emphasize that climate change is only one of many interacting factors that will determine vulnerability and society's capacity to adapt.

Now the question of fit becomes much more multidimensional. There is no one right answer in deciding the spatial scale of the system that needs to be assessed, or what level is optimal for political governance. It could range from the local community level to the national and international levels in discussing both adaptation and mitigation. It becomes easier to recognize that preferences for certain spatial scales are a joint product of social and biogeophysical processes, which creates a window for analyzing the politics of scale.⁶ A number of new questions can be asked: Who has power to decide the spatial scale preference? What implications do different scale choices have for what knowledge is considered legitimate? How does it affect responsibility for an issue? How do regimes give various actors a power base from which to highlight their spatial scale preferences?

Local, global, and regional preferences in the ACIA

The ACIA provides an illustration of how the global preference is complemented by a local perspective. As discussed in Chapter 6 of this dissertation, the local perspective in the ACIA scientific report is often connected to a social science knowledge base and to the participation of indigenous peoples. I argue that this local emphasis is a result of the power base that indigenous peoples have in the Arctic Council, which can be contrasted to the lack of such a power base in the IPCC where governments are the only legitimate political actors. By contrast, the relative weakness of a sub-regional perspective in the assessment could be a sign that sub-regional decision makers lack real influence in the Arctic Council.

The global framing is also emphasized in the policy document from the ACIA process. This could indicate that state actors who had the power to influence the policy outcomes wanted to link them to global policy processes and therefore had a preference for

⁵ Selin and VanDeveer, "Political Science and Prediction: What's Next for the U.S. Climate Change Policy?."

⁶ Louis Lebel, Po Garden, and Masao Imamura, "The Politics of Scale, Position, and Place in the Governance of Water Resources in the Mekong Region," *Ecology and Society* 10, no. 2 (2005): 18.

this global perspective. The reasons varied among the actors, for instance the Nordic states and the indigenous peoples wanted the Arctic to serve as a bellwether for global climate change and possible leverage in the global negotiations. By contrast, it was clear that the US State Department did not want to give the Arctic this role and that it would, in fact, put a major effort into stopping any initiative towards making the Arctic Council a legitimate arena for climate politics. In this instance, the global preference is in direct contrast to a regional preference.

These disagreements over how strongly the role of the Arctic should be highlighted illustrate that political powers struggle over the appropriate spatial scale in climate governance. For the indigenous peoples' organizations, the circumpolar perspective has many political advantages. First of all, it gives them a stronger power position than they would have if the nation state is the governance level of choice. At this level, they have been, historically, at the periphery with the power core in national capitals south of the Arctic. The circumpolar scale also gives them a special role in a global context as spokespeople for nature. For nation states, the circumpolar perspective can have advantages in relation to cooperation that does not entail any threat to national interests. However, because climate politics are so intimately connected to energy and also historically to economic growth, national interests were much more important in this assessment than in previous scientific assessments under the auspices of circumpolar political cooperation. Thus it should not come as a surprise that the circumpolar view was challenged, especially by the United States whose climate policies were most at odds with a message of the Arctic as a bellwether for climate change.

In the scientific report, there is a surprisingly weak focus on the circumpolar spatial scale in many of the individual chapters, relative to references to the global and local contexts. It is surprising based on the fact that the assessment was carried out as part of the circumpolar political cooperation in the Arctic Council. There is no challenge to the circumpolar perspective and several efforts to accommodate it, but nevertheless it appears that the circumpolar context of the assessment process, as a whole, was not quite able to overcome the preferences embedded in different scientific disciplines. I suggest that the relative weakness of circumpolar perspectives could at least partly be understood by the geopolitical history of the region and that the current regime for environmental cooperation has not been able to influence knowledge production for long enough, or is not strong enough, to have had a significant impact of the scientific framing of Arctic climate change. It may also reflect remnants of the colonial view of the Arctic within many natural science disciplines, where the Arctic is primarily of interest because of its global role. The efforts to try to accommodate the policy wish for circumpolar assessment would then be a sign of the growing role of Arctic political cooperation for knowledge production. The inclusion of more local perspectives could be viewed as an expression of peoples in the region striving for increasing independence, not only politically but also in questions about power over knowledge production about the region. The attempts to combine local indigenous observations across the Arctic can similarly be viewed as a mirror of the increasing political circumpolar cooperation among indigenous peoples.

The role of regimes in the politics of scale

What role do regimes play in the politics of scale? As already alluded to in the example of the WMO, norms can encourage regime members to muster financial and technical resources for knowledge production with a certain scale preference, in turn reinforcing a particular framing. By facilitating the mustering of resources for new technical and administrative systems, regimes can provide a venue through which political preferences become embedded in technology and in the way society's knowledge production is organized. The choices that are made in setting up a monitoring system is an example.

This can be very productive in the sense that regimes can help society organize its knowledge production to meet policy needs. The vast improvements in weather forecasting are a case in point as is our growing ability to detect global climate change and to make global scenarios for future climate change. However, it also means that policy makers need to be aware that current structures of international cooperation may have kept some facets of climate change hidden because the knowledge systems that have gained power from them are not apt to detect or understand them. Today's relative lack of knowledge about adaptation to climate variability is an example, as discussed by Pielke et al.⁷ Knowledge about many different aspects of a problem becomes especially important in a rapidly changing environment, where old experiences may not be as valid or where changes may show up in unexpected places. This study of the ACIA shows that norms about what constitute legitimate knowledge can vary between regimes and that Arctic Council norms helped highlight local perspectives in addition to the previously dominating global view of climate science. To safeguard against an over dominance of one particular scale preference or knowledge tradition and to ensure that more aspects of a challenge become visible, it would be wise to promote a diversity of perspectives. This may require a greater plurality in governance arrangements than has been present in climate change. The UNFCCC and the IPCC have dominated the picture so far and initiatives that focus on other spatial scales than the global have been more scarce or much weaker.

If we see redundancy in knowledge production as a safeguard against unpleasant surprises and plurality of governance arrangements as a potential way to create this redundancy, then the history of the ACIA is sobering. Early in the Arctic political cooperation, climate change and ultraviolet radiation assessments were to a large extent deferred to the global level. It was not until global and regional interests merged that this large-scale effort at assessing the impacts of Arctic climate change was launched. It raises questions of whether the structure of cooperation in climate policy, in particular the dominance of global preferences, may have delayed knowledge syntheses that could be important for adaptation efforts and possibly also for mitigation initiatives. Yet, the Arctic can be seen as lucky in that its role in the global climate system has been scientifically recognized for a long time and that it has attracted major research efforts from global regimes. Moreover, there was a political regime in place that could muster the resources to conduct a regional assessment. Many other regions of the world that may be equally vulnerable to climate change lack similar concerted efforts at understanding regional or local climate change impacts.

⁷ Pielke Jr., et al., "Lifting the Taboo on Adaptation."

Even with an assessment like the ACIA, the analyses of the ACIA process in Chapter 5 of this dissertation show that it was strongly influenced by the global climate regime in what issues to highlight. Consequently, there is also a need for policy makers to discuss how to make regional, national, and local assessments independent enough that they can contribute to a true diversity in the production of knowledge about climate change and its impacts and society's vulnerabilities. This becomes especially important in light of how the loss of diversity in know-how may reduce the resilience of a system and that combining different knowledge systems may be a key component of creating systems of adaptive governance.⁸ If one perspective is too dominant, it becomes difficult to create multilevel approaches that rely on collaborations across diverse social and ecological scales. The ACIA shows that downscaling of the global climate models to the regional level does not necessarily provide the same knowledge as syntheses that start at the local level. In the context of the UNFCCC and the Kyoto Protocol, the lack of progress in reducing emissions of greenhouse gases, as well as the need for adaptation, is the basis for ongoing discussions about the future structure of climate governance. Policy makers may need to ask similar questions relating to how the current global climate regime and alternative political structures can help or hinder knowledge production on climate change. More specifically, we need to ask what spatial scale preferences current regimes can highlight and what role they may have played in the lack of policy-relevant knowledge at other spatial scales. In this context, an analysis of regime interplay could become an important diagnostic tool for policy makers.

Understanding cross-scale interactions

The lessons from the ACIA that are highlighted here fit well with an emerging, more general discussion about scale challenges. Cash et al. define this as a situation in which the current combination of cross-scale and cross-level interactions threatens to undermine the resilience of the human-environment system.⁹ In addition to the ignorance of scale and level issues and mismatches, they highlight the common assumption that there is a single, correct or best characterization of the scale and level that applies to the systems as a whole or for all actors. In studying the ACIA, I have met such assumptions in both interviews and informal discussions, which highlights the need to bring these issues to the fore in both scientific and policy communities. However, the ACIA also features examples of explicit treatment of the issues and their interactions at different scales (e.g. *Chapter 7. Arctic Tundra and Polar Desert Ecosystems*). The author interviews also show that issues of scale are of interest to many of the scientists involved in the ACIA.

In addition to the role of spatial dimensions, Cash et al. also highlight challenges related to temporal scales, jurisdictional scales, and various analytical scales. An example of the latter could be the generalized understanding of formal science versus local traditional knowledge. By deliberately bringing scientific and indigenous knowledge together, the ACIA provides an example of a cross-level interaction in the knowledge system that has been rare in climate change science. As discussed in earlier chapters, the

⁸ Folke, "Resilience: The Emergence of a Perspective for Social-Ecological Systems Analyses."

⁹ Cash, et al., "Scale and Cross-Scale Dynamics: Governance and Information in a Multilevel World."

regime context of the Arctic Council played a key role in making this happen. For policy makers active in shaping the future of climate governance, this should raise questions about how regimes and regime interplay facilitates or hinders such cross-level interactions in knowledge production and how this in turn can enable or disable policy makers at various levels on a jurisdictional scale. Another way of phrasing the same challenge is to ask how international conventions and cooperation should be shaped to make climate knowledge relevant and climate governance possible at all levels ranging from the local to the global.

The ACIA case shows that the current regime structure allowed knowledge production but precluded coordinated climate governance at the circumpolar regional level. In other words, members of the Arctic Council could not agree to play a direct policy role in relation to either adaptation or mitigation that could match the emerging knowledge about the vulnerability of the region. The question of policy action was left to actors at other levels of governance. Some of the reasons for this apparent mismatch between such a major efforts towards knowledge synthesis and governance capacity may be that a strong climate regime was already established at the global level through the UNFCCC. Some of the explanation may also lie in the construction of the science-policy interface, which is explored in more detail in the next section.

7.3 The science-policy interface in a regional regime

What role do regimes play for how science influences policy? This section highlights the policy-impact end of the tension between the co-production of science and policy with a focus on the relationship between the Arctic Council, as a regime (the structure of cooperation), and different actors in the ACIA process. As discussed in Chapter 2 of this dissertation, previous studies have identified three factors as essential for scientific assessments to have policy impact: salience, credibility, and legitimacy. Salience refers to whether the assessment is seen as relevant. Credibility deals with whether it is judged to be reliable; while legitimacy refers to whether it is deemed respectful for the relevant audiences. There are often a tensions and tradeoffs among salience, credibility, and legitimacy for different audiences.¹⁰

This section uses these concepts to investigate the role of various actors and how their relationship to regimes can help explain the dynamics between the scientific assessment and the policy process in the ACIA. It especially highlights the role of boundary organizations.

Trying to separate science from policy

In the ACIA process, there was an increasing formal separation of the scientific and policy processes with the overview summary framed as part of the scientific process. The purpose of this was no doubt to shield the science from undue political influence or from allegation of such influence. In short the separation was to ensure the scientific credibility and the legitimacy of the process. The formal political influences on the sci-

¹⁰ Mitchell, et al. "Evaluating the Influence of Global Environmental Assessments."

entific report was similar to previous circumpolar assessments and to the scientific reports from IPCC's assessments, where state interests are represented mainly in the nomination of lead authors and by approving the outline and procedures of the assessment in plenaries. However, unlike the IPCC, the summary presented in ACIA's overview document was also placed formally in the scientific domain. Governments were invited to comment on drafts of the document but there was no negotiation of text as is the case in IPCC's summaries for policy makers. This created problems to both the credibility and legitimacy of the overview report to one important actor, the US State Department. With no ownership of the document, it was easy for the United States to question its message and how it was presented. The United States also referred to the IPCC as the proper model. Even if the ACIA chair worked hard at being a knowledge broker bringing the findings from the ACIA to policy makers in several of the Arctic countries, including those high in the US policy hierarchy, the weak formal bridge between the scientific and policy arenas, which only allowed communication from science to policy, appears to have served as a limiting factor for the science-policy dialogue.

Boundary organizations as connecting point

Scientific assessments are processes in which the boundaries between science and policy are constantly negotiated in order to ensure that science and policy have authority in their respective arenas.¹¹ Such negotiations are in fact central to science-policy relationship in general and a way to uphold the boundary between the two spheres and to make sure that the knowledge is generally accepted as valid and useful.¹² This is aptly illustrated by the ACIA process in the increasing demarcation of the policy process from the scientific domain. However, the ACIA process also points to the importance of appropriate arenas for the boundary work, including the role of boundary organizations. Boundary organizations answer to both the science and the policy worlds and serve as ways to manage the science-policy hybrids.¹³

In previous circumpolar assessments, the politically mandated working groups functioned as natural boundary organizations or arenas. However, the ACIA process was a joint project of two working groups (AMAP and CAFF), whereas the Assessment Steering Committee had responsibility not only for the scientific assessment but also for the the overview document that was to communicate the scientific outcome to policy makers. This structure limited the role of the working groups in connecting science to policy needs. These observations point to the lack of boundary organization as one of the potential reasons for the overview document's lack of credibility with some policy makers,

¹¹ Farrell and Jäger, "Overview. Understanding Design Choices," 14.

¹² Tora Skodvin and Arild Underdal, "Exploring the Dynamics of the Science-Policy Interaction," in *Science and Politics in International Environmental Regimes*, eds. Steinar Andresen, Tora Skodvin, Arild Underdal, and Jorgen Wettestad, 22-34 (Manchester and New York: Manchester University Press, 2000).

¹³ Guston, "Boundary Organizations in Environmental Policy and Science: An Introduction"; Clark Miller, "Hybrid Management: Boundary Organizations, Science Policy, and Environmental Governance in the Climate Regime," *Science, Technology & Human Values* 26, (2001): 478; David W. Cash, William C. Clark, Frank Alcock, Nancy M. Dickson, Noelle Eckley, David H. Guston, Jill Jäger, and Ronald B. Mitchell, "Knowledge Systems for Sustainable Development," *Proceedings of the National Academy of Sciences (PNAS)* 100, no. 14 (2003): 8086.

particularly within the US State Department. Such a conclusion is in line with results from the Global Environmental Assessment Project, where Mitchell et al. concluded that an assessment's influence flows from the process rather than from its reports and that bridging boundaries between the users and the producers of the assessment is essential for making the assessment effective.¹⁴ Thus, if boundary organizations function well, they make the process legitimate in the eyes of both policy makers and scientists. If they do not function well, or are not present or placed at the margin, a lack of hybrid management weakens the direct policy impact of a scientific assessment. This is what happened in the case of ACIA where the policy document does not make any major new commitments.

The lack of new commitments does not mean that the ACIA did not or will not influence policy, but it suggests that any potential influence is likely to be indirect. One potential route of influence is via the US congressional hearing where the ACIA was prominently featured. Another route is through the mass media. The end of the ACIA policy process illustrates the role that media attention played in the United States finally agreeing to a policy document. Media attention can potentially change public opinion consequently effecting what is politically feasible. This study did not follow the media impact of the ACIA, but an indication of impacts is that the ACIA chair has been labeled as the tide-turner in the US climate debate.¹⁵

The lack of bridging organizations may have been less important in relation to actors who already agreed on the main messages of the report – that climate change is real and happening here and now. There is at least no sign in the empirical material of other countries questioning the overview document or the assessment process. In this case, the message from the assessment was in line with current climate policies. In fact, if other countries had not pushed so hard for a policy document and if they had not had additional support for their position from the combined effects of indigenous peoples' outreach activities and media, the ACIA may not have had a policy outcome at all or an even weaker one. As an historical note pointing to the critical role of effective boundary organizations, it is worth remembering that when the IPCC was created in the late 1980s, a key driver for its design was to ensure that the process would reflect the views of not only science but also those of governments, in contrast to the Advisory Group of Greenhouse Gases, which was non-governmental in character.¹⁶ This has not stopped US actors from calling IPCC's assessment results into question, indicating that even if boundary organizations are essential they are not single-handedly sufficient for science to influence policy. However, the ACIA process indicates that the lack of the formal sites for the co-production of science and policy in the form of boundary organizations can create extra hurdles when scientists want to communicate their knowledge to policy makers.

¹⁴ Mitchell, et al. "Information and Influence," 324.

¹⁵ The Rolling Stone Magazine, "Warriors and Heroes," http://www.rollingstone.com/politics/story/8742145/warriors_heroes/ (Accessed 2 July 2006).

¹⁶ Wendy E. F. Torrence, "Science and Salience: Building an Agenda for Climate Change," in *Global Environmental Assessments. Information and Influence*, eds. Ronald B. Mitchell, William C. Clark, David W. Cash, and Nancy M. Dickson, 29-56 (Cambridge, MA: MIT Press, 2006).

Who owns the popular science synthesis?

One might assume that the placing of the overview document in the scientific sphere, shielded from the direct influence of policy, would have given it more credibility among the scientists who participated in the assessment. However, it appears that the overview document actually had some problems in this respect, too. Even if the scientists signed a paper ensuring that its content reflected that of the scientific report, remarks from some of the lead authors suggested a lack of ownership over the way in which the assessment results were presented. The issue came to the fore in the highlights document, a condensed version of the overview, which was produced with oversight only by the Assessment Integration Team. It is difficult to tell from the empirical material whether the communication glitches in relation to some of the scientific authors also affected its political credibility but it is an issue that may need further thought in constructing future assessment processes. Again, in the eyes of both policy makers and scientists, boundary organizations may be critical in creating credibility and legitimacy for the synthesis and popular science presentations of assessment results and that this may have little to do with whether everything written has backing in the scientific report. Instead it may more be a question of sense of ownership.

Co-production: a design concern for scientific assessments?

The lack of effective bridging between science and policy may be a problem in the longer run. According to Mitchell et al. experiences from a number of different assessment processes point to the importance of seeing an assessment as a process that creates knowledge rather than only the reports it produces. They write that an assessments' effectiveness depends on "a process of co-production of knowledge between assessment producers and potential user groups in which the boundaries among these groups are bridged so that they can develop reciprocal understanding of what salient, credible, and legitimate mean to the others involved."¹⁷ Moreover, they conclude that "influential assessments are those that eschew one-way communication from scientists to decision makers in favor of co-production of knowledge."¹⁸ This suggests that the idea of co-production of science and policy is not only an analytical tool in understanding their relationship but that it could also be seen as a necessary condition for science to influence policy. The overview document may have been designed for impact on decision makers but with its placement in the scientific domain those very decision makers had limited influence on the process by which it was produced. Instead of providing a bridging arena between science and policy in the ACIA process, it may actually have served as a separating device. This case study has not systematically gathered material on the Arctic Council follow-up of the ACIA, but there are some signs that the policy makers' lack of ownership over the assessment, in particular from the United States, stalled follow-ups, at least in the short run. For example, there was no clear mandate in the ACIA policy document for a follow-up process other than to establish a "focal point" to coor-

¹⁷ Mitchell, et al. "Information and Influence," 324 also quoting Sheila Jasanoff and Marybeth Long Martello, *Earthly Politics: Local And Global in Environmental Governance* (Cambridge, Massachusetts: MIT Press, 2004). and Jasanoff and Wynne, "Science and Decision Making."

¹⁸ Mitchell, et al. "Information and Influence," 325.

dinate among the different working groups.¹⁹ When this group reported back to the Arctic Council in the fall of 2006 it concluded it “had not been as effective as some had wished. For example, it has struggled to define its mission, and there is no clear responsibility for organization of practical issues or for preparing documents or indeed for any activity at all.”²⁰

The Permanent Participants

The political actors that most eagerly picked up ACIA’s message were no doubt the Permanent Participants. As described in Chapter 5 of this dissertation, they also played a critical role in publicizing the image of the Arctic’s extreme sensitivity to climate change and the implications that this has for its inhabitants. How can this be understood in relation to salience, legitimacy, and credibility? It appears that the combination of the ACIA chair having an active interest in having indigenous participation in the knowledge production and norms within the Arctic Council helped create a bridge that in turn made the assessment salient, legitimate, and credible to the Permanent Participants. It was salient because it addressed issues of concern to indigenous people and became legitimate when indigenous peoples were included in the process. The inclusion of indigenous observations and the treatment of those observations together with scientific observation probably played a role in increasing the assessment’s credibility for this audience. In addition, the assessment also made room for the discourse of indigenous people having a particular relationship with the environment giving them the role of spokesperson for nature. Though such a notion of a special relationship between indigenous peoples and the environment has been criticized, it has been used extensively by Arctic indigenous peoples in their political struggles to influence their futures locally and increasingly also in the region as a whole.²¹

In relation to the Permanent Participants, the assessment appears to have been very successful in reaching the policy level, as seen by the chair of the Inuit Circumpolar Conference becoming a public spokesperson for the assessment results. Their participation in the knowledge production process and the explicit merger of scientific and traditional knowledge in the assessment may also have strengthened their credibility in the eyes of media and the wider policy audience. Indigenous peoples and science were speaking with the same voice. This, in turn, created a base from which they could become powerful actors in the policy process, in spite of their weaker formal position in relation to the state actors. The initial boundary organization in this case was probably the Assessment Steering Committee. Of the people interviewed in this case study, the indigenous peoples representatives generally did not emphasize a separation of science and policy the way scientists and policy representative of states often did.

¹⁹ Arctic Climate Impact Assessment Policy Document. Issued by the Fourth Arctic Council Ministerial Meeting., 7.

²⁰ Report of the Arctic Council Focal Point (FP) for ACIA Follow-up Activities Presented to the Senior Arctic Officials (SAOs) of the Arctic Council 24 October 2006, Salekhard, Yamal-Nenets Autonomous Okrug Russian Federation.

²¹ Shepard Krech III, *The Ecological Indian. Myth and History* (New York: Norton, 1999); Nuttall, “Indigenous Peoples, Self-Determination and the Arctic Environment.”

7.4 Structure and agency: the regime concept revisited

Is the regime concept useful for analyzing the co-production of science and policy? Can it be made more useful? The purpose of this section is to discuss the regime concept based on the empirical findings of the ACIA case study and to discuss how the concept can be made more useful by making more explicit connections to some other theoretical approaches.

Based on the fact that a large share of the international environmental science-policy dialogue occurs in the setting of formal regimes they appear to play a central role for the co-production of science and policy. In an ideal situation, environmental regimes can give rise to boundary organizations where scientific and policy concerns can meet and so they become important for creating consensus on the knowledge base for political decisions.²² IPCC's first assessment in relation to the final negotiation and signing of the UNFCCC and its second assessment in relation to the Kyoto Protocol are cases in point. This dissertation has also shown that formal intergovernmental cooperation can play a role in consolidating and strengthening scientific networks, where the WMO and the IPCC are examples in relation to climate science. The future will tell if initiatives based on the ACIA will be equally important.

The importance of large-scale structures

In addition to a focus on regimes, the history and process of the ACIA highlights that it may be useful to also analyze the role of political structures that are not issue- or place-specific. As laid out in Chapter 2 of this dissertation, Buzan has suggested the term primary institutions to refer to fundamental structures of international society such as sovereignty, great power management, and colonialism, which are generally more enduring than specific regimes and influence a broader range of issues.²³ One example from the study of the ACIA illustrating that the process may be better understood with attention to primary institutions is the relative lack of knowledge about Russia. The old East-West division of the world put a damper on circumpolar knowledge production during the Cold War. The inadequate networks to Russian scientists in the ACIA also illustrate the relative structural inertia in overcoming this division of the Arctic. Another primary institution of importance to the ACIA is colonialism. In this case, the extensive inclusion of indigenous knowledge into the ACIA can be seen as a move away from the colonial structure of knowledge production in the Arctic and a shift in the primary institutions that also affects knowledge production. With this wider structural focus, the role of more specific regimes can be analyzed in relation to these larger structures. The Arctic Council with projects such as the ACIA and the goals of sustainable development and protection of the environment could be seen as the expression of a shift towards an emerging primary institution in international society that Buzan calls environmental stewardship.²⁴

²² Guston, "Boundary Organizations in Environmental Policy and Science: An Introduction"; Cash, et al., "Knowledge Systems for Sustainable Development."

²³ Buzan, *From International to World Society*, chapter 6.

²⁴ Buzan, *From International to World Society*, 187.

Agency and actor networks in focus

While regimes and primary institutions can be important concepts for highlighting structures, the history and process of the ACIA also illustrate that actors and structures interact. For example, the ACIA policy process certainly could not be understood without paying attention to the roles of various state actors, including how some Nordic countries wanted to use the Arctic regime for pushing certain climate policies and how the United States in particular challenged this. I believe this clash may not only be relevant to climate policy but also to how knowledge production about Arctic climate change will develop, especially as it relates to policy-relevant questions of mitigation and adaptation. This study also highlights the relation between regimes and actors other than states. As an example, a formal regime can play a key role in making individual knowledge brokers successful by providing the platform from which they can act and gain easier access to policy makers. Another example is that a regime can change or become stabilized based on what different actors do. The actions of the Inuit Circumpolar Conference (ICC) both at the beginning and during the scientific assessment appears to have been important in enhancing the norm to include indigenous knowledge, and this norm in turn provided the ICC with a role in the policy process that it may not have had without the Arctic Council's decision-making procedures.

Based on actor-network theory, it is relevant to reflect on the relationships between non-human actors (e.g. technologies), social actors, and structures of international society, be they primary institutions or issue-specific regimes. Latour has shown that the primary institution of colonialism was important in creating a distinction between local knowledge and science, which gave the latter the authority to speak for nature with universalist claims.²⁵ In the case of climate science, specific cooperative arrangements, such as the WMO, have supported data management and climate modeling and thereby served as what Latour calls center of calculation. It is inside such centers that the physical artefacts that mirror nature, such as maps and data logs, are accumulated and are used by scientists "to escalate the proof rate." Thereby "the tiny number of scientists is more than balanced by the large number of resources they are able to muster."²⁶ The transformation of the scientific calculations and conclusions in IPCC's assessment into policy relevant language and into the summaries for policy makers is similarly powered by the structures of the IPCC and its linkages to the UNFCCC. The structure of international cooperation in the climate arena has an important role in enhancing the reach and thus the power of observations and work of individual scientists. It is also these formal cooperations that make aspects of the biogeophysical environment and technologies powerful actants outside their local contexts. They do so by connecting various local actor networks and by linking them directly to political decision making.

Other areas of Arctic science have not had the same strong support from a global climate regime. This could be an important explanation on why knowledge gathered by those scientists has not enjoyed an equally strong influence in the global climate debate including the framing of climate change as one of many interacting factors that comes forth in many studies that are based on a preference for a local spatial scale. It is too

²⁵ Latour, *Science in Action*, 215 ff.

²⁶ Latour, *Science in Action*, 232.

early to assess what role these additional perspectives in the ACIA will play for how Arctic climate change will be framed in the future. It will, for example, be very interesting to see what role indigenous observations of Arctic climate change will play in five or ten years. Will the Arctic Council become a center of calculation for indigenous communities and individuals across the Arctic by virtue of ACIA's attempt to systematize local community observations of weather variability and climate change? Just the fact that some of these observations are now gathered in written form that can be cited allows the observations to act at a much greater distance than within a single community.

A more versatile analytical toolbox

To summarize, although the concept of regimes is important to understanding the politics of knowledge production, its focus on issue-specific principles, norms, structures, and decision-making procedures may not be sufficient. First, a focus on structure needs to include attention to primary institutions of international society and their roles in strengthening the power of some knowledge traditions over others. Second, concepts from actor-network theory can be used for understanding the connections between the macro-level of the international system with the micro-level sociology of science that often is in focus in science and technology studies. Third, there is a need to study how, why, and when actor networks become solidified and gain power, not only through black-boxed technologies and scientific theories as discussed by Latour, but also by becoming part of formal political regimes. A fourth point to add is that political actors are not only states. In the ACIA, indigenous peoples' organizations were important transnational actors as were individual scientists and scientific organizations.

7.5 Regional arenas in international climate policy

One question in this dissertation has been what potentials and limitations do regional arenas hold for future climate policy. Based on the ACIA, it appears that a regional assessment process can provide an in-depth synthesis of available scientific knowledge regarding the region's role in global climate change and can also complement the global framing of climate change impacts with local perspectives that emphasize climate as one of many factors that affects vulnerability. The ACIA case also shows that the regional arena has the potential to bring new actors into international climate politics and knowledge production, as evidenced by the strong role of indigenous peoples' organizations in both the scientific assessment and the ACIA policy process.

Without additional case studies of regional climate impact assessments, it is difficult to judge if there are generalities to these conclusions. However, it appears that ACIA's outcome was dependent on a number of factors that may or may not be present in other regional settings. These factors could be used as preliminary diagnostic tools for judging the potential of other regional assessments. This section highlights these critical factors and could serve as a basis for evaluating their usefulness in other case studies.

A political platform combined with a scientific bridge

A key factor in the initiation of the ACIA was the presence of a regional regime that made the exercise salient, credible, and legitimate for key political actors in the region, in this case the eight Arctic states and the indigenous peoples as represented by the Permanent Participants of the Arctic Council. Making the ACIA salient entailed taking on issues that were important to specific actors, such as the connection to political rights in relation to indigenous peoples or the global role of Arctic climate change in relation to both states that wanted to further the global climate policy work and to indigenous peoples who wanted to claim a role for themselves as the spokesperson for nature. Credibility was helped by including both scientific and traditional knowledge, with the science side being important for ensuring that the results would be taken into account by the scientific community and by state actors and the traditional knowledge playing a similar role in relation to indigenous peoples. The most precarious issue appears to have been ensuring legitimacy of the process, judging from the constant balancing of the science-policy interface to ensure scientific independence without compromising a sense of ownership over the process by different key groups of actors: states, scientists, and indigenous peoples' organizations.

A second key factor in the Arctic case was the presence of a scientific organization – the International Arctic Science Committee – that could serve as a bridge between the regional regime and the global climate science community, along with a few key individuals with both global and Arctic interests. This most likely made the process more salient within the global climate science community because it addressed their interests of promoting more Arctic climate research. The process can be described as a regional regime providing a new platform for actor networks that had previously been active at the global level and serving as a connecting point to important regional political actor networks.

It is noteworthy that this large-scale circumpolar assessment did not come about until global and regional interests merged. Previous efforts had been more limited or smaller in geographic coverage.²⁷ This suggests that the presence of scientific and political arenas with an interest in learning more about climate change in the region is important for regional climate knowledge production and also that a major assessment effort requires that the regional interests connect to global regimes.

A soft law regime paved the way for indigenous priorities

Based on the ACIA, it also appears that the nature of the regional regime in relation to global climate policy arenas can play a role for what is assessed and the policy outcomes. For example, in the Arctic Council setting, indigenous peoples were able to participate both in the scientific framing of climate change and in the policy process, leading to the inclusion of indigenous observations and knowledge that highlighted the impact on their cultures and livelihoods. This illustrates the point made by Koivurova and Heinämäki that indigenous peoples are more likely to be able to participate in interna-

²⁷ E.g., AMAP's 1998 assessment (Weatherhead, "Climate Change, Ozone, and Ultraviolet Radiation." and the subregional integrated assessments in the Mackenzie Basin and in the Barents Sea and the Bering Sea regions.

tional norm-making in soft law agreements than in formally codified treaties because in these, states are the legitimate actors according to the norms that govern international law.²⁸ In the IPCC, scientists were the non-state actors with the most access to the process, whereas the political side mostly followed the same norms and dynamics as the UNFCCC, neither of which has provided a platform for indigenous peoples. By contrast, sub-regional actors, who did not have a formal role in the Arctic Council, did not participate in this exercise. They include policy makers at the county or municipal levels. There was also no active participation by economic stakeholders, other than the member states. This, together with a weak structural basis in the Arctic Council for discussing economic development, may be part of why socioeconomic impacts that did not specifically address indigenous peoples were generally not assessed (fisheries being an exception).

Global policy dynamics took precedence

The ACIA also illustrates some potential limitations of regional arenas in relation to global climate policy and knowledge production. Specifically, the ACIA policy process showed that international regional discussions of climate change are likely to be colored by the global policy dynamics. In this case, the Nordic countries used the process to try to push their agenda for stronger control of greenhouse gas emissions by using the new knowledge base to strengthen their argument about the need for action. The United States, on the other hand, tried to distance itself from this new scientific base in order to not reconsider its previous climate policy stands. In this vertical interplay among regimes, the well established global regime took prominence over the regional one. Even if there was a policy document that acknowledged the implications of the ACIA and called for measures to reduce emissions of greenhouse gases, it did not go further than commitments already made in the global climate negotiations.

One possible explanation for this dynamic is that the UNFCCC until recently has had an almost exclusively global focus and thus cemented the framing of climate politics as a global issue, especially as it relates to mitigation. To change such a framing would be very difficult especially if it goes against the interest of powerful actors, such as the United States. Another explanation could be that the Arctic Council is a soft-law regime dependent on consensus and so preventing the breakdown of that consensus, which could threaten the future of the Arctic Council, was an important priority for several state actors in the ACIA process. This would make any change in framing even more difficult. It also made it easier for state actors who do not want to see a united circumpolar climate policy to say that the Arctic Council was not the proper forum for making climate policy. Vertical interplay may also explain why the ACIA reports do not include any assessment of regional greenhouse gas emissions. According to the UNFCCC, such inventories are the responsibility of states.

The place of mitigation issues in global and national arenas rather than at the regional level may have negative consequences for regional mitigation efforts. Specifically, the ACIA process does not provide any direct knowledge or policy base for sub-

²⁸ Koivurova and Heinämäki "The Participation of Indigenous Peoples in International Norm-Making in the Arctic," *Polar Record* 42, no. 221 (2006): 101.

regional or local actors to start discussing local, sub-regional, or circumpolar cuts in emissions of greenhouse gases. One might argue that the Arctic's contribution to global greenhouse gas emissions is negligible, but similar arguments can be made for other regions and many individual countries as well. Moreover, it is worth noting that a substantial share of the global oil and gas reserves are in the Arctic, some of which are under rapid development and may become even more attractive when they are more accessible because of declining sea ice.²⁹ The actors allowed in a regional regime and the regime's mandate in relation to issue areas may therefore be important factors in determining what role a particular regime will be able to play in future climate policy and knowledge production. Future development within the Arctic Council, especially how it will connect knowledge from the ACIA process with a forthcoming assessment of oil and gas, may provide further clues into the dynamic interplay between different arenas in relation to climate change mitigation. It may also provide further clues as to how the Arctic Council will deal with these issues in relation to sustainable development, an overarching policy goal of the Council's work. The ACIA itself made very few such connections.

To summarize, based on the Arctic experience, soft-law regional international regimes are not likely to overcome deep conflicts of interest among member states or become major alternatives to the negotiation arenas of the UNFCCC. However, the regional Arctic assessment brought new actors into the core activities of knowledge production and new issues to the fore in framing of climate change. In particular, the inclusion of indigenous peoples' knowledge helped illustrate current and potential future impacts of climate change in ways that were strong enough to affect the dynamics of the policy process, even if there was little immediate change in climate policy.

7.6 Summary

Climate change has often been framed as a global issue but slow progress in the global climate negotiations and an increasing need to plan for local adaptation have made it increasingly salient to also discuss the potential of other arenas for climate policy and knowledge production. This dissertation analyzes the interplay between science and policy at the international regional level based on a case study of an assessment of the impacts of climate change in the Arctic. In this case, the regional arena brought new actors into climate knowledge production and policy with an increased emphasis on the complexity of social and cultural impacts of climate change among indigenous peoples. It also highlighted the Arctic as a bellwether and key for understanding global change. Meanwhile, state policy positions were ruled by the same political dynamics as the global climate negotiations. The process illustrates how the structure of international cooperation can influence knowledge production about climate change. This includes the role of vertical interplay among regimes and how new arenas can make an assessment salient, credible and legitimate to different actors. It also highlights the political dimensions of focusing on particular spatial scales and governance levels in climate knowledge production and policy.

²⁹ AMAP, *Arctic Pollution Issues*, 146.

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Appendix I:

Documents in chronological order

Most official documents were obtained from electronic archives or websites at the indicated URLs. This includes material from the Arctic Climate Impact Assessment (ACIA), the Arctic Council, the Arctic Monitoring and Assessment Programme (AMAP), the Conservation of Arctic Flora and Fauna (CAFF), and the Intergovernmental Panel on Climate Change (IPCC). Other documents have been obtained by contact with secretariats, as meeting material, or via personal contacts with participants in the ACIA process. This chronologically organized list contains documents that have been used for this study and that are not included in the bibliography.

Document	Source
1990	
Arctic Monitoring and Assessment Programme - Minutes from the expert meeting in Oslo 12-16 Nov. 1990.	AMAP secretariat
1991	
The Rovaniemi Declaration. Declaration on the Protection of the Arctic Environment, 1991.	www.arctic-council.org
State of the Arctic Environment. Updated draft proposal for Arctic Monitoring and Assessment Programme (AMAP). Prepared by State Pollution Control, Norway.	AMAP secretariat
Arctic Environmental Protection Strategy (AEPS), Rovaniemi, Finland, June 1991.	www.arctic-council.org
Minutes of the First Meeting of the Arctic Monitoring and Assessment Task Force, Tromsø, Norway 2-6 December 1991.	AMAP secretariat
1992	
Scientific Plan for A Regional Research Programme in the Arctic on Global Change. Proceedings of a Workshop at Reykjavik, Iceland 22-25 April 1992. IASC and National Academy Press, Washington D.C. 1994.	IASC secretariat
United Nations Framework Convention on Climate Change (UNFCCC)	www.unfccc.int
Minutes from the Second Meeting of Arctic Monitoring and Assessment Task Force, Toronto, Canada, 30 November-4 December, 1992.	AMAP secretariat

1993

- The Monitoring Programme for Arctic Monitoring and Assessment Programme, AMAP. AMAP Report 93:3. Arctic Environment. Second Ministerial Conference, Nuuk, Greenland, September 1993. AMAP secretariat
www.arctic-council.org

1994

- CAFF International Working Group. Third Annual Meeting Report, 1994. www.caff.is

1995

- Arctic Environmental Protection Strategy Inuvik Declaration, March 21, 1996. www.arctic-council.org

1996

- Declaration on the Establishment of the Arctic Council. 19th September 1996. www.arctic-council.org

1997

- Implications of Global Change in Alaska and the Bering Sea Region. Proceeding of a Workshop. University of Alaska, Fairbanks. June 1997. www.besis.uaf.edu
- SAAO Report to the Ministers for the Fourth Ministerial Conference of the Arctic Environmental Protection Strategy (AEPS), June 12-13, 1997, Alta, Norway. www.arctic-council.org
- Arctic Environmental Protection Strategy Alta Ministerial Declaration June 13, 1997. www.arctic-council.org
- AMAP Strategic Plan 1998-2003. AMAP Report 99:6 AMAP secretariat

1998

- CAFF Technical Report No 5. AMAP/CAFF Workshop on climate change, Rovaniemi, 24-25 March 1998. www.caff.is
- Report of the Senior Arctic Officials to the Arctic Council. Iqaluit, Canada. September 17-18, 1998. www.arctic-council.org
- The First Ministerial Meeting of the Arctic Council. Iqaluit, Canada, September 17-18, 1998. www.arctic-council.org
- Arctic Council Rules of Procedure adopted at the First Arctic Council. Ministerial Meeting Iqaluit, Canada September 17-18, 1998. www.arctic-council.org
- Principles Governing IPCC Work. Approved at the Fourteenth Session (Vienna 1-3 October 1998) and amended at the 21st Session (Vienna, 2 and 6-7 November 2003). Including Appendix A. Procedures for the preparation, review, acceptance, adoption, approval and publication of IPCC reports. www.ipcc.ch
- Minutes from AMAP 12th Working Group Meeting, Helsinki, December 7-9, 1998. AMAP Report 99:2. www.amap.no

1999

- Some principles for conducting Scientific Assessments by IASC (A sketch by Bert Bolin). Discussion paper prepared for IASC's Executive Committee January 28, 1999. IASC secretariat
- Minutes from the First Meeting of the Assessment Steering Group (ASG-II) of the Arctic Monitoring and Assessment Programme Silver Spring, MD, USA, 8-10 March, 1999. AMAP Working Paper 99:1. www.amap.no
- Minutes from the 1st meeting of the ACIA Assessment Steering Committee (ASC). Silver Spring, MD, USA, March 11, 1999. www.amap.no
- Impacts of Global Climate Change in the Arctic Regions. Report from a Workshop on the Impacts of Global Change. 25-26 April 1999. Tromsø, Norway. International Arctic Science Committee 1999. IASC secretariat
- Senior Arctic Officials Meeting. Anchorage, Alaska, U.S.A. May 3-6, 1999. Revised as of September 28, 1999. www.arctic-council.org
- Minutes of the Second Meeting of Assessment Steering Group II (ASG II) of the Arctic Monitoring and Assessment Programme. Toronto, Canada, November 8-10, 1999. AMAP Working Paper 99:3. www.amap.no
- Minutes from AMAP 13th Working Group Meeting, Toronto, Canada November 10-12, 1999. www.amap.no
- Senior Arctic Officials Meeting. Washington, D.C., U.S.A. November 18-19, 1999. Minutes (Draft – 4/12/2000). www.arctic-council.org

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- ACIA. Report of the 3rd Meeting of the Assessments Steering Committee and a Scoping Workshop, February 28 – March 1, 2000, Washington, DC, U.S.A. ACIA report No. 1. www.acia.uaf.edu
- Arctic Council Senior Arctic Officials Meeting, Fairbanks, Alaska, April 27-28, 2000. Minutes revised 10/12/00. www.arctic-council.org
- Summary Report of the 5th Assessment Steering Committee (ASC) Meeting, June 15-16, 2000, Danish Polar Center, Copenhagen, Denmark. www.uaf.edu
- Minutes from the Joint meeting between AMAP and CAFF regarding ACIA, September 4, 2000, Trondheim, Norway. www.amap.no
- Arctic Council. Notes from the Second Ministerial Meeting. Barrow, Alaska, U.S.A.. October 12-13, 2000. www.arctic-council.org
- ACIA Implementation Plan Version 3.7. presented to the Arctic Council Second Ministerial Meeting, Barrow, Alaska, U.S.A. October 12-13, 2000. www.arctic-council.org
- Barrow Declaration on the occasion of the Second Ministerial Meeting of the Arctic Council, October 13, 2000. www.arctic-council.org

Summary Report on the Sixth Assessment Steering Committee (ASC) Meeting, October 15-18, 2000, Seattle, Washington, USA.	www.acia.uaf.edu
2001	
Guidelines for the AMAP Phase II Assessments. AMAP report 2001:1.	www.amap.no
Report from the Arctic Climate Impact Assessment Modeling and Scenarios Workshop. January 29-31, 2001. Stockholm, Sweden.	www.acia.uaf.edu
Summary Report of the Seventh Assessment Steering Committee (ASC) Meeting, 19-20 April 2001, Reykjavik, Iceland.	www.acia.uaf.edu
Stockholm Convention on Persistent Organic Pollutants. Arctic Council Senior Arctic Officials Meeting. Rovaniemi, Finland, June 12-13, 2001. SAO2001B4.	www.pops.int www.arctic-council.org
Minutes from the Fifteenth Meeting of Arctic Monitoring and Assessment Programme Working Group. Stockholm, Sweden, 30 August, 2001. Including Minutes of the Fourth Assessment Steering Group II/Cross-Fertilization Meeting. Stockholm, Sweden, August 27-30, 2001. AMAP report 2001:2.	www.amap.no
Minutes of the 2nd Joint AMAP-CAFF Meeting, Stockholm, Sweden, 31 August 2001.	www.amap.no
Arctic Council Senior Arctic Officials' Meeting. Espoo, Finland. November 6-7, 2001.	www.arctic-council.org
Summary Report of the Eighth Assessment Steering Committee (ASC) Meeting, 3-5 December 2001, Ottawa, Canada.	www.acia.uaf.edu
2002	
Minutes of the Sixteenth Meeting of Arctic Monitoring and Assessment Programme Working Group. Torshavn, Faroe Islands, 30 April-3 May, 2002. AMAP Report 2002:1.	www.amap.no
Summary Report of the Ninth Assessment Steering Committee Meeting (ASG) 2-5 June 2002, Asker, Norway.	www.acia.uaf.edu
Report of Senior Arctic Officials to the Arctic Council Ministers. Inari, Finland. October 9-10, 2002.	www.arctic-council.org
Inari Declaration on the occasion of the Third Ministerial Meeting of the Arctic Council. October 10, 2002.	www.arctic-council.org
2003	
Letter to members of the Arctic Council and Permanent Participants from the Norwegian Royal Ministry of Foreign Affairs (Kim Traavik). February 21, 2003.	Material obtained from participants in the ACIA process
Arctic Council Meeting of Senior Arctic Officials, Reykjavik Iceland April 9-10, 2003. Minutes.	www.arctic-council.org

Minutes from the Seventeenth Meeting of Arctic Monitoring and Assessment Programme Working Group. Boulder, USA 12-14 May, 2003. AMAP Report 2003:1.	www.amap.no
Background Paper. "Preliminary Science and Policy Perspectives from the ACIA" Prepared for the Informal Meeting Organized by the Norwegian Ministry of Foreign Affairs and the Senior Arctic Officials of the Arctic Council. Svalbard, Norway August 5-7, 2003.	Material obtained from participants in the ACIA process
Rapport från möte angående Arktiska rådets ACIA-arbete (Arctic Climate Impact Assessment), Longyearbyen/Ny Ålesund, Svalbard, 5-7 augusti 2003. Miljödepartementet. PM 2003-08-08.	Swedish Ministry of the Environment
Reviews of the ACIA scientific report that were made available as background material in connection with the meetings of the Assessment Integrations Team and Assessment Steering Committee October 2003.	Meeting material
Letter to Sally K. Brandel, Senior Arctic Official, U.S. Department of State from Chuck Greene, ICC Alaska October 17, 2003.	Material obtained from participants in the ACIA process
US Statement on Policy Document, distributed at the Policy Drafting Group Meeting in London October 2003.	Material obtained from participants in the ACIA process
Guidance to ACIA Authors on Documenting Responses to Reviewers Comments. For Discussion at the ASC Meeting, 15-16 October 2003, London.	Meeting material
Summary Report on the Tenth Assessment Steering Committee (ASC) Meeting, 15-16 October 2003, London, U.K.	www.acia.uaf.edu
Draft minutes of the Arctic Council Meeting of Senior Arctic Officials, Svartsengi, 23-24 October 2003 (in Agenda for Arctic Council Meeting of Senior Arctic Officials, Selfoss, Iceland, May, 2004.	www.arctic-council.org
Letter to Mr. Helgi Jensson, Chairman of AMAP and Mr. Kenth Wohl, Chairman of CAFF from Gunnar Pálsson, Chairman of Senior Arctic Officials, November 10, 2003.	Material obtained from participants in the ACIA process
Letter from Bob Corell to Members of the Assessment Steering Committee and the Assessment Integration Team.	Material obtained from participants in the ACIA process
Letter to Mr. Gunnar Pálsson, Chairman of the Senior Arctic Officials from Helgi Jensson, AMAP Chair and Kenton Wohl, CAFF Chair, December 2, 2003.	Material obtained by participants in the ACIA process

Letter to Ambassador Gunnar Pálsson, Chair, Senior Arctic Officials from Michael Zacharof, President Aleut International Association, Joe Linklater, Chair Gwich'in Council International, Pavel Sulyandziga, Vice-President RAIPON, Cindy Dickson, Executive Director Arctic Athabaskan Council, Sheila Watt-Cloutier, International Chair Inuit Circumpolar Conference, and Geir Tommy Pedersen, President Saami Council, 8 December 2003.	Material obtained by participants in the ACIA process
ACIA Secretariat's timetable dated December 19, 2003.	ACIA secretariat
2004	
Letter to Senior Arctic Officials and Permanent Participants from Gunnar Pálsson Chairman of Senior Arctic Officials, 8 March 2004.	Material obtained by participants in the ACIA process
Arctic Climate Impact Assessment Overview Report Expert Review – Master Collation March 15, 2004 and Addendum to the Collation March 17, 2004.	ACIA secretariat. Meeting material
Memo at AI from Susan Hassol Regarding Review Comments.	Meeting material
Minutes of the 18 th Meeting of the Arctic Monitoring and Assessment Programme (AMAP) Working Group. Oslo, Norway, 14-16 April 2004, including Annex 7: Minutes of the 3 rd Joint AMAP/CAFF meeting, Oslo, Norway, 15-16 April 2004. AMAP Report 2004:1.	www.amap.no
Powerpoint presentation by Robert Corell: Status, Progress, and Next Steps For the Arctic Climate Impact Assessment (ACIA). Oslo, Norway April 14-16, 2004.	Material obtained by participants in the ACIA process
Letter to Senior Arctic Officials and Permanent Participants from Gunnar Pálsson, April 27, 2004 outlining results of the Nuuk informal meeting and suggestions about the ACIA policy process to be presented at the Selfoss SAO meeting in May 2004.	Material obtained by participants in the ACIA process
Permanent Participant Advice on Communicating the Results of the Arctic Climate Impact Assessment (ACIA). Distributed at the meeting of Senior Arctic Officials, Selfoss, Iceland 4-5 May 2004.	Meeting material
Letter to ACIA Lead authors June 4, 2004 from Bob Corell regarding Review and Sign-Off of the ACIA Overview Document.	ACIA secretariat
Letter to Chairs of AMAP, CAFF, and IASC from Robert W. Corell, regarding Final Sign-Off of the ACIA Scientific Chapters and the Overview Document.	ACIA secretariat
Letter to Gunnar Pálsson, chairman of the Senior Arctic Officials from Sheila Watt Cloutier, Chair Inuit Circumpolar Conference August 25, 2004	Material obtained by participants in the ACIA process

- CICERO (Center for International Climate and Environmental Research), "Impacts of a warming climate. Arctic Climate Impact Assessment (ACIA) – key findings," Oslo, October 2004 (CD-recording). Distributed at the ACIA Scientific Conference
- Klimaet i Arktis – en forsmak på framtiden. Press release from Center for International Climate and Environmental Research – Oslo. November 8, 2004. Distributed at the ACIA Scientific Conference
- New Scientific Consensus: Arctic Is Warming Rapidly. Press release in Reykjavik from Arctic Climate Impact Assessment, November 8, 2004. Distributed at the ACIA Scientific Conference
- Arctic Climate Assessment Proves Threat To Indigenous Peoples. Press release from Indigenous Peoples Secretariat, November 8, 2004. Distributed at the ACIA Scientific Conference
- New Scientific Consensus: Arctic is Warming Rapidly. News release, Washington. Arctic Climate Impact Assessment, University of Alaska Fairbanks. Distributed at the ACIA Scientific Conference
- ACIA Arctic Climate Impact Assessment Fact sheets 1-6 ("Faktaark"). CICERO and ACIA. Distributed at the ACIA Scientific Conference
- Minutes of the AMAP Extended Board Meeting. Reykjavik, Iceland 9 November 2004. www.amap.no
- Remarks given by Ms. Shiela Watt-Cloutier, Chair of the Inuit Circumpolar Conference at the Arctic Climate Impact Assessment (ACIA) Conference. Reykjavik, Iceland November 12, 2004. www.inuitcircumpolar.com
- Arctic Climate Impact Assessment Policy Document. Issued by the Fourth Arctic Council Ministerial Meeting Reykjavik 24 November 2004. www.arctic-council.org
- Reykjavik Declaration on the Occasion of the Fourth Ministerial Meeting of the Arctic Council www.arctic-council.org
- Report of the Senior Arctic Officials to Ministers at the Fourth Arctic Council Ministerial Meeting. Reykjavik, November 24, 2004. www.arctic-council.org
- CAFF 2002-2004 Progress Report and 2002-2006 Work Plan. Presented to the Senior Arctic Officials and the Arctic Council Ministers at the Fourth Ministerial Meeting November 2004. www.caff.is
- Impacts of a Warming Arctic. Highlights. www.amap.no
- 2005**
- Minutes of the 19th Meeting of the Arctic Monitoring and Assessment Programme (AMAP Working Group. St Petersburg, Russia, 12, 13, and 16 September 2005. www.amap.no
- Inuit Petition Inter-American Commission on Human Rights to Oppose Climate Change Caused by the United States of America. Press release from Inuit Circumpolar Conference December 7, 2005 www.inuitcircumpolar.com

2006

- International Expert Review Process – ACIA Science Chapter Summary by Patricia Anderson, ACIA Secretariat via e-mail January 25, 2006, including supporting lists of nomination and selection of reviewers. ACIA secretariat
- ACIA Science Review Response www.amap.no
- Conference Statement of the Parliamentarians of the Arctic Region, Kiruna, Sweden, 2-4 August 2006. www.arcticparl.org
- Report of the Arctic Council Focal Point (FP) for ACIA Follow-up Activities Presented to the Senior Arctic Officials (SAOs) of the Arctic Council 24 October 2006, Salekhard, Yamal-Nenets Autonomous Okrug Russian Federation. www.arctic-council.org

Appendix II: Interviews

Name	Role in ACIA's history or process	Interview date(s)
Outi Berghäll	Climate negotiator, Finland	June 8, 2005
Jim Berner	Lead author. Chapter 15. Human Health	November 10, 2004
Bert Bolin	International Arctic Science Committee (IASC), vice chair of the Executive Committee at initiation of the ACIA. Founding chair of the IPCC	September 9, 2005
Sally Brandel	Senior Arctic Official, United States	May 3 and November 11, 2004
Elisabeth Bush	Member of the Assessment Steering Committee and the Assessment Integration Team	May 5, 2004
John Calder	AMAP Working Group, head of delegation, United States	April 16, 2004
Terry Callaghan	Lead author. Chapter 7. Arctic Tundra and Polar Desert Ecosystems. Member of the Assessment Integration Team	November 10, 2004
Robert Corell	ACIA Assessment Steering Committee chair. International Arctic Science Committee (IASC), US representative and chair of Regional Board.	August 14, October 16 and November 25, 2003; January 22, February 23, March 24, May 3, October 13 and 22, and November 21, 2004; June 2005.
John Crump	Indigenous Peoples Secretariat, executive secretary	November 10 and 11, 2004
Terry Fenge	Inuit Circumpolar Conference	May 3 and November 23, 2004
Rune Fjellheim	Saami Council	December 15, 2004
Liseanne Forand	Alternate Senior Arctic Official, Canada	November 23, 2004

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Shari Fox Gearhard	Lead author. Chapter 3. The Changing Arctic: Indigenous Perspectives	November 12, 2004
Christopher Furgal	Lead author. Chapter 15. Human Health	November 10, 2004
Paul Grabhorn	Graphics artists	November 16, 2003
Susan Joy Hassol	Science writer, author of the overview document	November 16, 2003 and March 24, 2004
Jan Tore Holvik	Senior Arctic Official, Norway	November 22, 2004
Henry Huntington	Lead author. Chapter 3. The Changing Arctic: Indigenous Perspectives, and Chapter 1. An Introduction to the Arctic Climate Impact Assessment	December 21, 2004
Christian Peter Ibsen	Climate negotiator, Denmark	November 23, 2004
Arne Instanes	Lead author. Chapter 16. Infrastructure: Buildings, Support Systems and Industrial Facilities	November 10, 2004
Helgi Jensen	AMAP Working Group chair and Policy Drafting Team co-chair	August 21, October 13 and 16, and December 11, 2003
Glenn Juday	Lead author. Chapter 14. Forests, Land Management, and Agriculture	November 11, 2004
Erland Källén	Lead author. Chapter 4. Future Climate Change: Modeling and Scenarios for the Arctic	November 30, 2004
Anders Karlqvist	Swedish Polar Secretariat. Director	June 21, 2005
Vladimir Kattsov	Lead author. Chapter 4. Future Climate Change: Modeling and Scenarios for the Arctic	November 9, 2004
David R. Klein	Lead author. Chapter 11. Management and Conservation of Wildlife in a Changing Arctic Environment	November 12, 2004
Harald Loeng	Lead author. Chapter 9. Marine Systems	November 11, 2004

MaryBeth Martello	Lead author. Chapter 17. Climate Change in the Context of Multiple Stressors and Resilience	November 11, 2004
Svein D. Mathiesen	Contributing author. Chapter 17. Climate Change in the Context of Multiple Stressors and Resilience	November 23, 2004
Gordon McBean	Lead author. Chapter 2. Arctic Climate: Past and Present. Member of the Assessment Integration Team	November 10, 2004
James J. McCarthy	Lead author. Chapter 17. Climate Change in the Context of Multiple Stressors and Resilience	November 12, 2004
Magdalena Muir	Conservation of Arctic Flora and Fauna (CAFF) executive secretary	March 24, 2004
Carl Christian Olsen (Puju)	Inuit Circumpolar Conference	November 23, 2004
Gunnar Pálsson	Senior Arctic Official chair, Iceland	January 17, 2005
Pål Prestrud	ACIA Assessment Steering Committee vice chair	October 16, 2003 and April 15, 2004
Terry D. Prowse	Lead author. Chapter 8. Freshwater Ecosystems and Fisheries	November 12, 2004
Lars-Otto Reiersen	Arctic Monitoring and Assessment Programme (AMAP) executive secretary	August 15 and October 13, 2003, and May 4, 2005
James D. Reist	Lead author. Chapter 8. Freshwater Ecosystems and Fisheries	November 8, 2004
David Roddick	Arctic Athabaskan Council	October 15, 2003
Odd Rogne	International Arctic Science Committee (IASC) executive secretary	April 14, 2004
Per Rosenqvist	Climate negotiator alternate, Sweden	November 26, 2003
Samantha Smith	World Wide Fund for Nature Arctic	April 15 and November 23, 2004
Jan-Idar Solbakken	Saami Council	October 15 and 16, 2003

Appendix II

David Stone	AMAP Working Group, head of delegation, Canada	April 16, 2004
Aapo Taskanen	Lead author. Chapter 5. Ozone and Ultra-violet Radiation	December 13, 2004
Havard Toresen	Climate negotiations expert, Norway	May 4, 2004
Anders Turesson	Climate negotiator, Sweden	October 31, 2003 and June 21, 2005
Johan Mathis Turi	Corresponding author. Chapter 17. Climate Change in the Context of Multiple Stressors and Resilience	November 23, 2004
Michael B. Usher	Lead author. Chapter 10. Principles of Conserving the Arctic's Biodiversity	November 11, 2004
Hjálmar Vilhjálmsson	Lead author. Chapter 13. Fisheries and Aquaculture	November 11 and 12, 2004
John E. Walsh	Lead author. Chapter 6. Cryosphere and Hydrology	November 8, 2004
Elisabeth Weatherhead	Lead author. Chapter 5. Ozone and Ultra-violet Radiation	November 8 and 11, 2004
Günther Weller	Lead author. Chapter 1. An Introduction to the Arctic Climate Impact Assessment; Chapter 18. Summary and Synthesis of the ACIA. ACIA executive director	November 11, 2004
Kent Wohl	Conservation of Arctic Flora and Fauna (CAFF) Working Group chair and Policy Drafting Team co-chair	April 15, 2004
Fred Wrona	Lead author. Chapter 8. Freshwater Ecosystems and Fisheries	November 11, 2004
Helena Ödmark	Senior Arctic Official, Sweden	May 19, 2004

Appendix III:

Interview guide ACIA lead authors

Basic information:

- Name?
- Which chapter?
- Your affiliation?
- Your scientific discipline/background?

Questions:

1. What is the task of the chapter you are responsible for?
2. What do you think were ACIA's motives for choosing you as lead author?
 - a. How would you describe your role as lead author?
3. What types and sources of information have been important in your ACIA chapter?
4. Have you been able to gather data from all relevant areas of the Arctic?
 - a. Why/why not?
 - b. How did the ACIA process, its mandate and structure facilitate or hinder this?
5. In your field/ACIA chapter, what is the role of the spatial scale at which data in gathered and integrated?
 - a. Were there specific obstacles related to scale issues for the assessment of your field? What? How were they, or could be, overcome?
 - b. How does the regional perspective of ACIA fit into global syntheses of climate change knowledge (e.g. IPCC), or to more local syntheses (e.g. national assessments)
6. Has the ACIA assessment affected the scientific understanding of climate change in your field?
 - a. How?
 - b. What has contributed? (Types or sources of information, the ACIA process ...)
 - c. Does this have any implications for the directions of future research?
 - d. What role do you think ACIA (especially your chapter) will have for the understanding of global climate change?
7. Has the ACIA process generated any new scientific ideas for you?
8. How would you compare working in a regional scientific assessment such as ACIA, with other scientific activities you have participated in?
 - a. Similarities and differences with other assessment processes, such as IPCC?
 - b. Similarities and differences with the work you carry out at your home institution?

9. What have you learned from participating in the ACIA process?
 - a. What contributed to this learning (or lack of learning)?
 - b. For liaisons: How did your participation in the Assessment Integration Team affect what you have gotten out of the ACIA process scientifically?
10. In your view, has the policy issues influenced the assessment? How?
11. In your view, has knowledge produced in the assessment process already influenced (climate) policy? Do you expect it to do so?