

In the Vortex of the Thaw

General Introduction

EZRA B. W. ZUBROW, ERROL MEIDINGER,
AND KIM DIANA CONNOLLY

[I]n almost every case, even down to the level of specific communities, there are likely to be winners and losers almost living next door to one another. The issue is to understand how the downside and upside is distributed across the Arctic from natural ecologies to human activities.

—Professor David Vaughan, Director of Science
at the British Antarctic Survey

The captain had been telling how, in one of his Arctic voyages, it was so cold that the mate's shadow froze fast to the deck and had to be ripped loose by main strength. And even then he got only about two-thirds of it back.

—Samuel Clemens, *Following the Equator*

Climate Change is Real, and It Is Impacting the Arctic

Climate change is one of the drivers of global change. Some aspects of causation and control are controversial. But experts agree on one thing:

climate change is real.¹ And those who have looked at how climate change is impacting the Arctic region agree that it is catalyzing change across systems in multiple and profound ways.

Many experts in various disciplines have explored climate change issues in the Arctic in recent years. This book has been written to add a unique transdisciplinary perspective, bringing together diverse expert contemplations of climate change across various Arctic systems and offering complementary perspectives. It aims to provide readers with further insight into information they may already have while also offering new information delivered from unique perspectives that may suggest new ways to contemplate our thawing world.

What proof is there that climate change is real? The United States National Aeronautics and Space Administration (NASA) presents monthly updates of the planet's vital signs. In 2016, NASA reported that carbon dioxide in the atmosphere reached 404.48 parts per million—the highest in 650,000 years.² The worldwide average global temperature has risen 1.4 degrees Fahrenheit—the highest since 1880. Arctic ice has been shrinking at a rate of 13.4 percent per decade. The land ice is decreasing about 281 gigatonnes per year. Greenland's land ice loss doubled between 1995 and 2005. Global average sea level has risen nearly seven inches over the last 100 years. Together, these proxies indicate substantial climate change.

Moreover, the United Nation's Intergovernmental Panel on Climate Change (IPCC) has released multiple installments of detailed expert assessments over the years.³ It is in its sixth assessment cycle and has offered proof again and again, with increasing specificity, that climate change is undeniable. As one set of experts participating in the IPCC work remarked several years ago, "Dramatic changes to the lives and livelihoods of Arctic-living communities are being forecast unless urgent action is taken to reduce greenhouse gases, according to the Intergovernmental Panel on Climate Change (IPCC)."⁴

This very real climate change is of central importance today for individuals, communities, states, nations, and the world. Foretelling what he now calls "climate reality," former vice president Al Gore was part of an early call to action by telling the world about the "inconvenient truth" of climate change and starting a "crusade"⁵ Gore stated in his book entitled *Earth in the Balance* that "[w]e can believe in the future and work to achieve it and preserve it, or we can whirl blindly on, behaving as if one day there will be no children to inherit our legacy. The choice

is ours; the earth is in balance.”⁶ A quick Google search reveals many hundreds of thousands of reports, books, websites, conferences, etc. since 1992 talking about climate change and this balance. Yet to paraphrase a saying attributed to Samuel Clemens, everyone is talking about climate change, but only a few are doing something about it.

Is this surprising? Coping with the challenges of climate change is a daunting enterprise for all of us. From natural scientists and engineers to social scientists, from economists, artists, and musicians to individuals—all are called upon to comprehend alternative futures and plan to adapt or otherwise cope. Yet it is not easy.

Policymakers and politicians will be increasingly called upon not only to understand, but also to make hard choices in our thawing world. They must decide on both short-term responses and dedication of resources and long-term strategies to balance risks and costs. In doing so, they will be forced to reconcile and stabilize many difficult and tense relationships among communities, interest groups, and governments. The regular IPCC Conferences of the Parties attempt to bring world leaders together regularly.⁷ Yet politics in various powerful nations⁸ and among various organizations⁹ can create barriers to meaningful progress. Moreover, the unique nature of the Arctic itself, with its multiple nations and various laws governing the environment, adds even more of a challenge to crafting a meaningful and achievable response.¹⁰

This edited volume draws together writings from acute observers with different perspectives. It considers pressing issues of how climate change in the Arctic is affecting, and will continue to affect, environments, cultures, societies, and economies throughout the world. It explores how these sectors are actually responding, are capable of responding, and, in many cases, it makes suggestions as to how they should respond going forward.

The Arctic Is Special, and It Is Threatened by Climate Change

Long ago, scientists who studied the Arctic discovered that climate change transpires in that region between two to four times faster than elsewhere on this planet.¹¹ Experts believe Arctic climate change is a forerunner and a predictor of forthcoming ecological transformation that will sweep the planet.

Some have come to view the Arctic as the earth's "environmental canary." In days gone by, when a caged canary taken into mines stopped singing, coal miners knew that the carbon monoxide gas level was so high that they had to escape the chamber. The thawing Arctic may be the earth's early warning system.¹²

Few who know the Arctic will dispute that temperatures are "a-rising," the sea and land ice is "a-melting," the permafrost is "a-thawing," and the natural and human ecosystems are "a-changing." While these realities are increasingly accepted—they are also increasingly alarming. As one recent popular online magazine termed it, "The melting arctic has become this decade's Amazon deforestation crisis. There's no Sting album or fair trade coffee fundraiser, but the world's attention turns north with each piece of distressing news of the catastrophic polar melt."¹³

Yet, the scientific realities underlying these realities beg for more. Increased carbon dioxide absorbed into the ocean creates carbonic acid. The colder Arctic Ocean then absorbs more carbon dioxide, making it extra acidic. At the same time, patchy permafrost (which is particularly conducive to thawing) encounters ground temperatures within 1 to 2 degrees of thawing, catalyzing even more disappearing ice across the Arctic.¹⁴

The changing ecology means life and culture must shift. The Arctic's human population is approximately 4 million people in eight countries who live in a wide range of situations. Some live in modern industrial cities, some in pastoral and hunting and gathering settlements, and others in entirely different situations. For all, melting permafrost, reduced ice, and warming temperatures undermine necessary conditions for human survival. The people who live in the Arctic depend on reliable roads and buildings, stable hunting, and sufficient and safe pastoral ranges. At the same time, increasing sea levels destroy coastal towns and change fishing patterns.¹⁵ However, some parts of the complex interaction may not always be detrimental.¹⁶

Rising temperatures have increased the growing season in the Arctic. The result is changed ecosystems with increased diversity. NASA has observed a 7–10 percent increase in vegetation, resulting in a ring of greening by trees and shrubs around what was previously tundra in the far northern latitudes. This is complemented and augmented by melting sea ice that opens many thousands of square miles of ocean, providing homes for large, new populations of phytoplankton.¹⁷

In considering why the Arctic is just a bit different than other areas in the era of climate change, recall that the earth depends on two worldwide environmental systems. The first, which covers the entire globe, is the atmospheric system. The second, which covers approximately 71 percent of the world, is the oceanic system. Each system is a connected whole—what happens in one part will impact other parts. And the interplay between the two is played out intensely in the Arctic Region.¹⁸ A number of chapter authors help bring this to light. And climate change's impact on the culture in the Arctic is unique, a story that is explored by other chapter authors. Yet more authors explore another reality: it is more than the physical and cultural environment that must be considered when talking about climate change in the Arctic—the political environment comes into play as well. Some developments as this book was coming into being help illustrate this fact.

Modern Politics and the Arctic:
The Polar Code, President Obama, The Paris Agreement,
President Trump, and Other Actors

This book took several years to get to press. A number of events have occurred since the conference that initially brought the authors together, and a brief discussion of them highlights some relevant context for the political and policy-based discourse in the coming chapters.

First, in light of the impact on shipping of the thawing Arctic, shortly after The Big Thaw conference, new safety-related requirements addressing operating ships in polar waters were adopted by the 94th session of the Maritime Safety Committee in November 2014. Thereafter, at the 68th session of the Marine Environment Protection Committee of the International Maritime Organization from 11–15 May 2015, updated environmental provisions of the International Code for Ships Operating in Polar Waters (Polar Code) were formally adopted, completing the creation of the Polar Code. One scholar praises the safety aspects of the code but raises concerns about the environmental protections as follows: “The adoption of a mandatory Polar Code is no doubt good news for the Arctic. The Polar Code provides improved and uniform safety and environmental standards for shipping in the Arctic. The International Maritime Organization has responded to international community concerns regarding

increased shipping activities in an ice-free Arctic relatively quickly. One should not, however, overestimate the role of the Polar Code for the prevention of vessel-source pollution in the Arctic. The Polar Code has left several issues of vessel-source pollution for another day.”¹⁹ The passage of the Polar Code, regardless of its eventual impact, is a strong signal of the changing views of ship traffic and commerce in Arctic waters.

Second, in 2015 Barack Obama became the first sitting U.S. president to visit the Arctic.²⁰ His speech upon his departure lamented the damage that climate change had already brought to this region, and he urged action, noting that “a very serious reality lies within those breathtaking sights. And that’s the fact that this state’s climate is changing before our eyes. A couple of days ago, I stood on rock where, just 10 years ago, there was a glacier. Yesterday, I flew over Kivalina Island, an Arctic town that’s already losing land to the sea from erosion and further threatened by sea-level rise. I’ve seen shores that have been left battered by storm surges that used to be contained by ice. And now, that ice is gone.”²¹ This commitment to Arctic protection was cemented in the closing months of his administration, when President Obama’s Department of the Interior announced an energy plan precluding drilling in the Arctic that stated, “Considering the fragile and unique Arctic ecosystem and the recent demonstrated decline in industry interest, the Proposed Final Program does not include any lease sales in the Chukchi or Beaufort Seas. Based on consideration of the best available science and significant public input, the Department’s analysis identified significant risks to sensitive marine resources and communities from potential new leasing in the Arctic. Moreover, due to the high costs associated with exploration and development in the Arctic and the foreseeable low projected oil prices environment, demonstrated industry interest in new leasing currently is low.”²² President Obama faced critics in his work regarding the Arctic and climate change, and the final upshot of his legacy will continue to unfold over time.

Third, this book was being edited when a pivotal worldwide event took place in 2015 addressing climate change: The Paris Agreement was negotiated and came into force. This agreement was made within the United Nations Framework Convention on Climate Change (UNFCCC) and addresses greenhouse gases emissions, mitigation, adaptation, and finance starting in the year 2020. Representatives from 197 nations negotiated the language of the agreement at the 21st Conference of the Parties of the UNFCCC in Paris, adopting it by consensus on December 12, 2015. Formally opened for signature on April 22, 2016 (Earth Day) at a ceremony in New York, the European Union’s ratification in

October 2016 meant that it entered into force shortly thereafter. At its heart, this agreement committed the global community to limiting the temperature increase to below 2 degrees Celsius and involves myriad and complex commitments.²³

Fourth, the United States elected Donald Trump as its 45th president. President Trump has vowed to remove the United States from the Paris Agreement, and he recommitted to recent views that he held as a private citizen to deny the reality of climate change. For example, in 2012 Mr. Trump posted on Twitter that “the concept of global warming was created by and for the Chinese in order to make U.S. manufacturing non-competitive.” After his election, Mr. Trump reiterated this belief as well as campaign promises to pull the United States from the Paris Agreement. He has also indicated support for drilling in the Arctic National Wildlife Refuge. A shift in U.S. policy began during the last part of the United States holding the chair position at the Arctic Council (through 2017).²⁴ President Trump actively tweets climate denial, and experts respond, including one Arctic expert, who noted, “The top of the world is now warming at twice the average global rate. . . . Since 1979, peak sea-ice coverage has fallen from about 6.5 million to 5.5 million square miles. At the dawn of the 20th century, it took the great polar explorer Roald Amundsen three years and three icebound winters to sail the fabled Northwest Passage at the top of the continent. Today ships steam right through, and forecasters predict that the entire Arctic Ocean may be ice-free in summer 2050.”²⁵

Fifth and finally, the youth of the planet are raising their voices. There has been intense attention to the youth climate lawsuit filed in 2015, *Juliana v. United States*, which asserts that affirmative U.S. government actions causing climate change violate the youngest generation’s constitutional rights to life, liberty, and property, as well as fail to protect essential public trust resources.²⁶ Likewise, young political activists are getting attention, such as Greta Thunberg, the 15-year-old from Sweden who captured the hearts of people in 2018 with statements such as, “We cannot solve a crisis without treating it as a crisis.”²⁷ Simultaneously, organizations such as the United Nations are highlighting youth action on climate change as “helping all of us change the way we live and do business.”²⁸ It is the voices of Arctic youth who often appear in campaigns to warn of the impacts of Arctic climate change that they have been witnessing all their lives, and to urge action.²⁹ Readers may notice that the urgent messages of these youth efforts are mirrored in some content woven through various chapters of this book.

Readers should remain aware that some of the chapters in this book reflect data and developments that are several years old. This is inevitable, as the many changes that are happening in the Arctic on all levels are moving swiftly, and the political landscapes are ever shifting. As the next section explains, the contributions compiled here nevertheless contain a tapestry of insights that will contribute to considerations and debate about Arctic climate change going forward.

What This Book Is Designed to Do

This Book Presents Findings from a 2013 Conference

This book, *The Big Thaw: Policy, Governance, and Climate Change in the Circumpolar North*, is the result of an international conference held at the Baldy Center for Law & Social Policy at the University at Buffalo on April 18–19, 2013. The conference was financed in part by a grant from the Baldy Center and additionally from the National Science Foundation’s Polar Program’s Social Science Division. There was further sponsorship from the University at Buffalo Anthropology Department, the School of Law, and other university departments. The event brought together academics, lawyers, and policy planners as well as Arctic fishing boat sea captains and representatives of indigenous hunting and trapping organizations. There was rousing conversation and an interest in building on the transdisciplinary conversation going forward.

This Book Collects Ideas to Inspire Further Thinking

The Big Thaw was created to bring together the learning that grew out of the original conference papers, nurtured by the conference discussions and reflected in two sets of revisions of each of the chapters. Together, these chapters provide a set of collected ideas that allow readers to think through these profoundly complicated and multicausal issues. To help guide the reader, the book is divided into three themes.

The first theme focuses on actual physical changes in the Arctic. That section offers evidence-based commentary on what has been and is actually happening in the Arctic, from a variety of disciplines. The second theme considers Arctic policy and governance at all scales: international, national, community, and individual. It helps connect the physical to the political and provides insights into what makes the issues

so complex. The third theme concentrates on culture and community. It acknowledges the mosaic of indigenous and nonindigenous populations with a diversity of economies, ideologies, and religions as well as dissimilar agendas that makes for a very complex set of interrelationships.

The current climate situation leading to the conference and this book has come to be known as *The Big Thaw* for a variety of reasons. First, although there have been previous periods of global cooling and warming, this time is turning out to be a considerably more serious period of global warming than anticipated by anyone. The rate of climate change and associated ecosystem shifts are occurring at a faster pace than predicted by scientists, policymakers, and politicians. It is “big” in many ways. It is large quantitatively, it is vast geographically, it is enormous in its environmental and cultural impact, and it is immense in the effort necessary to address and ameliorate.

Second, the book is titled *The Big Thaw* because it really is a thaw. The word *thaw* is both a verb (process) and a noun (event). As a verb, this thawing involves icecaps, glaciers, snow, hail, and other frozen substances, such as permafrost, to dramatically change: They unfreeze, dissolve, melt, liquefy, and change their state into other forms. As an event, this thawing is a period—a period of time characterized by heightened temperatures that have environmental and human consequences.

Third, the current climate is not only a change in what had occurred before: it is now and going forward as well. The Big Thaw is neither binary (thawing or not thawing), nor episodic. It is continuously incremental. Climate change is continuing to warm the atmosphere and the oceans. It is melting ice caps as well as large amounts of snow and glacier ice. It is changing the boundaries between environmental zones—and consequently changing the boundaries of the cultural and political world. Climate change is changing the Arctic (and other environments on our planet) into a new world. The new world of the Arctic will be where the Northwest Passage is open, Franklin’s ships are found, oil and fishing are possible near the pole, and nations send fighter planes and naval ships to defend frozen wilderness.

Fourth, if globally incremental, climate change is locally far more variable. Across the planet, extreme climate and its consequent extreme weather events are becoming more frequent, less predictable, and considerably more intense. Monsoon seasons have changed and tsunamis such as the one that devastated Ache, Indonesia, and large parts of the Asian Pacific shoreline have created an apprehensive mentality not seen since the early-nineteenth-century influenza epidemics or the

Cold War. This mentality is reflected in decision makers wringing their collective hands, populations living in fear, and profit-making popular culture such as major motion pictures using climate change as a plot. Some examples of such movies include *The Thaw* (in which the melting polar ice cap has released a deadly prehistoric parasite), *The Steam Experiment* (in which a deranged scientist threatens to kill six hostages if the local paper does not publish his story about global warming), and *The Day After Tomorrow* (a father seeking to rescue his son from catastrophic climatic effects following the disruption of the North Atlantic Ocean circulation that ushers in a new ice age).

Climate change creates a potential conundrum in terms of the planet's population. On one hand, the global population is increasing—it is now well over seven billion. Prior to the twentieth century, no person had lived through a doubling of world population, but there are people now who have seen a tripling during their lifetimes. On the other hand, if climate change is, as expected, sufficient to melt the polar icecap, the Greenland ice sheet, and the Antarctica ice sheet, the world's coastal populations could diminish drastically. A 40-centimeter rise stands to impact at least 100 million people. Some posit that unchecked climate change would not only stabilize the population but also cause it to decrease.³⁰

Yet this Big Thaw should not be a surprise. Humans have been warned about it for more than a decade. The IPCC issued its first assessment report in 1990.³¹ Now it seems that these projections were underestimations. The projected global rise in temperature by the end of the century thought to be 2 degrees Celsius has been doubled to 4 degrees Celsius. Sea level is rising 60 percent faster than predicted, and the Greenland ice sheet is shrinking twice as fast—and even more importantly, the mass lost is five times what was thought in 1990.³²

Table 1.1. Number of people impacted by type of climate disasters worldwide from 1975 to 2001³³

	Drought	Flood	Windstorm
	1,100,000,000	2,100,000,000	416,000,000
Africa	222,000,000	29,000,000	9,000,000
Latin America	48,000,000	40,000,000	22,000,000
Oceania	9,000,000	500,000	6,000,000
Europe	6,000,000	8,000,000	8,000,000
North America	30,000	800,000	300,000

It is vital to keep in mind that the Big Thaw affects politics, economics, security, and community. A sea-level change impacts the mega-deltas and food production. Population displacement will create potential conflict from the recipient developed countries. Examples of the impact of climate migrations are easily found. For instance, consider Bangladesh. Given land loss, land degradation, and increasing violent storms, agricultural scarcity has resulted in 12 to 17 million Bangladeshis moving to India and at least a half-million moving internally.

Table 1.2. Climate-induced migration, comparing the number of people moving and the intensity of resulting conflicts

Origin	Number moving	Conflict intensity
1. Bangladesh, 1970s–1990s	600,000	High
2. Ethiopia: (a) central/northern; (b) Awash river basin/Afar, 1984–1985	600,000	Medium
3. Rwanda, rural south, center, early 1990s	1.7 million	Very high
4. Mexico, Southern Guatemala, 1960s–1990s	280,000	High
5. Bangladesh, various regions 1950s–present	12–17 million	High
6. El Salvador, 1950s–1980s	300,000 to Honduras, 500,000 to United States	Very high
7. Ethiopia/Eritrea, 1960s–1980s	1.1 million	Medium
8. Mauritania, 1980s–1990s	69,000	High
9. Somalia, late 1970s	400,000	Medium
10. Haiti, north, 1970s–1990s	1.3 million	Medium
11. Philippines, lowlands, 1970s–1990s	4.3 million	High
12. South Africa, black areas 1970s–1980s	Up to 750,000 per year	Medium
13. Sahel, rural areas, late 1960s–1980s	10 million	Medium
14. Brazil, northeast, 1960s–present	8 million	Medium
15. Sudan, north, south, west, 1970s–1980s	3.5–4 million by early 1990	High
16. United States, Great Plains, 1930s	2.5 million	Medium
17. Ethiopia, late 1970s	450,000	Very high
18. Nigeria, Jos Plateau, 1970s–1990s	n/a	Medium
19. Pakistan, 1980s–1990s	n/a	Medium

Was the Big Thaw a historical surprise? Perhaps. Until recently, many held a conceptual fixity about the climate. Even if it was variable, all but a few believed changes were ephemeral and not incremental until the end of the last century.³⁴

Moreover, the Arctic of old was marginal—colonially, demographically, and economically. It was (generously speaking) a place of mystery, adventure, and obscurity, occupied by the Tungus, Sami, Yakuts, Chukchee, Inuit, and others. In reality, the Arctic was largely ignored by most for many centuries because it had few people, few resources, and even its geography was generally unknown. It was considered by some to be the last frontier for a time. While Stanley was exploring Africa in the 1870s, Peary and Cook were trying to reach the North Pole in the first decade of the twentieth century.

More recently, fairly rapid demarginalization of the Arctic took place because of what was there. As the need for resources changed the shape of the earth, nonnative people ventured forth into that last frontier. Sequentially, outsiders have sought access in the Arctic to fur, gold, and oil. Shipping lanes will be next.

The now-changing Arctic may be seen as a precursor for what could happen to the rest of the earth in the era of climate change. Although originally a surprise to most, in retrospect one understands how the cultural and environmental Arctic of today is a long-term result of the evolutionary dynamics of both the environment and the humans who adapted to it.

Science has shown a coherent structure in the turbulent flows of climate change. While complex, the Big Thaw has understandable causes. Likewise, the degree of incompressibility at its core is nevertheless intuitively clear. The Big Thaw creates change and then communicates and exports change to other systems. Change impacts civilization on all scales: international, national, state, municipality, and even smaller communities.

Thank you for reading this book and joining a journey that began in 2013 at The Big Thaw conference at the University at Buffalo, State University of New York. A thaw is really happening. It is big. It will impact many people and systems. So, interested minds must come together to learn, understand, and plan. As editors, the three of us hope that you will find this book interesting, useful, and motivating.

Notes

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