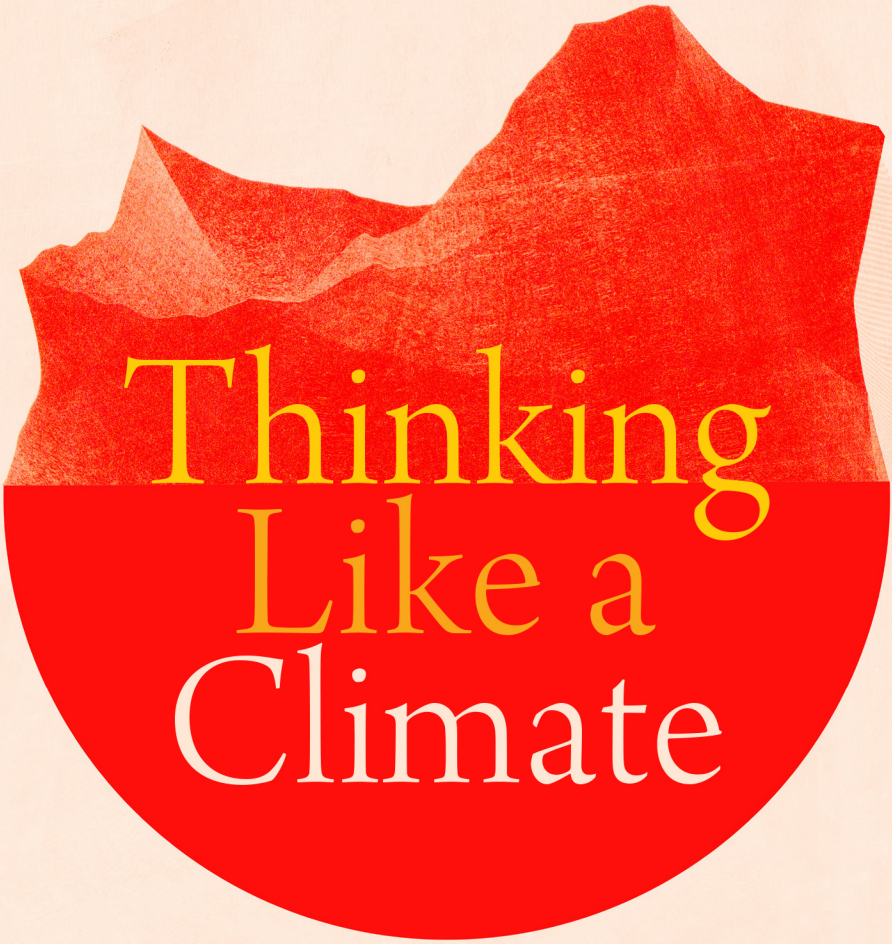
HANNAH KNOX



Thinking Like a Climate

GOVERNING A CITY IN TIMES OF ENVIRONMENTAL CHANGE

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HANNAH KNOX

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Governing a City in Times of Environmental Change

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A lost number in the equation,
A simple, understandable miscalculation.
And what if on the basis of that
The world as we know it changed its matter of fact?

Let me get it right. What if we got it wrong?
What if we weakened ourselves getting strong?
What if we found in the ground a vial of proof?
What if the foundations missed a vital truth?

What if the industrial dream sold us out from within?
What if our impenetrable defence sealed us in?
What if our wanting more was making less?
And what if all of this . . . it wasn't progress?

Let me get it right. What if we got it wrong?

— EXCERPT FROM LEMN SISSAY, "WHAT IF?"

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CONTENTS

PART II | Rematerializing Politics

ABBREVIATIONS

COP	Conference of the Parties
DECC	Department for Energy and Climate Change
DEFRA	Department of Environment, Food and Rural Affairs
EU	European Union
GCM	general circulation model
GVA	gross value added
IT	information technology
IPCC	Intergovernmental Panel on Climate Change
NGO	nongovernmental organization
PPM	planned preventative maintenance

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PREFACE / ACKNOWLEDGMENTS

When I began this research on climate change around 2010, I did not come at it with a particular desire to do something about it: my interests were driven by epistemological concerns about engineering, expertise, and materiality rather than a desire for justice or social change. I was first drawn to the possibility of an ethnographic study of climate change mitigation during conversations with an engineer involved in urban modeling for the engineering firm Arup, who reflected on climate change as one of the biggest challenges he thought engineers were going to be working on in the future. At that time this engineer was working on a project to build a digital model of the city of Manchester. One of the ambitions for the model was that it would be capable of measuring, mapping, and visualizing the carbon emissions of all of the city's buildings. Although the model was still in development, those building it had begun to imagine how it might be used: by planners to create decisions about new buildings; by building owners who might be able to influence their employees by having real-time displays of a company's carbon emissions projected on the outside of the building; and by scientists to better understand the opportunities and gaps for climate change mitigation in the city. Here in this modeling work climate change was being made tangible as infrastructure. As an anthropologist of infrastructure and digital technologies, my interest was piqued.

The project began to take shape, a study not so much of climate change as nature, or a form of environmental relating, but of climate change as a modeled and infrastructural phenomenon. I was interested in data, models, and the science of climate not as the explanatory background to contemporary social/environmental relations but as the matter of social work itself. What, I wanted to know, might be happening to social, political, and technological relations when confronted by the modeled and infrastruc-

tural phenomenon of climate change? For the engineer I first spoke to, climate change was a site of opportunity, of learning, and of novelty. But as we know from the study of other engineering projects, even the most laudable and necessary engineering interventions have unforeseen consequences and knock-on social effects. While I was generally sympathetic to the need for greater attention to issues of environmental sustainability, my primary interest was not in intervening or devising methods or insights that would address climate change but in bringing to discussions of climate change an improved sensibility to the effects of the science, and of the politics of climate change and energy, on people and their lives.

However, by entering into the worlds of climate science, climate policy, and climate activism, my academic agnosticism toward the problem of climate change itself has been transformed. Spending time immersed in numbers and calculations about temperatures and carbon dioxide emissions, tracing their capacity to move and travel, their fragility in the face of other ways of knowing, and their intransigence and insistence that a chaotic climatic future awaits, I have come to be affected by what I have learned both from the numbers and from those who translate, communicate, and live those numbers in the ways I recount in this book. This has meant coming to terms with a different kind of relationship with those with whom I spent time doing research—not as the objects or even subjects of research but more as fellow travelers in a process of understanding who have drawn me into the question they too have been compelled to ask: "What can be done about climate change?" This shift in perspective has informed my writing of this book and the conclusions that I come to, requiring me not just to reflect on and attempt to understand the knowledge, practice, and relations of those I met but also to reconsider the approach of the discipline of anthropology to climate change as a problem, its assumptions about its domains and methods of engagement, and the challenge that climate change potentially poses to my own disciplinary practice as an anthropologist. Therefore, it is more than just for reasons of access, friendship, collegiality, time, reflection, conversation, and information that I thank those who helped to bring this book into being and also helped to change me as a scholar and as a person as I began to learn how to think like a climate.

Many people in Manchester and beyond made this book possible, and thanks go to all of them, but some in particular fundamentally changed the direction of the research. Thank you to Richard Sharland for sharing with me reflections on the need for cultural change, for teaching me about the

ins and outs of local politics, and for reminding this anthropologist that in spite of all the critiques of culture that anthropologists have explored, there is still something profoundly cultural about the challenges that climate change poses. This has challenged me to return to the concept of culture and to reconsider representation as part and parcel of what climate change is as a phenomenon. Thank you also to Marc Hudson for helping me navigate the world of climate change in Manchester, for all the introductions, for always being a critical voice, for never letting narratives lie unchallenged, and for many insightful and reflexive conversations. I look forward to many more. I also thank others who opened my eyes to a different way of thinking, doing, and engaging climate change, and whose generosity of time and tolerance for the indiscipline of ethnographic participation helped open new avenues for considering what climate change is and where and how we might research it. Particular thanks go to Jonathan Atkinson, Ben Aylott, Bryan Cosgrove, Simon Guy, Britt Jurgensen, Aleksandra Kazmierchak, Lisa Lingard, Patrick McKendry, Vin Sumner, and Jessica Symons, who helped me navigate and better understand the everyday struggle of trying to act on and for the climate. I also thank the many others whom I interviewed, shadowed, and kept meeting at events, whose work I read, and who let me sit in on their meetings.

Thanks also go to many academic colleagues who read, listened to, and commented on earlier drafts of this book. Thanks in particular to colleagues from the Centre for Research on Social Cultural Change (CRESC): Michelle Bastian, Penny Harvey, Gemma John, Niamh Moore, Damian O'Doherty, Madeleine Reeves, Nick Thoburn, Elizabeth Silva, Sophie Watson, and Kath Woodward, who shaped the fieldwork and informed the early writing; to University College London colleagues Haidy Geismar, Antonia Walford, Ludovic Coupaye, and Chris Rapley for discussions about models, technologies, science, data, and politics; and to those further afield who have engaged with my work and deepened my understanding of environmental politics and technology—including Simone Abram, Kristin Asdal, Dominic Boyer, Steffen Daalsgaard, Rachel Douglas-Jones, Tone Huse, Ingmar Lippert, Maria Salaru, and Brit Ross Winthereik. I am also indebted to the anonymous reviewers of this book, whose invaluable comments have pushed me to clarify and refine my thinking, and to Gisela Fosado and Alejandra Mejía at Duke University Press.

And, finally, thanks to those at home: to the women who did the invisible labor of domestic care without which this book would not have been

possible: Marta Wendrenska, Veronika Farková, Carolina Gracia Lopez, Karen Ashton, and Judith Ferry; to Damian for being with me always as a fellow traveler on this ongoing journey; and to Imogen, Francesca, and Beatrice—this book is for you.

Matter, Politics, and Climate Change

How can we get people more involved in doing something about climate change? This is the question being explored at a meeting of the steering group that has responsibility for managing Manchester's plan to reduce the city's carbon emissions. It is a Tuesday afternoon in June, and about twenty of us are sitting, cabaret style, around tables in the breakout room of a local art-house cinema in Manchester, England. The main agenda item for the day is how to regalvanize Manchester's carbon-reduction plan and get people in the city to somehow rise to the challenge of tackling climate change.

Spread out on the tables are flip-chart pads scattered with thick colored markers—ubiquitous tools of management meetings that have been provided to help us tackle this challenge. On one of the flip charts, the page has been divided into four parts by two perpendicular lines. On the top left-hand side, Linda, who is here in her role as a project manager for an environmental charity, has written "41%"—Manchester's carbon-reduction target. On the right-hand side, she has written "engagement." The group around the table is trying to list examples of engagement under this heading, but it is not clear who engagement should focus on, or what the role of

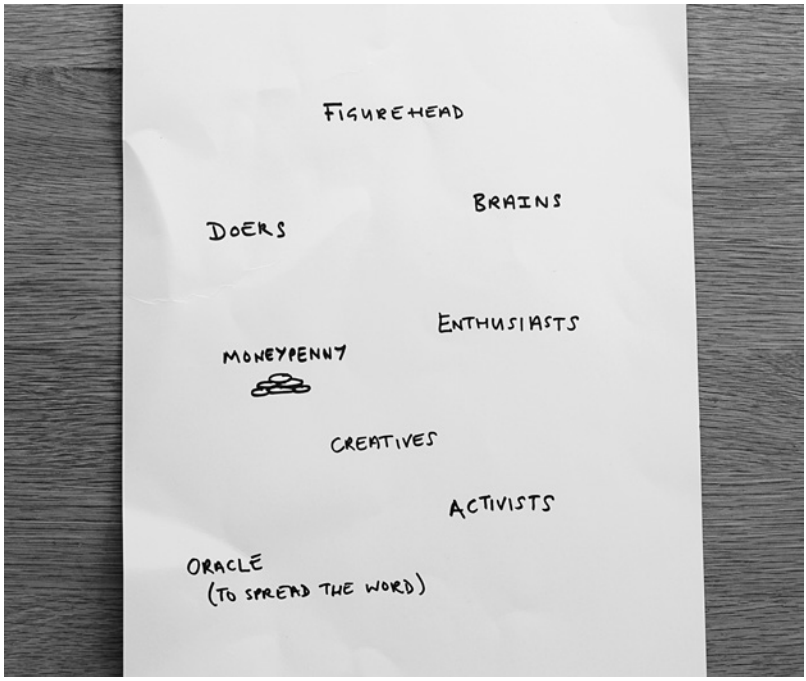

FIGURE I.1 Diagramming the city.

the steering group should be in generating this engagement. On another flip-chart sheet, the gridded lines have been dispensed with. Instead, in the open space of the page, the group starts to write down the different kinds of people they can think of who need to be engaged. First, Robert, an officer from the council, suggests the need for a figurehead, or leader. Someone else suggests we might need experts. Colin, the director of an ethical marketing company, is trying to get people to think differently about the problem. He suggests we need to call these people "brains," not experts, or maybe even "number crunchers." Creative thinkers emerges as another category, then accountants (translated by Colin as "Moneypenny"). Robert says we also need some doers, and everyone agrees. Then there are also activists, enthusiasts, and oracles.

Colin, Robert, Linda, and I stand around the table looking at the page, trying to make sense of this motley gathering of groups that might hold the key to tackling climate change. Colin says that now we can divide it up and think who might fit into these different groups. The chart is divided up.

The doers end up in the middle with all the other sections partitioned off into their own space. Colin comments that the doers don't have their own section. It is clear that this wasn't intentional, and no one knows if it matters. As we continue talking, there is further confusion—is this a diagram of the steering group or of the city as a whole? Are the doers the people who are ensuring that the plan gets done or the people who are actually doing it? There is a risk here that the doers get turned into the former, and that no one ends up actually doing anything.

Suddenly our deliberations are interrupted by the clattering of hail and a torrential downpour outside. There is a palpable hush in the room as people glance, uneasily, at the rivulets of water streaming down the window and the puddles forming rapidly on the decking outside. Inside the room we are insulated from the storm, and yet the storm is also with us, forcing itself on the proceedings and provoking a febrile atmosphere in the room.

Everyone in that room knows that a rainstorm is not climate change, but there is a sense of an indescribable link between what the group is trying to do and the weather battering at the windows. One person says that maybe the doers should concentrate on building an ark. Another says, "Is this what a postcarbon Manchester will be like?" As the rain comes down, we carry on, glancing occasionally at the windows. Eventually the rain stops, and as it does, the weather is forgotten, and the discussion continues on the question of how to enthuse people into becoming committed to a plan that will ensure that Manchester does its bit for tackling climate change.

This book takes as its starting point this moment when a storm intruded on a bureaucratic gathering in Manchester, England, to open up a discussion about the transgressions that occur when climate change confronts political practice. In Manchester, when the rain clattered down on the steering group meeting, the phenomenological experience of a downpour drew people's attention, in that moment, to a materialized form of weather that rapped at the windows of democratic deliberation. But Manchester is renowned for its rain. So why was this a moment of significant experience, and what did it have to do with the climate? What produced that rainfall as a commentary on climate change as a state of being? For people out on the street passing the room where we sat, that same downpour might have been experienced as awkward, uncomfortable, or inconvenient. For hikers out in the hills in hiking clothes, the rain might have been experienced or remembered as a bracing walk or a memorable encounter with the elements. As it was, in a meeting room surrounded by pens and paper,

flip charts, and vegan salads, during discussions about climate change and ways to do something about it, the weather became something more than weather, raising questions for people about what the rainfall was, what it might mean, and how it might be related to the actions and thoughts of the people in that room.

There are a number of excellent ethnographies that attend to the way in which people's relationships with changing weather affect their social practices.[1] However, surprisingly, there has not been a very established conversation between these studies of local weather matters and a broader anthropology of global climate change as a technological, infrastructural, political-economic phenomenon. Weather is generally seen as the material manifestation of atmospheric conditions in a particular place. Tim Ingold describes the experience of weather as a relationship with our surroundings where "*in this mingling, as we live and breathe, the wind, light, and moisture of the sky bind with the substances of the earth in the continual forging of a way through the tangle of life-lines that comprise the land*" (2007, S19, emphasis added). But what happens when this mingling is experienced as both evidence of and a portent for a future yet to come caused by the social-economic infrastructures of the recent past? If weather is inherently phenomenological, weather-as-climate enters perception by means of scientific instruments of detection and models of projected effects that refract lived worlds through the prism of historical and global processes traced in graphs, charts, and diagrams.

On the flip-chart diagram of the key people involved in tackling climate change in Manchester, the climate science that helps turn weather into climate was indicated by the category "brains." "Brains" were the scientists who provided the steering group with facts about climate change, facts that took the form of prognostic graphs of rising temperatures and hopeful projections of falling greenhouse gas emissions. This science was embodied both in the local climate scientists who worked for the universities in the city and regularly met with city administrators in meetings, workshops, and public events, giving PowerPoint presentations of their findings and those of their colleagues, and in reports produced by organizations like the Intergovernmental Panel on Climate Change (IPCC) and the UK Committee on Climate Change that outlined policy road maps for responding to climate change. Moreover, "the science" was also embodied in the biographies of many people working on climate change in the city. I often found myself in meetings where those with a background in engineering or environmental sciences would wonder whether the general public had an ad-

equate vernacular understanding of the science of climate change that they had expertise in, and how people's fact-based understanding of the climate could be improved.

The thing that needed to be understood as scientific fact through engagement with "brains," then, was climate. *Climate*, unlike *weather*, is a description of general prevailing conditions associated with a particular geographical region. Historical uses of the term *climate* referred not only to weather but also to the agriculture, flora, fauna, ways of living, and even cultural temperament of a particular region (Hulme 2017). The study of climate change is therefore a probabilistic study of general conditions at global and regional scales, not the actual weather in a particular place at a particular moment in time. And yet, confusingly, weather is still the stuff from which climate is derived and an important medium through which it is experienced. If we wish to study the relationship between climate and politics, I therefore suggest that it is not sufficient to study how embodied individuals are relating to changing weather, nor is it sufficient to understand only how people are relating to and understanding scientific models. Rather, studying climate change anthropologically demands that we attend to what happens to people's understanding of themselves and others when confronted with climate as a "techno-nature" (Escobar 1999), as a phenomenon that does not fall neatly into a category of either immediate materiality or abstract representation. If we are to understand the kind of challenge that climate change (as opposed to weather) poses to social relations in different locations and among different groups of people, then I suggest we need an anthropological approach to studying climate change that acknowledges *with* climate scientists that climate is not weather but that is also capable of treating climate as more than symbolic, modeled representations that float free from weather's materiality.

To address what happened in Manchester when climate change forced itself on urban politics, I have had to learn to approach climate change not as a cultural practice with ontological dimensions but as a material process that exhibits epistemological qualities. As climate seeped into the imagination, and as imaginations helped to surface the often undesirable social effects of changing climate systems, I found people were not confronting nature but instead experiencing themselves as entangled in a relational nexus wherein processes of signification—both human and nonhuman—were affecting one another. To capture this ecology of signs where climate seemed to shimmer into view through repetitious traces in computer models, where those models entered into workplaces via online training pack-

ages, where the complexity of ecological relations became smoothed into a curve on a graph, and where that curve on the graph had the capacity to create a knot in the stomach of a person confronted with its implications for their future and for future generations, I use the phrase *thinking like a climate*.[2]

Thinking Like a Climate

My first point of reference for understanding climate as what we might call a "form of thought" comes from a reading of Gregory Bateson, in particular his comments on the notion of the idea. In the opening paragraph to *Steps to an Ecology of Mind*, Bateson writes that the book proposes "a new way of thinking about *ideas* and the aggregates of those ideas which I call 'minds.' This way of thinking I call 'the ecology of mind' or the ecology of ideas" ([1972] 2000, xxiii). He goes on, "At the beginning, let me state my belief that such matters as the bilateral symmetry of an animal, the patterned arrangement of leaves in a plant, the escalation of an armaments race, the processes of courtship, the nature of play, the grammar of a sentence, the mystery of biological evolution and the contemporary crisis in man's relationship to his environment, can only be understood in terms of such an ecology of ideas as I propose" (xxiii).

For Bateson, what is crucial about ideas is not whether they are material or mental but that they are entities that, through their formal properties, communicate with other entities. An idea for Bateson is an arrangement—of letters, cells, or electrical pulses—that interacts with other arrangements and forms. The fundamental question Bateson sets himself to answer is, how do ideas interact? Through a study of this interaction, he proposes to explore how social arrangements and phenomena (an armaments race, processes of courtship) emerge.

One of the key points that Bateson highlights in his approach is the way in which it allows him to work with scientific data. While highly aware of the constructed nature of all data—he writes that "no data are truly 'raw' and every record has been somehow subjected to editing and transformation either by man or his instruments" (xxvi)—Bateson nonetheless stresses that data "are the most reliable source of information and from them the scientists must start. They provide his first inspiration and to them he must return later" (xxvi).

For Bateson, incorporating the data into his analysis qua data and not something to be socially deconstructed is justified by reference to his notion of an ecology of ideas. If we take nature "out there" to be material, and interpretations "in here" to be ideational, then it is necessary to decide at which point the material is transformed into the ideation—when the "raw" becomes "cooked," or when "reality" becomes "data." But if we follow Bateson in concerning ourselves not with the question of whether something is real but with its form, then things *and* data *and* their interpretation by humans or machines can all be addressed on the plane of signs. The task of the analyst thus becomes one of observing the interactions not only of a community of people but of an ecology of ideas of which people and their ideas are just one part.

A similar line of thinking is pursued by Eduardo Kohn in his recent ethnography *How Forests Think* (2013), a study of the village of Ávila in the Ecuadorian Amazon. To understand the way in which the lives of the Runa Puma who live in Ávila are entangled with and produced through interactions with the forest and its beings, Kohn argues that anthropology needs to go beyond its primary concern with human symbolic meaning making and linguistic communication, to study the way in which human worlds are made out of interaction with the sign-producing functions of other life-forms. Moving across the waking and dreaming life of the Runa Puma and his own embodied (and disembodied) experiences as an ethnographer, Kohn shows that it is not only human beings who have a capacity for signification but that human worlds are made through iconic and indexical engagements with other beings that also use representational forms to communicate and interact. Building in particular on the work of the philosopher Charles Sanders Peirce and the more recent work of Terrence Deacon, Kohn argues for what he calls an "anthropology beyond the human." For Kohn, an anthropology beyond the human is an anthropology that is capable of attending to the way that human worlds are made not only through interaction between people but out of what he terms an "ecology of selves." An anthropology beyond the human is not a posthuman anthropology but an attempt to extend anthropology's remit to be able to attend to representational capacities that the modern social sciences have tended to bracket out as not central to human meaning-making processes.

Both Bateson and Kohn, then, deploy the language of signs, ideas, minds, selves, and thought to describe the forms that emerge out of an interplay between entities of which humans are just a part. "Thinking" in

both these cases moves from something that is only the domain of human symbolic meaning making to something that can be considered the sum effect of interactions among signs, selves, and ideas more broadly conceived. Thinking is treated here not as an action but as an effect that has some level of coherence, pattern, and form. It is in this sense that Kohn can claim that "forests think" (2013, 21).[3] By this I take Kohn to mean that the sum of the interactions between the forms of life found in a forest creates patterns and that this patterning has a coherence to it akin to the patterning that occurs when we speak of ideas or describe something as a thought. Bateson makes a similar claim when he writes, "Now, let us consider for a moment, the question of whether a computer thinks. I would state that it does not. What 'thinks' and engages in 'trial and error' is the man *plus* the computer *plus* the environment. And the lines between man, computer and environment are purely artificial, fictitious lines. They are lines *across* the pathways along which information or difference is transmitted. They are not boundaries of the thinking system. What thinks is the total system which engages in trial and error, which is man plus environment" ([1972] 2000, 491).

Just as thoughts can form and dissipate, so can the form of a whirlpool, or the ecosystemic relations of a forest floor, or the interactions between human and machine. To say that forests, or environments, think is not to attribute to them the capacity for symbolic thought but to acknowledge that they are the stabilized effects of interactions among entities that communicate with one another through their significatory capacities, and that these stabilizations matter. They are the difference that makes a difference.

In using the phrase *thinking like a climate*, I propose that it is analytically helpful for the anthropology of climate change to consider climate as a form of thought. Only by approaching climate change in this way have I found myself able to hold in view, ethnographically, the multifarious manifestations of climate in my own research: the materiality of rain battering at the windows, the work of ordering carbon numbers in a spreadsheet, the experience of climate activists taking their collective bodies into the chambers of local government, the affective hope of museum exhibits on loss and the future, and the mundane attention to light bulbs, computer monitors, or plastic straws as efficacious responses to climate problems.

Thinking like a climate is thus proposed as a conceptual tool to assist an exploration of how the material dynamics of climate change—which have become known through the data, visualizations, and computer models that constitute what Paul Edwards (2010) has called the "Vast Machine" of climate science—come to be translated (or not) into the mundane work

of knowing and managing the social order. The central location of the study is Manchester, UK, the birthplace of the Industrial Revolution and a place that self-identifies as the "original modern" city.[4] Where better to look at the questions raised by the challenges of climate change than in the city that defines itself as the place where this whole process began, where coal was extracted and burned to fuel the manufacture of cotton, which heralded the beginning of industrial capitalism?

This book centers on the practices and conversations of a loosely defined group of officials and activists who were, and are, trying to work together to explicitly develop a future for Manchester as both a postindustrial and low-carbon city. The people who appear in this book were linked, either directly through a steering group or indirectly as partners, with a plan for managing the city's carbon emissions that was published in 2009 and given the title *Manchester: A Certain Future*. The story of how this group of people came to be tackling climate change will be told throughout the book, but it is important to note at the outset that the *Manchester: A Certain Future* plan was seen by its participants as very distinctive for the way it displaced responsibility for tackling climate change from the local council to "the city as a whole," the plan being "a plan for everyone." Accordingly, the plan's steering group members came from various organizations including the city council, the three universities in the city, the National Health Service, environmental charities and environmental pressure groups, an engineering firm, a housing association, economic development organizations, and freelancers working in the environmental sector. It was described to me by one participant as akin to a proto–citizen's panel. The members of the steering committee and partner organizations were well educated and established in professional positions in public and private-sector organizations, charities, and environmental nongovernmental organizations (NGOs). Their conversations and practices, and the relationships they were involved in to tackle climate change, form the core focus for this study, allowing us a window onto how climate change emerged in this late-liberal political setting as a mode of questioning and unsettling urban politics as political relations became deformed and reformed around the question of what to do about rising carbon emissions.

My research for this book entailed spending time with this network of people over a period of eight years. Research for this project began slowly in 2011, involved a focused fourteen-month period in 2012–2013, and has continued in short stints since then. The book also draws on additional fieldwork conducted in 2017–2018, during which I looked at how people were

engaging with energy through data and devices. Fieldwork entailed conversing with and interviewing many people involved in the steering group, attending steering group meetings and events, participating in critical fringe events by activist groups, participating in the everyday work of the environmental strategy team at the city council who managed the steering group behind the scenes (during four months of daily ethnographic research), attending public policy meetings, shadowing the work of an environmental manager at a housing association, and exploring the meetings, documents, and daily work of the Manchester-based partners of two projects funded by the European Union (EU) exploring how to use digital technologies to tackle climate change.

Methodologically, the city of Manchester has provided a relationally and spatially appropriate field site through which to analyze broader social, ethical, and epistemological questions that are currently being posed about the relationship between politics and the environment established by climate change.[5] Richard Sharland, who was head of the environmental strategy team at the city council during the time I was doing research, once said to me that the wonderful thing about working at the level of the city is that it gives you the opportunity both to reach up to the global and to reach right down to the people on the ground. This has a similar methodological resonance for me, for doing an ethnography of a project of social transformation in the city provides a way of talking ethnographically about both the global institutions that are so central to climate change politics and also the local practices of those who are devising answers to those problems and are subject to proposed solutions. Researching climate change in the city is not just a matter of studying the ideas of a coherent group of people located in a geographically bounded space but is rather a means of generating a perspective or vantage point from which to describe ideas, concepts, and people who are held together in a shared project across different kinds of social spaces.

The field site for this research was the city of Manchester, UK, then, but it was a field site that also opened up to places beyond the designated boundaries of the city. Some of the other places that this research led to were geographical—meetings in London, Lancaster, Brussels, and Linköping; and stories of experiences people had had in Northern Ireland, South America, the United States, Antarctica, Australia, and China. But perhaps even more significant were the nongeographically defined spaces that the research also led to: the space of documents produced by governmental and intergovernmental organizations; the space of websites, discussion forums, and email exchanges where questions of technique and examples of good

practice were being shared; the space of technological networks: of the energy monitors, solar panels, and statistical models through which the job of attempting to reduce carbon emissions was enacted. And, finally, Manchester was itself not just a geographical context for this research, but as we see in the opening vignette, it, like the climate it was trying to engage, was also a concept, an idea, and a thing that was being reworked in relation to the project of carbon emissions reduction. Part of the challenge of reducing carbon emissions at a city scale was reimagining just what kind of social, environmental, and technical entity the city itself was. As the opening vignette hints, forging a local and situated response to models of rising temperatures, increasing sea levels, and climbing measures of carbon dioxide particles in the atmosphere required people not just to act but to interrogate and re-create the very forms and categories of social organization, like "the city" and "the citizen," that would be necessary to bring about the desired change. Tracing climate change in this city was, to paraphrase Donna Haraway, a matter of getting away from the "god tricks of self-certainty and deathless communion" and paying attention to "counter-intuitive geometries and emergent translations" (2003, 25). Part of that work of translation revolved around the question of just what kind of collective entity would be appropriate to tackling a problem like climate change, and whether the city of Manchester might fulfill that role.

Scientists and Skeptics

With the city providing the scale of analysis, and climate change providing the focus of people's activities, one might imagine that the struggle facing city administrators would be one of convincing a skeptical citizenry of the realities of climate change. But rarely in my research was the nature of climate politics articulated in this way. The only time I heard anyone speak of climate deniers or climate skepticism was during a conversation with a housing-association employee when he mentioned that the director of the housing association did not believe in climate change. Elsewhere, whether the people being engaged by those trying to do something about climate change were building managers or council employees, homeowners or renters of council properties, the question of whether climate change was real or human-made never came up in my ethnographic work.[6]

This was somewhat surprising to me given the very different rendering of the politics of climate that has until recently dominated the popu-

lar and intellectual imagination. During the time of my research, discussions about the politics of climate change in media and policy in the United Kingdom and United States largely focused on a very public struggle between climate science and climate change skepticism. In this public politics of climate change, the central institution that has stood for the science of climate change has been the IPCC, accompanied by a network of laboratories, scientists, and research centers who have contributed to an ever more robust description of the projected transformations in global climate (Weart 2003). In the opposing camp, climate skeptics have been represented by governments such as the current Trump administration in the United States, the fossil fuel industries and their lobbying powers, the right-wing media, and a poorly informed, relatively unengaged general public that has been seen both as uninterested in climate change and as structurally incapable of doing much to respond to it (Hulme 2010; McCright and Dunlap 2011; Tranter and Booth 2015). Those who have explored the epistemological dimensions of this battle between scientists and skeptics have tended to highlight the way in which the position that each group inhabits is sustained by an argument around the validity or robustness of the facts being produced and the terms of their interpretation (Latour 2010; Oreskes and Conway 2010).

Probably the most famous example of this battle over the facts of climate change, at least in the United Kingdom, was what came to be called the Climategate controversy of 2009, when emails between scientists at the Tyndall Centre for Climate Change Research at the University of East Anglia—which raised questions about the meaning and validity of modeled results—were leaked to the press, fueling claims that climate science was weak and that human-made climate change was a conspiracy aimed at undermining capitalist social relations.[7] Other, more recent incidents suggest that the same debates continue to drive public discussions about the politics of climate change. In September 2017, for example, a paper was published in *Nature Geoscience* that argued that there was a greater likelihood than previously thought that global warming could be kept within the 1.5-degree warming ambition set by the IPCC in 2016 (Millar et al. 2017). Using new methods of modeling, the authors suggested that there is a 66% chance that this will be possible, if certain strict conditions are adhered to—a finding that was meant to galvanize efforts to head off global climate change by demonstrating that while politically challenging, it was not "geophysically impossible" (Millar et al. 2017, 741). However, headlines in the *Telegraph* newspaper responded by announcing "Climate Change

Not as Threatening to Planet as Previously Thought, New Research Suggests."[8] Although this was broadly in line with the press release that accompanied the report, some climate scientists I spoke to were horrified at this headline. They were concerned that the message that would be taken from the study was that everyone could relax about climate change, rather than the message being that there is still a slim chance that a climate disaster could be averted if everyone does everything they can to reduce carbon emissions as quickly as possible. The fears of the scientists were confirmed when the study was cited by a politician well known for his skepticism toward climate science (and incidentally the former head of the Manchester City Council), Graham Stringer, in an editorial in the tabloid paper the *Daily Mail*. The headline read: "Now That's an Inconvenient Truth" followed by the subhead "Report shows the world isn't as warm as the green doom-mongers warned. So will energy bills come down? Fat chance, says MP Graham Stringer."[9]

A second incident occurred a few weeks earlier when another politician who is known for his skepticism toward climate science, Lord Nigel Lawson, was interviewed on the BBC *Today* program on Radio 4.[10] In the interview Lawson claimed that global temperatures had not risen over the past decade, a claim that went unchallenged in the interview. If the first incident was a debate over how to interpret the facts of climate science, this second incident revolved around the responsibility of the BBC to provide impartial reporting on climate science. The BBC has, until recently, faced repeated criticism from climate scientists, who have argued that attempts to represent "both sides of the argument" have given undue weight to findings that are not corroborated by most of the climate science community. Again, in this case, the BBC appealed against initial complaints about the interview with Lord Lawson, arguing that "Lawson's stance was 'reflected by the current US administration' and that offering space to 'dissenting voices' was an important aspect of impartiality."[11] However, after the original complaints escalated, the BBC admitted that the facts being reported were erroneous and Lawson should have been challenged by the interviewer.[12] As these examples demonstrate, even the most avowedly neutral media's representation of climate change has to tread carefully in this ongoing debate between scientists and skeptics. The battle here is about whose facts count and how those facts should be interpreted. But this is a rather different politics of climate change from that which I describe as being fought out in the city. Here, instead of facts, what were at stake were methods of bureaucratic organization, techniques of construction, engineering logics, and local so-

cial and political histories, which were being ruptured and reconfigured by the appearance of climate models. By taking as a vantage point not national debate but the situated practices of city administrators, this book offers an alternative description of the politics of climate change. While the details of the political relations I describe are specific to Manchester, the analysis I present offers a means of tracing a reconfiguration of the political in the technological and bureaucratic life of climate change. In doing so it aims to open up the possibility of analyzing how climate comes to be animated or silenced in other bureaucratic and institutional domains where the struggle is also no longer over the basic facts of climate science but over what to do about them.

Climate Change as Ontological Politics

When the problem with climate change is an oppositional politics between believers and nonbelievers, then the answer to the struggle is to convince the nonbelievers that climate change is real. There is hope here that once the communicative message has been conveyed properly and skepticism has been done away with, consensus will lead to effective policies that will reduce carbon emissions. However, this ignores the day-to-day struggle experienced by people like those with whom I did research, who are generally in agreement about the facts of climate change. During the time of my research this struggle rarely made the headlines, but it constitutes, I argue, a much more profound barrier to reducing carbon emissions than climate skepticism or denialism in its strong form. The struggle here is not with a cultural or political adversary who disagrees over whether climate change is happening, or who identifies its causes as natural rather than human, but with the problem of how to deal—bureaucratically, institutionally, and socially—with material processes, evidenced by climate science, that threaten to disrupt what we might call a modern way of being in the world. It is this terrain of politics that this book explores.

When I began this research in 2011, average concentrations of carbon dioxide in the atmosphere stood at 390 parts per million. When I was writing the draft of this manuscript in 2019, they surpassed, for the first time, a measure of 414 parts per million, with an annual average of over 410 parts per million.[13] When we consider that for the thousand years preceding the Industrial Revolution, carbon dioxide concentrations stayed relatively stable at 250 parts per million, the current rate of acceleration of carbon dioxide

concentrations in the atmosphere is alarming. Projections of the effects of this change are also worsening, with the scientific consensus shifting in recent months to a prediction that we are now on course for an average of 3 degrees of global warming by the end of the century (Raftery et al. 2017). This portends sea-level rises of two meters or more, powerful hurricanes, the slowing or cessation of jet streams, droughts, fires, crop failures, wars, and mass migration.[14]

For those climate scientists, concerned citizens, activists, and political actors of different kinds whom I met in and around Manchester, who were all trying to do something about climate change, the appearance of these ever more dire facts and figures about a changing atmosphere seemed unrelenting. These data were indicative not just of the level of change that was necessary to mitigate them. Rather, their ongoing appearance continually re-posed the question of why it is that the conventional means of attending to and responding to these facts about the world appear to prove inadequate when they are mobilized as a response to historical and ongoing climate change (Marshall 2015). Why, people asked, is no one listening to the numbers and acting accordingly? And how could things be different?

One response to this question was to attribute responsibility for a failure to act on climate change to particular groups or individuals. Accusations are frequently made by climate critics that the richest individuals, the biggest companies, the structure of our financial systems, and certain nation-states are the agents that are failing in their duty to respond to the problem of rising greenhouse gas emissions (Swyngedouw 2010a; Szerszynski 2010). In Manchester a critical political engagement with the structural causes of climate change manifested in activities such as the Shell Out! campaign to prevent Royal Dutch Shell from sponsoring an exhibition at the Manchester Museum of Science and Industry, a campaign to get Manchester's pension fund to divest from fossil fuels, and the Energy Democracy Greater Manchester campaign, which aimed to encourage Greater Manchester to establish its own citizen-owned green energy company. Tackling climate change through this kind of critical structural approach was complicated, however, by the realization that even those who were trying to do something about climate change (and who were often part of the privileged groups identified)—climate scientists, activists, public intellectuals—often experienced themselves as unable to make the difference that seemed necessary within their own lives. This inability to change things either individually or structurally was in turn read in the unrelenting rise in concentrations of greenhouse gases in the atmosphere, which suggested that in

spite of all the initiatives, activities, and changes that had been put in place, *no one*, including those who were already attempting to make the necessary changes, was able to do enough. Many I spoke to during my research articulated how they experienced a confrontation with climate change both viscerally and emotionally. Several people told me how, as a result of thinking about and working on climate change, they had been through periodic episodes of depression, how they lived within a generalized sense of doom and felt "extreme despondency," how they had found themselves toying with millenarianism, and how they often experienced feelings of despair. At the same time, an awareness of climate change was also causing people to ask difficult questions of themselves and their peers about their practices and their working lives. For those thinking about climate change in relation to how to make the city responsible for its carbon emissions, this meant asking crucial questions about the relationship between, on the one hand, the forms of accountability that have conventionally driven, justified, and evidenced the effectiveness of governmental action and, on the other, the role of climate science as an alternative arbiter of political effectiveness. Climate change was changing something about the experience and possibility of doing politics. But what exactly was it about climate change that was producing this experience of rupture? And how was the particularity of climate change as a phenomenon affecting how it was being responded to?

Bringing Nature into Politics

One way of understanding this articulation of a change or a challenge is to see it as the outcome of an attempt to reintroduce nature into politics. As I explore in later chapters, for most of the twentieth century, modern governmental practice in urban settings has been framed not by ecological considerations but by what we might call biopolitical concerns (Foucault 1997; Joyce 2003; Rose 1990). This is not to say that the environment (for example, in the form of natural resources) has not been crucial to the constitution of the modern city. As William Cronon (1991) makes clear in *Nature's Metropolis*, and Howard Platt (2005) similarly argues in *Shock Cities*, urban settlements have always depended on natural resources—be that rivers, forests, agricultural crops, or the weather—to exist. Manchester's origin story is often told as a story of weather, a city whose industrial success as a global center for the cotton industry came from its damp climate, which prevented cotton threads from fraying when being woven. However,

in spite of the possibility of telling the history of a city as a tale of political ecology, the actual practice of managing the city as an object of governance has tended, until recently, to operate through attention to urban populations, measures of economic activity, health, and planned urban infrastructures, rather than a direct engagement with the natural resources that lie within or outside city borders or the environmental relations that make certain forms of life and economy possible within the city.[15]

One of the critiques that has thus often been made of modern forms of governing and accounting is that they work by excluding, as externalities, relations between people and "the environment." Marxist analyses, such as Teresa Brennan's (2000) highly insightful work on the problems inherent to the modern economy, demonstrate, for example, how modern forms of social organization that have conceptually bracketed nature out have led to an exhaustion, both metaphorically and literally, of nature.[16] Brennan argues that economic value under capitalism is not created only through labor power but also depends on the unacknowledged exhaustion of both human bodies and natural resources. Similarly, in *The Question concerning Technology* (1977), Martin Heidegger famously points to a peculiarly modern and what he terms "technological" way of relating to nature that frames an inert nature as a "standing reserve," conceptually awaiting human exploitation. With nature externalized as something that human beings can exploit, the metropolis, even when conceived of as political ecology, becomes a performance of human domination over nature, a space that is separated off, both geographically and conceptually, from the rugged or rural locations where nature, as a standing reserve for human use, patiently resides.

In recent years there have been significant moves in urban planning around the world to reframe the place and value of nature in cities and to explicitly bring nature back into urban politics. Utopian, master-planned ecocity projects such as Masdar City in the United Arab Emirates, Tianjin in China, and Songdo in South Korea figure as the spectacular avant-garde for a global conversation about how to bring questions of sustainability into the design of cities. An attention to nature promises a way to balance human needs and ecological processes and to resolve problems ranging from air pollution, to water quality, to carbon reduction, to preparedness for future climatic changes. This newfound attention to nature and sustainability has in turn fueled new directions in urban planning and design. Future cities, it now seems, are green and sustainable cities (Bulkeley et al. 2013; Lovell 2004; Miller 2005; Rademacher 2017; While, Jonas, and Gibbs 2004).

One way of attending to the appearance of climate change as a "matter of concern" impinging on the work of those who plan and manage cities would be to see climate change as another manifestation of this attention to nature in urban settings. Certainly, in Manchester, climate change appeared as a generalized justification for sustainability initiatives such as the encouragement of green roofs on public buildings, the planting of wildflowers along main roads in and out of the city, the placing of beehives on top of municipal buildings, the planting of trees to improve urban drainage, and the creation of linear parks as wildlife corridors along old railway lines. At the same time, these biodiversity projects and green infrastructure projects did not seem to suffer from the same kind of logical incommensurability and epistemic collapse that climate change produced when addressed as a problem of governance.

Although climate change is undeniably part of broader discussions about how to create more sustainable and livable cities, we risk missing something of its particular characteristics if we simply see it as one part of a broader sustainability discourse. Addressing climate change as a problem in its own right, as I do in this book, allows us to approach it as something that may or may not be a matter of nature. As such, this book addresses climate change not as an instance of bringing nature into urban biopolitics but as a particular kind of rupture in biopolitical and, more recently, neoliberal organization. Taking this approach requires that we do not classify climate change too quickly as nature but rather allow its characteristics and dynamics to emerge ethnographically. It requires a starting point that does not assume that climate change is necessarily about sustainability, ecology, and green politics but instead allows the question of what climate change is, and when it is aligned with these other preoccupations, to be discovered as an outcome of the research.

Sustainability is often argued to be an extension of modern bureaucratic and capitalist practice into new domains—a bureaucratization or capitalization of nature. In contrast, I introduce an alternative telling of the cultural life of climate change, attending to the way climate change repeatedly resisted its successful incorporation into the bureaucratic and capitalist practices of Manchester's administrators. Climate change risked fundamentally unsettling methods of contemporary governance that administrators were familiar with—methods that built on imaginaries of the human population, markets, and economies (Mitchell 2002). Centered on the challenge of how to incorporate the description of a changing climate