INTRODUCTION

Crisis and Opportunity in a Changing Climate

The world is warming, and the pace of warming is starting to quicken. In just the time it took to research and write this book, Earth endured seven of the eight hottest years ever measured by meteorological instruments. Its average annual temperature is now roughly one degree Celsius hotter than it was midway through the twentieth century. By the end of the twenty-first century, warming may well exceed two degrees Celsius. Around the world, people are already experiencing gradual and global changes in Earth's climate through local weather events that pass quickly but have lasting consequences. Climate change is not only altering average weather but also the frequency and severity of weather extremes. Present-day warming has intensified storms, prolonged heat waves, and provoked precipitation anomalies in ways that have overwhelmed vulnerable human infrastructure and thereby exacted a fearsome toll on rich and poor societies alike. Ever more extreme weather in our warmer future could threaten the very survival of our civilization.[1]

[1] B. Kirman et al., '2013: Near-term Climate Change: Projections and Predictability'. In *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, eds. T. F. Stocker et al. (Cambridge: Cambridge University Press, 2014), 981. Virginia Burkett et al., *Climate Change 2014: Impacts, Adaptation, and Vulnerability*. (IPCC WG II AR5, 2014), 13. IPCC, '2014: Summary for Policymakers'. In *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, eds. C. B. Field et al. (Cambridge: Cambridge University Press, 2014), 7. See also E. M. Fischer and R. Knutti, 'Anthropogenic Contribution to Global Occurrence of Heavy-Precipitation and High-Temperature Extremes'. *Nature Climate Change* (2015): http://dx.doi.org/10.1038/nclimate2617.

To properly appreciate and begin to address this defining crisis of our time, we must look to the past. We can gain a sense of the magnitude and causes of global warming by comparing it to the baseline of natural climatic variability, which we can only determine by reconstructing past climatic trends. We can better understand and confront the causes of warming by tracing the human histories that led us to capitalism, globalization, and industrialization. We can acquire insights into how our civilizations can adapt to human-caused warming by determining why many societies suffered, although a few thrived, when natural forces in our distant past changed Earth's climate in smaller but still significant ways.[2]

This book contributes to that third kind of 'climate history'. Midway through the thirteenth century, average annual temperatures in the Arctic and eventually around the world started falling. It was the beginning of the so-called Little Ice Age, the chilly climatic regime that is the focus of this book. Until the recent onset of global warming, the Little Ice Age may have been the most significant climatic anomaly to affect the Northern Hemisphere in at least 6,000 years.[3]

Many historians and scientists believe that the Little Ice Age endured for around six centuries, until roughly 1850. Different definitions arise, in part, from a particularly cold period between approximately 1560 and 1720 that was bookended by two frigid, decade-scale climatic regimes: the Grindelwald Fluctuation (1560–1628) and the Maunder Minimum (1645–1720). Atmospheric and oceanic circulation changed in both of these cold phases, causing patterns of precipitation and storminess to shift from region to region. Weather from season to season and year to year was also less predictable than it had been, but overall average global temperatures remained roughly one degree Celsius below the twentieth-century (c. 1900–1960) norm. In the so-called early modern centuries, from around 1450 to 1750, the lives and livelihoods of most people depended on local agriculture. Around the world, the weather of the

[2] Paul Edwards, *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming*. (Cambridge: MIT Press, 2010), 4.

[3] For different perspectives on the term 'Little Ice Age', see Michael E. Mann, 'The Little Ice Age'. In *Encyclopedia of Global Environmental Change*, eds. Michael C. MacCracken and John S. Perry. (Chichester: John Wiley & Sons, Ltd., 2002), 504–509. John A. Matthews and Keith R. Briffa, 'The "Little Ice Age": Re-evaluation of an Evolving Concept'. *Geografiska Annaler: Series A, Physical Geography*, 87:1 (2005): 17–36. Sam White, 'The Real Little Ice Age'. *The Journal of Interdisciplinary History* 44:3 (Winter, 2014): 327–352.

Little Ice Age played a role in triggering harvest failures, commodity price shocks, famine, social unrest, and ultimately death on a vast scale.[4]

Yet a few societies prospered, and none more than the Dutch Republic, the precursor of the present-day Netherlands. Between 1590 and 1715, its coastal regions underwent an extraordinary golden age that precisely coincided with the coldest stretch of the Little Ice Age. For centuries, these regions – collectively known as the 'Low Countries' – had differed in important ways from the rest of Europe. Salt marshes and peat bogs made them mostly uninhabitable until medieval settlers in huge numbers dug up peat, drained bogs, and reared cattle that trampled what was left. The land sank in response, until it dropped below the level of the sea, and the settlers in turn built a huge web of river embankments, dikes, and drainage channels to hold back the water. They created a strange network of walled-off farmland and waterways that had few parallels anywhere else in the world.[5]

This engineered landscape was perpetually menaced by the 'water wolf': the sea that always threatened to spill over Dutch coastal defences. Yet water also helped provide the motivation and means for fantastic profits. In the fourteenth century, floods destroyed farmland across the Low Countries and prompted merchants to import from the nearby Baltic Sea. Port towns accommodated this new trade and fostered the

[4] John Brooke, *Climate Change and the Course of Global History: A Rough Journey*. (Cambridge: Cambridge University Press, 2014), 383. Shaun A. Marcott et al., 'A Reconstruction of Regional and Global Temperature for the Past 11,300 Years', *Science*, CCCIX (2013), 1198. Geoffrey Parker and Lesley M. Smith, eds., *The General Crisis of the Seventeenth Century*. (Oxford: Routledge, 2005), 7. M. J. Ingram, G. Farmer and T. M. L. Wigley, 'Past Climates and Their Impact on Man: A Review'. In *Climate and History: Studies on Past Climates and Their Impact on Man*, eds. M. J. Ingram, G. Farmer and T. M. L. Wigley. (Cambridge: Cambridge University Press, 1981), 17. Hubert Lamb, *Climate, History and the Modern World*, 260. Jean M. Grove, 'The Century Time-Scale'. In *Time-Scales and Environmental Change*, eds. Thackwray S. Driver and Graham P. Chapman. (Oxford: Routledge, 1996), 40. Geoffrey Parker, *Global Crisis: War, Climate Change and Catastrophe in the Seventeenth Century*. (London: Yale University Press, 2013), 26. Ljungqvist, 'A New Reconstruction of Temperature Variability in the Extra-Tropical Northern Hemisphere during the Last Two Millennia', 445.

[5] Piet H. Nienhuis, *Environmental History of the Rhine-Meuse Delta: An Ecological Story on Evolving Human-Environmental Relations Coping with Climate Change and Sea Level Rise*. (New York: Springer, 2008), 54, 87. M. van Tielhof and P. J. E. M. van Dam, *Waterstaat in Stedenland: het Hoogheemraadschap van Rijnland voor 1857*. Utrecht: Matrijs, 2006. William TeBrake, *Medieval Frontier: Culture and Ecology in Rijnland*. (College Station: Texas A&M University Press, 1985). Audrey M. Lambert, *The Making of the Dutch Landscape: An Historical Geography of the Netherlands*. (London: Academic Press, 1985), 203.

skills and infrastructure that permitted the rise of new industries on land and at sea. When the Spanish Habsburg Empire absorbed the Low Countries late in the fifteenth century, the region's cities had become hubs in a continent-straddling commercial network. Yet they were also divided by a bewildering patchwork of local laws and customs, and frayed by the spread of Protestantism. Spanish attempts to centralize the region under Catholic rule ignited a revolt that eventually united the northern provinces of the Low Countries within a radical new kind of political structure: a loose confederation largely governed by councils of urban merchants.[6]

This 'Dutch Republic' gave rise to a remarkably dynamic economy that thrived while its competitors faltered amid the chilliest decades of the Little Ice Age. Dutch entrepreneurs invented or implemented technologies that sharply increased the efficiency of, for example, shipping, shipbuilding, firefighting, and land reclamation. Merchants, many of them immigrants from the war-torn southern Low Countries, cultivated new industries and circumvented Spanish embargoes by establishing the Dutch East and West India Companies. The East India Company quickly came to dominate the lucrative trade that sent precious metals to Asia in exchange for spices and textiles. Burgeoning Amsterdam became the financial and commercial capital of Europe; a major hotbed for mapmaking and publishing; and the first truly global nexus for importing, trading, and exporting goods. For decades, the republic's level of urbanization, rates of literacy, robust fiscal system, stable and effective governments, diverse commercial economy, and efficient sources of energy set it apart within contemporary Europe. Its economic booms and busts, frequently triggered by financial speculation and accompanied by environmental degradation, resembled those of present-day capitalism. The precocious dynamism of the Dutch economy made the republic a great power with global reach, but it was not to last. By the middle of the seventeenth century, Dutch commercial success provoked protectionist legislation, costly wars, and – worst of all – emulation in France and especially England. Meanwhile, falling commodity prices, increasing labour costs, and a series of natural disasters undermined the republic's agricultural productivity.

[6] Louis Sicking, *Neptune and the Netherlands: State, Economy, and War at Sea in the Renaissance*. (Leiden: Brill, 2004), 209. Jonathan Israel, *The Dutch Republic: Its Rise, Greatness, and Fall, 1477–1806*. (Oxford: Clarendon Press, 1998), 209. Maarten Prak, *The Dutch Republic in the Seventeenth Century*. (Cambridge: Cambridge University Press, 2005), 8. Alastair Duke, *Reformation and Revolt in the Low Countries*. (London: Hambledon Press, 1990), 11.

In the face of these challenges, the republic's economy changed and ultimately declined in the eighteenth century, just as Earth's climate started warming.[7]

There was something about the Dutch Republic that let its citizens thrive during the coldest decades of the Little Ice Age. This book demonstrates, first, that weather was a dynamic natural agent that shaped the history of the Dutch Golden Age. It shows, second, that weather trends in the chilliest phases of the Little Ice Age had mixed but overall beneficial consequences for distinctively Dutch ways of conducting commerce and waging war, which the culture of the republic registered and reinforced. Climate changes that led to particularly cold stretches of the Little Ice Age certainly presented challenges for Dutch citizens, but they also offered opportunities that merchants, sailors, soldiers, and inventors aggressively exploited.

Most histories of the Little Ice Age focus on agriculture. Yet domestic agricultural production was less important for the prosperity and security of the Dutch Republic than it was for most other states. This book therefore explores diverse and, until now, largely unstudied links between climate change and early modern history. It shows that complex relationships

[7] Violet Barbour, *Capitalism in Amsterdam in the 17th Century*. (Ann Arbor: University of Michigan Press, 1963), 12. Bas van Bavel, 'Manors and Markets. Economy and Society in the Low Countries (500–1600): A Synopsis'. *Tijdschrift voor Sociale en Economische Geschiedenis* 8:2 (2011): 63. J. L. Price, *Dutch Society, 1588–1713*. (New York: Longman, 2000), 70. Jan de Vries and Ad van der Woude, *The First Modern Economy: Success, Failure, and Perseverance of the Dutch Economy, 1500–1815*. (Cambridge: Cambridge University Press, 1997), 357. C. A. Davids, 'De technische ontwikkeling in Nederland in de vroeg-moderne tijd. Literatuur, problemen en hypothesen'. *Jaarboek voor de Geschiedenis van Bedrijf en Techniek* 8 (1991): 9. Oscar Gelderblom, *Zuid-Nederlandse kooplieden en de opkomst van de Amsterdamse stapelmarkt (1578–1630)*. (Hilversum: Uitgeverij Verloren, 2000), 114. Victor Enthoven, 'Early Dutch Expansion in the Atlantic Region, 1585–1621'. In *Riches from Atlantic Commerce: Dutch Transatlantic Trade and Shipping, 1585–1817*, eds. Johannes Postma and Victor Enthoven. (Leiden: Brill, 2003), 23. Gerrit Knaap and Ger Teitle, eds., *De Verenigde Oost-Indische Compagnie: Tussen Oorlog en Diplomatie*. (Leiden: KITLV Uitgeverij, 2002), 4. Jonathan Irvine Israel, *Dutch Primacy in World Trade, 1585–1740*. (New York: Oxford University Press, 198), 213. Clé Lesger, *Handel in Amsterdam ten tijde van de Opstand: kooplieden, commerciële expansie en verandering in de ruimtelijke economie van de Nederlanden ca. 1550 – ca. 1630*. (Hilversum: Uitgeverij Verloren, 2001). P. C. Emmer, *The Dutch in the Atlantic Economy, 1580–1880*. (Aldershot: Ashgate, 1998), 14. Jan Luiten van Zanden, 'Economische Groei in Holland tussen 1500 en 1800'. *NEHA-Bulletin* 16:2 (2001): 65. J. L. van Zanden, *Arbeid tijdens het handelskapitalisme: Opkomst en neergang van de Hollandse economie 1350–1850*. (Hilversum: Uitgeverij Verloren, 1991), 11. E. M. Jacobs, *In Pursuit of Pepper and Tea: The Story of the Dutch East India Company*. (Walburg: Walburg Pers, 2009), 11.

between global climatic trends and local environments influenced the transportation networks that sustained the Dutch trading empire. Weather that became common in cooler climates encouraged new discoveries and industries in distant seas, quickened the journeys of departing East India Company ships, hampered some elements of Baltic commerce while possibly enriching others, and altered how travellers moved within the republic.

The book also demonstrates that climate change affected how the Dutch defended their republic and expanded its commercial empire. From 1568 to 1688, Dutch military operations generally benefitted from cold, wet, and stormy weather that became more common in especially chilly phases of the Little Ice Age. However, in the 1630s and 1650s, weather typical of an interruption in the Little Ice Age aided Dutch offensives in the Spanish Netherlands and then thwarted the republic's naval operations during the First Anglo-Dutch War.

Finally, the book reveals that climate change influenced the dynamic culture of the Dutch Golden Age. By tracing weather patterns through time, some Dutch citizens developed a vague awareness of what we would call climate change. Dutch artistic responses to weather expressed the conviction that even the extremes of a frigid climate could be endured and, occasionally, exploited. Little Ice Age weather encouraged social spaces and technologies that contributed to the resilience of the republic in the face of climate change.

That concept – 'resilience' – is notoriously difficult to define. Other scholars have used it to refer to an adaptive social capacity that mitigates loss amid changing environmental conditions. According to that definition, 'vulnerability' means the potential for loss. In this book, 'resilience' also encompasses the largely unavoidable natural circumstances that can make shifting environmental conditions more or less damaging in a particular place, for a particular society. Resilience, therefore, is not just about what humans decide to do, but also about the choices environmental circumstances allow them to make. A society that is vulnerable to climate change could simply be in the wrong place, at the wrong time.[8]

[8] Grove, 'The Century Time-Scale'. 80. Georgina H. Endfield, 'Exploring Particularity: Vulnerability, Resilience, and Memory in Climate Change Discourses'. *Environmental History* 19 (2014): 305. Christian Pfister, 'Climatic Extremes, Recurrent Crises and Witch Hunts: Strategies of European Societies in Coping with Exogenous Shocks in the Late Sixteenth and Early Seventeenth Centuries', *The Medieval History Journal* 10:1&2 (2007): 44. Field et al., 'Climate Change 2014: Impacts, Adaptation, and Vulnerability, Summary for Policymakers', 5.

We can therefore imagine resilience to climate change as a negotiation between environmental fluctuations, on the one hand, and the characteristics of a society, on the other. If a climatic shift is too extreme, no society can endure. If a society depends on a particularly delicate environmental equilibrium, even a hint of climatic variability can be dangerous. Societies can be vulnerable for very different reasons. Today, developed states strain or exceed the capacity of environments that climate change will make less hospitable. In the early modern world, by contrast, many societies depended on the meagre yields and slight surpluses of agricultural systems that could rarely cope effectively with shifting climatic conditions. As we will see, the Dutch Republic was not one of those civilizations.

A NEW APPROACH TO THE HISTORY OF CLIMATE CHANGE

Scientists have long understood that Earth's climate has never been entirely stable, yet most historians have only recently accepted that climate changes influenced human history. The Little Ice Age in particular belatedly entered the mainstream of the historical profession owing to the pioneering work of scholars such Emmanuel Le Roy Ladurie, Hubert Lamb, and Christian Pfister, who first developed rigorous methods for reconstructing past climate changes and tying them to human histories.[9] In recent years, scholars have drawn on these methods and used a broadening range of textual and scientific sources to write increasingly sophisticated histories of the Little Ice Age. Still, nearly all conclude that cooling made life more difficult for just about everyone in the early modern world. They focus on examples of decline and disaster: admittedly the most common fate of premodern societies confronted with sudden or severe shifts in the environments they exploited. Yet most ignore societies that prospered in cold periods of the Little Ice Age, which means that they

[9] Rudolf Brázdil et al., 'Historical Climatology in Europe – the State of the Art'. *Climatic Change* 70:3 (2005): 366. Hubert Lamb, *The English Climate*. (London: English Universities Press, 1964), 12. Emmanuel Le Roy Ladurie, *Times of Feast, Times of Famine*, 10. Gustaf Utterström, 'Climatic Fluctuations and Population Problems in Early Modern History', *Scandinavian Economic History Review* 3:1 (1955): 3. Behringer, *A Cultural History of Climate*, 86. Emmanuel Le Roy Ladurie, *Times of Feast, Times of Famine: A History of Climate since the Year 1000*. (Garden City, NY: Doubleday & Company, Inc., 1971), 293. Lamb, *Climate, History and the Modern World*, 232. Christian Pfister, 'The Little Ice Age: Thermal and Wetness Indices for Central Europe', *The Journal of Interdisciplinary History* 10:4 (1980): 665. Christian Pfister, 'The Climate of Switzerland in the Last 450 Years'. *Geographica Helvetica* 35 (1980): 15.

rarely consider how individuals and communities could endure, adapt to, and exploit changes in the natural world.[10]

I therefore began my research for this book by searching for weather references, not disaster stories, in early modern Dutch documents. Occasionally, I specifically sought texts written during weather extremes, but even then I did not concentrate solely on the kinds of weather that other historians have associated with societal crises. By approaching my sources with an open mind, I found that relationships between climate change and human activity were, and perhaps remain, more complex and counterintuitive than narratives that stress decline, or 'declension' typically allow. There were winners and losers in the early modern struggle with climate change, just as there are today and will be in the future.

To trace the human consequences of climate change, in this book I carefully measure percentages and gauge probabilities. One of the book's most important principles is that seemingly slight changes in environmental conditions or human arrangements can have disproportionate consequences for people and their societies. The reason lies in the relationship between long-term trends and short-term events. A trend need only trigger one event for it to have major historical significance. More importantly, superficially slight trends are often expressed in short-term extremes. For instance, although Earth's average temperature has, as of 2017, risen by just over one degree Celsius since the conclusion of the Little Ice Age, severe heat waves are now four times more common around the world than they were in 1850. To take another example, a 30 per cent

[10] Fred Pearce, *Climate and Man: From the Ice Ages to the Global Greenhouse*. (London: Vision Books, 1989), 31. Neville Brown, *History and Climate Change: A Eurocentric Perspective*. (London: Routledge, 2001), 262. Bauernfeind and Woitek, 'The Influence of Climatic Change on Price Fluctuations in Germany during the 16th Century Price Revolution', *Climatic Change* 43:1 (1999): 307. Pfister, 'Climatic Extremes, Recurrent Crises and Witch Hunts', 39. Leo Noordegraaf, 'Dearth, Famine and Social Policy in the Dutch Republic at the End of the Sixteenth Century'. In *The European Crisis of the 1590s: Essays in Comparative History*, ed. Peter Clark. (London: George Allen & Unwin, 1985), 67. Joëlle Gergis, Don Garden, and Claire Fenby, 'The Influence of Climate on the First European Settlement of Australia: A Comparison of Weather Journals, Documentary Data and Palaeoclimate Records, 1788–1793'. *Environmental History* 15(3) (2010): 485. Wolfgang Behringer, *A Cultural History of Climate*. (Cambridge: Polity Press, 2010), 141. Adam R. Hodge, '"In Want of Nourishment for to Keep Them Alive": Climatic Fluctuations, Bison Scarcity, and the Smallpox Epidemic of 1780–82 on the Northern Great Plains'. *Environmental History* 17(2) (2012): 400. See also Sam White, Richard Tucker, and Ken Sylvester, 'Climate and American History: The State of the Field'. In *Cultural Dynamics of Climate Change and the Environment in Northern America*, ed. Bernd Sommer. (Leiden: Brill, 2015). Sam White, *The Climate of Rebellion in the Early Modern Ottoman Empire*, 12–14.

decline in the grain harvest could double the price of bread in many parts of early modern Europe, yet a 50 per cent reduction quintupled it. All of this should give us pause as we contemplate our warmer future.[11]

To write a book about such a vast topic, I had to draw some sharp and at times painful limits. The Little Ice Age undoubtedly affected land reclamation, agricultural production, pastoralism, and industry within the Dutch Republic. It influenced Dutch fisheries within the waters of the republic, the North Sea, and beyond. It helped cause catastrophic storm and river flooding, and it altered the efficiency of the West India Company, the Levantine trade, the Archangel trade, and other profitable but often brutal expressions of Dutch commercial might that are not covered in this book. Some scholars have either examined or started to examine how climate change influenced these and other aspects of the Dutch Golden Age. All the same, I was tempted to write a book that briefly touched on all these topics, one that was, in other words, a mile wide but an inch thick. Such a book, however, would have reflected a problematic trend in histories of climate change.

These histories can be wonderfully broad, covering a dizzying array of possible interactions between climate change and human affairs. But many also skip lightly over the ways in which global environmental change really affected people on the level of the transient local activities that ultimately shape human history. By ignoring how the influence of climate change cascades across different scales of space, place, and time, such books can also rest on one-dimensional understandings of causation. Ultimately, big histories like this one can either attempt to cover every aspect of a historical relationship, or give examples that reflect a broader pattern. I opt for the latter approach by exploring some of the best-sourced interactions between climate change and the history of the Dutch Golden Age. That has led me to examine weather patterns and social arrangements rarely examined by other historians, and it has, I hope, provided a novel perspective on humanity's long experience with climate change.

PREVIOUS SCHOLARSHIP AND FRESH SOURCES

The coastal regions of the Low Countries have long been especially susceptible to climate changes. They lie so far beneath sea level that even

[11] Parker, *Global Crisis*, 20. Fischer and Knutti, 'Anthropogenic Contribution to Global Occurrence of Heavy-Precipitation and High-Temperature Extremes', 1.

minor fluctuations in average temperature, precipitation, and storminess have made them vulnerable to flooding. Their average winter temperatures have usually lingered near freezing, so modest cooling or warming has dramatically altered the duration and extent of the ice that can form on their many waterways. They are relatively close to major extremes in atmospheric pressure, so they can endure profound changes in prevailing wind directions. Scholars have long studied how farmers and engineers have shaped the unusual environments of the Low Countries. Yet strangely, very few have investigated how the Little Ice Age changed those environments during the best-known period in the history of the Low Countries: the Golden Age of the Dutch Republic.

The reasons may lie in the dominant themes that run through historiographies of both Dutch environmental history and climate change. Historians of the Low Countries usually focus not on how environmental changes have influenced human actions, but rather on how human actions have led to environmental changes. They may mention weather, especially when describing life at sea, but they rarely describe how weather patterns changed over time in ways that mattered for people.[12] Meanwhile, historians of the Little Ice Age are often especially interested in the destructive consequences, for human beings, of climatic cooling or variability. From that perspective, the relative success of the Dutch Republic during decades of cooling and crisis might suggest that it was scarcely affected by climate changes. The prosperous Dutch appear only briefly in histories of the Little Ice Age, when they are mentioned at all.[13]

[12] For descriptions of how storms affected Dutch voyages to and within Asia, for example, see Jaap R. Bruijn, 'Between Batavia and the Cape: Shipping Patterns of the Dutch East India Company'. *Journal of Southeast Asian Studies*, 11:2 (1980): 260. Femme S. Gaastra, *The Dutch East India Company: Expansion and Decline*. (Zutphen: Uitgeversmaatschappij Walburg Pers, 2003), 114. Robert Parthesius, *Dutch Ships in Tropical Waters: The Development of the Dutch East India Company (VOC) Shipping Network in Asia 1595–1660*. (Amsterdam: Amsterdam University Press, 2010), 52. Maarten Hell and Wilma Gijsbers, 'Geborgen of gezonken, gered of verdronken: Papieren getuigen van scheepsrampen rond Texel (1575–1795)'. *Tijdschrift voor Zeegeschiedenis* 31:2 (2012): 45. This book draws from two erudite collections of weather-related primary sources and histories: J. Buisman and A. F. V. van Engelen (ed.), *Duizend jaar weer, wind en water in de Lage Landen, Vol. IV 1575–1675*. (Franeker: Uitgeverij Van Wijnen, 2000). J. Buisman and A. F. V. van Engelen (ed.), *Duizend jaar weer, wind en water in de Lage Landen, Vol. V 1675–1750*. (Franeker: Uitgeverij Van Wijnen, 2006).

[13] Behringer, *A Cultural History of Climate*, 111. Lamb, *Climate, History, and the Modern World*. 2nd ed., 228. Brian M. Fagan, *The Little Ice Age: How Climate Made History, 1300–1850*. (Boulder: Basic Books, 2000), 113. Brooke, *Climate Change and the Course of Global History: A Rough Journey*, 422.