

**Master's Thesis in History**

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## **Was There a ‘Tambora Crisis’?**

Linking volcanic impacts and early nineteenth century history



## **Abstract**

Historical interactions of climate and society are receiving intense attention. In this context, impacts of the 1815 Tambora eruption have been suggested as the cause of a global crisis with long-range repercussions. This thesis evaluates the merits of these claims, focusing on the issues of migration from the British Isles and the Kingdom of Württemberg, the famine in the Yunnan province in Qing China, and the first cholera epidemic originating in Bengal in 1817. These three topics serve as a prism to discuss how we can develop a model of climate-society interactions that is neither social nor climatically determinist, the potential and limitations in tracing the impacts of global climate change and in which ways this revision in history studies can qualify historiography more generally. Related to this are the challenges of writing global history large in spatial scale that easily gives precedence to material drivers of change – in this context the climate – that suppresses human agency. This thesis argues that the adoption of tools handed down from the cultural theories coupled with a conceptualization of global history as a perspective, not solely defined by spatial scale, may provide a way out of this determinist trap where synchronicity has the appearance of causality. This way, culturally specific particularities are not subsumed into teleological narratives of how societies succeed or fail due to changing conditions in the natural environment and allows us to gain insight into the complex and dynamic processes at the interface of humans and nature.

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**LAVA VULKAN** – Olivia, 01.03.2021.

Thank you, my first daughter, for opening this thesis to the point and in colors. You are my greatest inspiration and whenever I lose sight of what matters you are there to bring perspective. Thank you, Ebba, for getting me up in the mornings. You are my bundle of joy. Thank you, Heidi, for holding the four of us together. I love you. Thank you, mother, for endless and unconditional support. Thank you, prof. Dominik Collet, for also bringing perspective and for inspiring me to push forward.

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## CHAPTER 1: INTRODUCTION

On the eve of 5 April 1815, the inhabitants of Java in the Indonesian archipelago could hear a series of explosions which lasted overnight. Considering the news that Napoleon had returned with force back in Europe, the British troops who were stationed on the island prepared for a French invasion.<sup>1</sup> When ash fell from the sky the following day it became clear that the threat was not human after all and that the rumbling sounds originated from a volcano 1000 kilometers away. After centuries of dormancy, Mount Tambora on the island Sumbawa east of Java was due to explode. The magma chamber within the volcano had built up enough pressure to transfer a total of 50 km<sup>3</sup> of solid mass into the sky.<sup>2</sup> The mountain which prior to this seismic event is estimated to have measured 4200 meters above the Flores Sea now stands at 2850 meters. Over the course of this violent eruption, one third of Tambora got displaced and large amounts of volcanic ash was ejected into the stratosphere. In addition to the initial and disastrous impact on the areas near the volcano, the eruption had a disruptive effect on the global climate lasting several years. The sulfur aerosols circumventing the earth created a veil that partially blocked out the sun, causing global cooling and altered precipitation patterns.

In 1816, the monsoon season in parts of India and China was abruptly and the lack of rainfall led to droughts. The following year was characterized by an opposite trend with torrential rains and subsequent flooding in the same areas. In the northern hemisphere, where central Europe and North America were the most affected, average temperatures dropped by up to 3 degrees Celsius in 1816 with devastating effects on harvests. The global climate change triggered by the eruption of Tambora coincided with events of famine, mass migration and the spread of diseases on a global scale. A connection between volcanic impact on the climate and a wide range of political, economic, social, and cultural changes in this era has been suggested in recent contributions to the field of climate history. This thesis seeks to evaluate claims that this period marks a turning point for all of nineteenth century history and that volcano-induced climate change was a strong driver in this rupture.

In conjunction with the bicentennial of the 1815 Tambora eruption, two major historical studies were published on the subject. Wolfgang Behringer's *Tambora and the Year without a Summer: How a Volcano Plunged the World into Crisis* and Gillen D'Arcy Wood's *Tambora: The Eruption That Changed the World* chart the eruption's effect on the natural climate and humans.

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<sup>1</sup> Lady Sophia Raffles, *Memoir of the Life and Public Services of Sir Thomas Stamford Raffles* (London: James Duncan, 1835), 267.

<sup>2</sup> J. Kandlbauer and R.S.J. Sparks, "New Estimates of the 1815 Tambora Eruption Volume," *Journal of Volcanology*, vol. 286 (2014), 99.

In a big panorama, they trace numerous connections between volcanic impact on the climate and significant shifts in the trajectory of human societies on a global scale.<sup>3</sup> In their respective syntheses on the Tambora crisis, Wood and Behringer knock on the doors of historians who have sought to explain the turbulent period in the wake of the Napoleonic Wars within a national or Eurocentric framework while omitting the fact that this was also a period of great climate variability. Behringer concludes his monograph by suggesting a new master-narrative for this era which acknowledges the vulnerability of human culture to climate change:

Many phenomena of those years – the toppling of governments, mass protests, mass-migration, employment programs, agrarian reforms, the rise of new scientific disciplines, religious renewal, river regulation, pauperism, the introduction of technologies, the founding of savings banks and life insurance, the power shift in international politics, etc. – only make sense against the background of the Tambora Crisis.<sup>4</sup>

Of course, these claims stand or fall on the premise that volcanism has the potential to alter the natural climate and that the years after the Tambora eruption was a period of anomalous weather. With respect to the first point, it is generally accepted in the natural sciences that large volcanic eruptions “impact climate through the injection of sulfur into the stratosphere, which increases the abundance of stratospheric aerosol and its capacity to scatter incoming solar radiation and cool the Earth’s surface.”<sup>5</sup> Attempts to explain the unusual weather observed in this period can be found in the transdisciplinary collection *A Year Without Summer? World Climate in 1816* edited by C.R. Harington, where volcanologists, glaciologists, climatologists, tree-ring experts, geographers, historians, and biologists made efforts to put together “the clearest picture possible of weather and climatic sequences in different parts of the world during 1816”.<sup>6</sup> They conclude that there is “a strong case for a volcanic influence on the climate. It is highly probable that what we are seeing in 1816 is in part a reaction of the surface climate to the massive injection into the atmosphere of dust and sulfur from the eruption of Tambora the previous year”.<sup>7</sup>

Recent contributions from the natural sciences on this subject have since supplemented and nuanced some of the conclusions in this volume, but it is still widely accepted that the eruption

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<sup>3</sup> Wolfgang Behringer, *Tambora and the Year without a Summer: How a Volcano Plunged the World into Crisis* (Cambridge: Polity Press, 2019), originally published in German as *Tambora und das Jahr ohne Sommer: Wie ein Vulkan die Welt in die Krise stürzte* (Münich: C.H. Beck, 2015) and Gillen D’Arcy Wood, *Tambora: The Eruption that Changed the World* (Princeton: Princeton UP, 2014).

<sup>4</sup> Behringer, 267.

<sup>5</sup> Toohey et al., “Disproportionately Strong Climate Forcing from Extratropical Explosive Volcanic Eruptions,” *Nature Geoscience*, vol. 12:2 (2019), 100.

<sup>6</sup> Charles R. Harington, ed., *The Year Without a Summer? World climate in 1816* (Ottawa: Canadian Museum of Nature, 1992), 6.

<sup>7</sup> C. Wilson, “Workshop on World Climate in 1816: A Summary and Discussion of Results,” in *The Year Without a Summer?*, Harington, 549.

of Tambora was the main cause for of the anomalous weather between 1815 and 1817.<sup>8</sup> There are currently around 1500 active volcanoes in the world, many of which have the potential to wreak havoc on the climate. Knowledge about the societal impact of volcanic eruptions might therefore be valuable in a future where the earth system is already destabilized by anthropogenic climate change.

In recent memory is the 2010 eruption of the Icelandic volcano Eyjafjallajökull. The ejected volcanic material famously halted air traffic in the northern hemisphere for a few days. For this occasion, ‘askefast’ entered the Norwegian vocabulary – used both as an adverb and an adjective to describe a situation where a person is stuck in an airport and unable to travel due to volcanic ash which interfered with the airspace. The language council of Norway picked this as ‘the word of the year’ in 2010.<sup>9</sup> Jens Stoltenberg, prime minister of Norway at the time, discovered while ‘askefast’ in New York the wonders of his newly acquired iPad which allowed him to communicate with colleagues back home, all the way across the Atlantic Ocean.<sup>10</sup> The case of Eyjafjallajökull suggests that the impact of volcanic eruptions may be traced beyond its climatic consequences. This 2010 event is rated at 4 on the Volcanic Explosion Index (VEI).<sup>11</sup> The 1815 Tambora eruption, on the other hand, is measured at a VEI of 7 and has been classified as the largest volcanic eruption in human history.<sup>12</sup> Thus, the impact of Tambora was comparatively far more severe on the earth system and it is probable that the consequent adverse effects on humans in this period went beyond reduced opportunities of mobility and lost revenue for travel companies.

This thesis will focus on three of the claims made by Wood and Behringer on the connection between the eruption of Tambora and social developments in the early nineteenth century, related to migration, famine and cholera. The aim is to use these cases as a prism to discuss how historians can comfortably connect natural events to societal phenomena and whether the climate can be seen as a global connector in this context. The research questions are introduced at the end of this section before the state of research and theory are presented. Chapter 2 gives exposure to the claim that volcanic impact on the climate caused large-scale migration from

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<sup>8</sup> Stefan Brönnimann and Daniel Krämer, *Tambora and the “Year Without a Summer”, A Perspective on Earth and Human Systems Science, Geographica Bernensia* (2016). A collection of texts based on a conference on the volcanic impact of Tambora on the climate and societies held in Bern in 2015.

<sup>9</sup> Språkrådet, “Oskefast/askefast: ordet for året 2010“, 24 December 2010.

<sup>10</sup> CNN, Stranded leader runs country from iPad, 17 April 2010.

<sup>11</sup> VEI: a logarithmic scale used to measure the relative explosiveness of volcanic eruptions.

<sup>12</sup> Shuji Cao, Yushang Li and Bin Yang, “Mt. Tambora, Climatic Changes, and China’s Decline in the Nineteenth Century,” *Journal of World History*, 23:3 (2012), 588.



Europe to North America and Russia in the years 1816-1820. An immediate concern here is the fact that migration is a recurring phenomenon in human history and can be traced at times and between places where climatic stress was not a factor. In this context however, where variability in the weather coincide with rising prices of grain in premodern agrarian economies – connecting climate change to human relocation does not seem that farfetched. Chapter 3 addresses the famine in the Yunnan province in Qing China between 1815 and 1817. Devoting a large part of his book to this event, Wood makes use of rich and varied source material to develop a convincing case for its connection to climate change. The connection is less clear, however, when the causal chain is extended to general decline of the China in the nineteenth century. Chapter 4 investigates the connection between the eruption of Tambora and the cholera epidemic originating in the Bengal region in India in 1817 which over the course of the nineteenth century claimed millions of lives on a global scale. Issues with this link can be brought into view by charting the impact of the current Covid-19 epidemic which reveals how social involvement significantly affects the spread of disease.

These points imply that there is no binary explanation to be found in the attempt to disentangle human-nature relations in this period. What remains then, is the question of where Wood and Behringer's studies can be situated on a scale between climate determinism, where climate is overemphasized as a dominant factor, and social determinism, where natural factors are ignored altogether, and of what can be gained from their studies – which is finally discussed in chapter 5.

The approach and path of this thesis has been chosen considering the limitations of the Covid-19 epidemic with respect to travel and archival research. Consequently, it is informed primarily by secondary literature and research from the natural sciences. Relevant primary sources available digitally or in UiO's libraries are also included. This thesis is however not merely an extended review of Wood and Behringer's texts but is built on the premise that their monographs stand for a main concern in history that is larger than their own case-specific arguments. Their studies on Tambora are reflective of a trend of bringing climate back into history and will serve as a hook to engage with the larger research debate on how climate and history go together.

This thesis gives an independent analysis of Wood and Behringer's claims and seeks to critically contextualize their arguments by confronting them with research that they themselves have not included, before discussing what bearings this has on historiographical practice more generally. The three topics of migration, famine and epidemics are some of Wood and

Behringer's main concerns in the context of the 'Tambora crisis', and these topics are of much interest for those engaging with environmental impacts in history in other periods and contexts. Furthermore, the relationship between climate and the issues of migratory movement, food availability and health are frequently debated in current climate change discourse. Hence, the three cases were chosen in part because they are relevant fields of discussion in a transdisciplinary context, but also because we can use them as a litmus test to see if there is anything that they bring to historiography that we would otherwise miss.

The research question of this thesis is twofold: Through the three case studies, it evaluates if volcanic impacts on the climate did indeed affect 19<sup>th</sup> century societies and seeks to answer whether the hypothesis that the 1815 Tambora eruption marked a global cesura is feasible. On a larger historiographical level it asks: What can be gained from (re-)introducing climatic impacts to historical narratives, and how can we tell more complex stories of humans and nature that are socially nor climatically determinist?

### **1.1 State of research**

Wood and Behringer are not the only scholars who have investigated the human effects of the 1815 Tambora eruption, but their books on the subject have been chosen as the point of departure for this thesis for three reasons. First, because they are currently the only syntheses on the subject and thus apply for the role as reference points for further research. Second, because both authors rock the boat and go relatively far in some of their claims of the eruption's direct consequences for human societies compared to existing research. Both authors connect the 1815 Tambora event to a diverse list of social, political, economic, cultural, and technological phenomena in the period and argues that volcanic impact was an important trigger for these, many of which can be traced for several decades after the eruption. In their framing of early nineteenth century history, it was not the majestic figure of Napoleon that paved the way for the transition to modernity and the liberal state, but rather the one of Mount Tambora. Third, they explicitly situate their studies within the field of climate history and under the global history label, areas in history that currently attract a lot of attention.

Behringer opens his book on the 'Tambora crisis' on the assumption that the natural climate exerts influence on human societies. To test whether this is true in the case of volcano induced climate change the years after 1815, he frames his study as "an experiment in which all of humanity involuntarily participated".<sup>13</sup> Different cultures and societies are then compared to

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<sup>13</sup> Behringer, *Tambora and the Year without a Summer*, 6.

tell the story of how some were able to cope “effortlessly” while others went into “protracted decline”.<sup>14</sup> These character traits are symptomatic of other and influential world histories that also allow agency to nature, like Jared Diamond’s *Collapse* or Terje Tvedt’s recent *World History: With the past as a mirror*. Diamond and Tvedt compare different cultures while measuring degrees of resilience and vulnerability to discuss in which ways the trajectories of societies are constituted by conditions in the natural environment. This has forced many, both within and outside academic circles, to consider the possibility that environmental factors fundamentally impact societies and have done so throughout human history. They have also, with these macro-perspective studies, revealed the limitations of national histories in explaining developments that are affected by material factors that transcends political borders.

Of course, these big narrative histories stay coherent through some degree of simplification and at a cost of omission which dissenting voices have lined up to point out.<sup>15</sup> Others have addressed what is arguably more pressing concern – the question of what role these non-human natural factors should play in explaining historical processes and how they should be weighted in relation to social factors.<sup>16</sup> Thus, what is at stake here runs deeper than a question of complete coverage across time and space or whether Durkheim’s notion that ‘social facts explain social facts’ is still valid, and brings into view some of the current anxieties of history.

In *Writing History in the Global Era*, Lynn Hunt pokes her finger in an open wound and asks “what is [history] good for?”<sup>17</sup> Hunt charts the historiographical development from Leopold von Ranke’s seminal contributions to the discipline in the early nineteenth century and follows its role as a nation builder until being permeated by the social and subsequent cultural theories of the twentieth century, before ultimately arriving in the 21<sup>st</sup> century where it is not clear which paradigm defines the field. In short, she proposes global history as a contender to fill the current void left by the cultural theories that faltered in making sense of a deeply interconnected world where human-nature relations are also addressed. She warns, however, against receding to the teleological nature of modernization theory, dialectical Marxism, or the Annales school in the process of adopting this paradigm – namely those that the cultural theories sought to replace.<sup>18</sup> In these traditions non-human material factors, be it the modes of production in Marxism or the

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<sup>14</sup> Behringer, *Tambora and the Year without a Summer*, 2.

<sup>15</sup> See the debate in Klassekampen in autumn 2020 triggered by Tore Linnè Eriksen’s book review of Tvedt’s *World History: With the past as a mirror* (Oslo: J.M Stenersen Forlag, 2020).

<sup>16</sup> Patricia McAnany and Norman Yoffee, eds., *Questioning Collapse* (New York: Cambridge UP, 2010). A collection of essays that challenge many of the claims by Jared Diamond in *Collapse* (London: Penguin, 2005).

<sup>17</sup> Lynn Hunt, *Writing History in the Global Era* (New York: W.W Norton & Company, 2014), 1.

<sup>18</sup> Hunt, 43.

'longue durée' and deep structures of the Annales school, are important drivers of historical change. Although, as the cultural theories revealed, at the cost of reflexivity and human agency.

The general reluctance among historians in recent decades to accept natural factors as movers of change can in part be understood considering this development. Thus, attempts at climate history that seek to make persuasive arguments about the interactions between human societies and nature on a global scale while avoiding determinist or teleological traps are faced with a wide range of theoretical and methodological challenges. What kind of interactions between humans and nature constitute social change, what approach to global history is best suited to reveal these intricate entanglements and what is to be gained from investigating environmental impacts? Considering a long tradition of climate determinism where historians have attributed everything to climate and on the other side a more widespread tradition of those completely ignoring it, this thesis investigates a revision in history studies that seeks to explore transnational issues where the climate might be situated as a link rather than a determinant.

### **1.1.1 Climate in history**

The idea that the climate influences human societies is not new and can be traced all the way back to the Histories of Herodotus where geography and cultures was understood as deeply interlinked. Enlightenment thinkers picked up the thread in the eighteenth century and inspired geographers in the early twentieth century to investigate how weather patterns specific to regions largely determines the culture, economies, and ways of life in these places.<sup>19</sup> Historians in the same period were not equally enthusiastic about climate as an explanatory tool, but natural factors were seldom disregarded altogether. In his groundbreaking work on the Mediterranean in the early modern period, Fernand Braudel was one who made a notable effort to show how nature impacted societies in the past. Braudel held that these conditions are predictable and determined by recurring seasonal cycles:

This first part is devoted to a history whose passage is almost imperceptible, that of man in his relationship to the environment, a history in which all change is slow, a history of constant repetition, ever-recurring cycles. I could not neglect this almost timeless history, the story of a man's contact with the inanimate, neither could I be satisfied with the traditional geographical introduction to history that often figures to little purpose at the beginning of so many books [...] as if the flowers did not come back every spring, the flocks of sheep migrate every year, or the ships sail on a real sea that changes with the seasons.<sup>20</sup>

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<sup>19</sup> Montesquieu and Hume in the eighteenth century and notably the works of Ellsworth Huntington (1876-1947), Thomas Griffiths Taylor (1880-1983) and Owen Lattimore (1900-1989).

<sup>20</sup> Fernand Braudel, *The Mediterranean and the Mediterranean World in the Age of Philip II* (London: Harper Collins, 1972 [1949]), vol 1, 20.

The assumption that nature was mainly a static backdrop for human activities persisted into the second half of the twentieth century. A river or a mountain pass could have affected the outcome of a battle, but only in the sense that they were there, patiently awaiting human interference. This view was challenged by another historian associated with the *Annales* tradition. In Emmanuel Le Roy Ladurie's *Times of Feast, Times of Famine, A History of the Climate Since Year 1000*, the concept of a more dynamic nature susceptible to change was developed. Here, Le Roy Ladurie analyzed data from wine grape harvests and written accounts of glacier positions to reconstruct past climates. He was thus able to identify a relative cooling period in early modern Europe and helped establish the concept of the Little Ice Age (LIA). Although alluding to the long-term consequences of climate change on societies in this period, he hesitated to make claims on this connection in fear of being written off as a climate determinist.<sup>21</sup> In demonstrating the opportunities in analyzing often overlooked human sources to reconstruct past climates, Le Roy Ladurie's study attracted attention from the natural sciences and climate history gained traction as a transdisciplinary oriented field.

Acknowledging that the natural sciences alone were not able to give a full and coherent picture of past weather, the climatologist Hubert Lamb welcomed contributions from historians whose skillset could help fill the gaps in climate reconstructions that were based primarily on data from proxies like tree-rings, ice core samples or lake sediments.<sup>22</sup> Human archives like weather diaries, harvest dates or even paintings have the potential to tell something about past weather on spatial and temporal scales that are glossed over by the proxies that the natural sciences rely on. Thus, historians can aid in increasing the resolution of climate reconstructions, but also bring into view climate as a cultural category and not just as an abstract concept projected through numbers.

The impression of natural phenomena like volcanic sunsets for instance, can be observed in many of W.M.J Turner and Caspar David Friedrich's paintings from the Tambora years. Or in Edvard Munch's "The Scream" where the red sky is thought to have been an expression of the vivid sunsets produced by the eruption of Krakatoa in 1883. This painting is admittedly dated ten years after the eruption, but the inspirational moment for Munch's most famous painting is

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<sup>21</sup> Sam White, Christian Pfister and Franz Mauelshagen, eds., *The Palgrave Handbook of Climate History*, (London: Palgrave Macmillan UK, 2018), 7.

<sup>22</sup> Michael McCormick, "Climates of History, Histories of Climate," *The Journal of Interdisciplinary History*, vol. 50:1 (2019), 20.

according to Olson et al. likely to have been at the time when the veil of volcanic ash from Krakatoa was still fleeting in the upper stratosphere.<sup>23</sup> From Munch's diary:

I was walking along the road with two friends – the sun set – and I felt a touch of melancholy – all at once the sky became blood red – I stood still and leaned against the railing, dead tired – flaming clouds hung like blood and sword above the blue-black fjord and the city – my friends went on – I stood there, trembling with anxiety – and I felt as though a great unending scream was piercing through nature.<sup>24</sup>

This universal symbol of anxiety shows that the climate is not *one* thing and suggests that cultural and historically situated contexts may reveal diverse understandings of the weather and how it changes over time. Reconstructions of the climate was the dominating approach in climate history until the 1990s and since then, studies on societal impacts and responses, the uses and abuses of climate knowledge, and cultural constructions and perceptions of climate have also defined the field.<sup>25</sup> Research in these categories use the physical characteristics of climate as a starting point or foundation to explore what happens when human and natural processes converge. In the discipline of history where human and natural histories have been kept at a safe distance since the Enlightenment, this revision has the potential to challenge explanations for historical processes where the climate has been left out of the equation.

### **1.1.2 Human-nature interactions on a global scale**

Renewed interest in the climate among historians accompanied the spatial turn towards the end of the twentieth century and the freshly minted concept of the Anthropocene – a new geological epoch defined by the notion that humans in themselves have become a force of nature.<sup>26</sup> By recognizing this capacity of our species, many have argued that the cleft between humans and nature that has been sustained and widened by most sciences in the past two centuries must be abridged.<sup>27</sup> The reasoning behind this perspective is that if humans are capable of altering the climate and leave permanent marks on the earth, much in the same way as volcanic eruptions and tectonic shifts, our species can no longer be understood as something distinct from nature but inextricably entangled with it. Research in the transdisciplinary environmental sciences make efforts to disentangle this relationship so to gain insight into the ways in which natural factors affect societies and vice versa. And within this paradigm, historians have asked whether

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<sup>23</sup> M.S. Olson, D.W. Olson and R.L. Doescher, "On the Blood-Red Sky of Munch's the Scream," *Environmental History*, 12:1 (2007), 130.

<sup>24</sup> Olson, Olson and Doescher, 130.

<sup>25</sup> Mark Carey, "Climate and history: a critical review of historical climatology and climate change historiography," *WIREs Climate Change*, vol. 3:3 (2012), 234.

<sup>26</sup> Paul J. Crutzen and Eugene F. Stoermer, "The Anthropocene," *Global Change Newsletter*, 41 (2000), 17-18.

<sup>27</sup> Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory* (Oxford: Oxford UP, 2005) and Philippe Descola, *Beyond Nature and Culture* (Chicago: University of Chicago Press, 2013) – Two influential anthropologists who have sought to reformulate how humans relate to nature.

it might have been this way for a long time and not just a dynamic exclusive to the context of anthropogenic climate change. For instance, recent archeological research has shown that forager societies in the Late Pleistocene 92 000 years ago substantially modified ecosystems with fires that “relaxed seasonal constraints on ignitions, influencing vegetation composition and erosion” which in turn “operated in tandem with climate-driven changes in precipitation to culminate in an ecological transition to an early, pre-agricultural anthropogenic landscape.”<sup>28</sup> Findings like this challenge the conceptualization of the Anthropocene as a manifestation of modernity and invites to a Long Anthropocene which can make historical expertise relevant in discussions about future climate change.<sup>29</sup>

Increased knowledge about the climate and how it changes over time have allowed historians to explore how this variability has affected past societies and how different cultures have responded to changing conditions in the natural environment. Considering that the climate cares little for political borders, many have argued that investigations into the relationship between humans and nature calls for a global view.<sup>30</sup> Thus, several influential studies in the field of climate history are global in scope and share many of the same character traits as Wood and Behringer’s studies on Tambora. Global histories large and ambitious in both spatial and temporal scale are however bound to generate some unease among many historians. Throughout the twentieth century, messy big histories and grand narratives were gradually replaced with finely honed studies that were small in scale but powerful in highlighting the minutia of complex processes which in turn could be translated into a larger context. Do we throw E.P Thompson out the window just because climate is the new kid on the block?

Some would think so and have done so<sup>31</sup>, but most studies in the field show an awareness of the potential and limitations of different scales. However, research following global climate change gives less wiggle room in this regard and forces historians to look beyond the lines in the map separating one nation-state from another. It appears that there is no current consensus on how to best respond to this methodological challenge. Consequently, interested readers have in the last decade been presented with several monumental works that all take different

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<sup>28</sup> J.C. Thompson et al., “Early human impacts and ecosystem reorganization in southern-central Africa,” *Science Advances*, vol. 7:19 (2021), 1.

<sup>29</sup> Ann MacGrath and Mary A. Jebb, eds., *Long History, Deep Time: Deepening Histories of Place* (Acton: Australian National University Press, 2015).

<sup>30</sup> Dipesh Chakrabarty, “The Climate of History: Four Theses,” *Critical Inquiry*, vol. 35:2 (2009) and Sebastian Conrad, *What is Global History?* (Princeton: Princeton UP, 2016).

<sup>31</sup> Jared Diamond’s *Guns, Germs and Steel: The Fates of Human societies*, (London: Penguin, 1998) is large in spatial and temporal scale and charts the formative effect of conditions in the natural environment on civilizations.

approaches to chart the role of climate change in history on a global scale. Two will be introduced here; *The Great Transition: Climate, Disease and Society in the Late-Medieval World* by Bruce Campbell and *Global Crisis: War, Climate Change and Catastrophe in the Seventeenth Century* by Geoffrey Parker.<sup>32</sup>

These works do not cover the same period as Wood and Behringer's books on Tambora, nor do they follow the same approach, but what all four seek to explain is strikingly similar. Curiously, they also have one big claim in common: the explanation for the 'Great Divergence'. Campbell, Parker, Wood and Behringer challenge the thesis of Kenneth Pomeranz and argues that the acceleration of Europe and decline of China must be understood against the background of climate change, but they disagree on the origins of this development. Campbell holds that the separate pathways can be traced back to the late Middle Ages, Parker identifies the divergence from the general crisis in the seventeenth century and Wood and Behringer argues that it was yet another Tambora effect.

At the center of these stories is the climate, or more specifically climate change, and how this can be connected to a global crisis with long-term effects for societies all over the world. Campbell charts these connections through the late Middle Ages and Parker is concerned with the seventeenth century – respectively at the beginning and in the middle of the Little Ice Age. Wood and Behringer's studies on Tambora can then be neatly situated at the end of this relative cooling period, but the LIA is less relevant to their overall thesis considering the severe, but temporary, shock of volcanic impact on the climate as opposed to the more sustained decrease in mean temperatures from the late Middle Ages and throughout the early modern period. Nevertheless, a premise for the claims in these studies is that the climate changed and crises for human societies ensued.

Campbell relies heavily on research from the natural sciences to develop his thesis that the Black Death in the fourteenth century was caused by changes in the climate. Pretty much half of *The Great Transition* is a deep dive into the microbial universe of the *Yersinia pestis* and the complex meteorological processes that facilitated its spread. Fascinating, inspiring, and often impregnable to this reader, Campbell arguably demonstrates the untapped potential in seriously engaging with research that historians usually shy away from, but also that it comes at a cost:

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<sup>32</sup> Bruce Campbell, *The Great Transition: Climate, Disease and Society in the Late-Medieval World* (Cambridge: Cambridge UP, 2016) and Geoffrey Parker, *Global Crisis: War, Climate Change and Catastrophe in the Seventeenth Century* (New Haven: Yale UP, 2014).



At Wanxiang Cave, close to the northern limit of the east Asian summer monsoon in northern China, an equivalent speleothem-based index of precipitation documents a broadly synchronous chronology of persistently strong monsoon rains from the mid-tenth to the beginning of the fourteenth centuries, similarly interrupted by a marked weakening of the monsoon during the Oort solar Minimum from the 1030s to the 1080s (Figure 2.5A).<sup>33</sup>

Failing to understand is of course no reason to denounce something and that is not the point, but there are surely others who may be interested in this subject who find it similarly challenging to comprehend the sheer complexity of what Campbell proffers. And so, books like *The Great Transition* might not be the ideal mascot for the field of climate history if the goal is not to discourage newcomers. Also, one reviewer has noted that this heavy focus on research from the natural sciences comes with some caveats: “Long in the making, the book will soon be out of date in some particulars due to the new data and interpretations gushing forth at alarming speed in the fields of paleoclimatology and paleogenomics”.<sup>34</sup> This discrepancy in publishing rates between fields in the humanities and the natural sciences, or the social sciences for that matter, reveals one of the big challenges for transdisciplinary collaboration. Parker’s book, also long in the making<sup>35</sup>, provides no immediate solution to this problem, but he asks many of the same questions as Campbell and seeks to answer them differently.

*Global Crisis* is a weighty one, almost twice the size as *The Great Transition* and similarly detailed in the analysis of socio-ecological interactions. Parker is conscious of the problems with a truly global view and compensates for this by giving voice to numerous individuals in the period. Climate change affects every continent, but it is mostly through these witnesses at a local level that we gain insight into its effects on seventeenth century societies. The central thesis in *Global Crisis* is that the Little Ice Age caused failed harvests in agrarian societies with consequent famines and that this causal chain coupled with wars and social unrest triggered a ‘fatal synergy’ of interactive factors which led to increased mortality rates which reversed the sustained population growth of the preceding century across Eurasia. Parker’s *Global Crisis* has garnered much praise for giving a fresh perspective on the general crisis of the seventeenth century and for paving the way for future research on the many topics he covers, but also some criticism regarding the cost of his ambitious approach.

Environmental historian Paul Warde takes issue with Parker’s application of terms like ‘synergy’, ‘tipping point’ and ‘crisis’ – arguing that “if they are not taken as an invitation to

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<sup>33</sup> Campbell, *The Great Transition*, 43.

<sup>34</sup> J.R. McNeill, “The Great Transition: Climate, Disease and Society in the Late-Medieval World (Review),” *Journal of World History*, 29:1 (2018), 112.

<sup>35</sup> Geoffrey Parker, “The Genesis of “Global Crisis,” *Journal of World History*, 26:1 (2015), 144. Parker began working on *Global Crisis* in 1997 and it was published in 2013.

precision, they have a tendency to obfuscate rather than enlighten; like a baggy suit, they can be made to fit anything but reveal little of what lies beneath”.<sup>36</sup> Jan de Vries is equally concerned about the potential pitfalls with these concepts and argues that Parker’s approach to show that the ‘Great Divergence’ originated in the seventeenth century “reduces the economy to little more than a direct physical relationship weather and harvest results, but seventeenth-century economies in most of Eurasia were not that simple.”<sup>37</sup> Campbell similarly invokes the idea of ‘tipping points’ and a ‘perfect storm’ of human and natural factors to show the far-reaching and severe effects of climate change and disease on late medieval societies, and his explanation for the ‘Great Divergence’ has been challenged by economic historian Èric Chaney on the same grounds as de Vries’ criticism of Parker.<sup>38</sup> Wood and Behringer also resort to these terms as explanatory tools in their syntheses on Tambora.

### 1.1.3 The ‘Tambora crisis’

The main thesis of Wood and Behringer is one that they share and can be inferred from the titles of their books on the subject: *Tambora and the Year without a Summer: How a Volcano Plunged the World into Crisis* and *Tambora: The Eruption that Changed the World*.<sup>39</sup> Both authors hold that (1), the climate changed, (2), it was a period of crisis, and (3), that this changed the world. A central premise in these studies is that the simultaneous events of chaos, disorder and despair which can be traced through every continent after the eruption were not accidental, mere mishaps or driven by internal dynamics, but developments triggered and driven by volcano induced climate change which constituted a shared, but not universal, experience of crisis for those affected. This, in turn, destabilized governments and economies and transformed societies. In other words, the eruption instigated a period of temporary but extreme stress on many societies with long-lasting repercussions. Consequently, the ‘Tambora crisis’ is for Behringer the cornerstone in a new master-narrative for the nineteenth century where everything from the invention of the bicycle in 1817 to the ‘Great Divergence’ were ultimately the product of material pressures caused by volcanic impacts on the climate. Wood similarly regards these years as a defining moment in early nineteenth century history and repeatedly warns against underestimating the importance of Tambora in explaining short and long-term historical developments originating in this period.

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<sup>36</sup> Paul Warde, “Global Crisis or Global Coincidence,” *Past & Present*, vol. 228 (2015), 297.

<sup>37</sup> Jan de Vries, “The Crisis of the Seventeenth Century,” *The Journal of Interdisciplinary History*, vol. 44:3 (2014), 375.

<sup>38</sup> Èric Chaney, “Medieval Origins: A Review Essay on Campbell’s *The Great Transition*,” *Journal of Economic Literature*, vol. 56:2 (2018).

<sup>39</sup> Former: Behringer, latter: Wood.

Wolfgang Behringer is a professor in early modern history at Saarland university and is primarily known for his works on witchcraft prior to his contributions to climate history. In the 2004 study *Witches and Witch-Hunts: A Global History*, Behringer compares episodes of witch-hunts in early modern Europe to similar phenomena in contemporary societies – primarily in parts of Africa, but also in tribal groups in Australia, America, and Asia. This work is methodologically similar to the broad approach in his study on Tambora. In *A Cultural History of Climate*, first published in German in 2007, Behringer extends the temporal scope of his study and charts global climate change and its impact on human societies, primarily in Europe, from the last ice age and until today. Aimed at a wider audience, it has been translated into six languages with a Chinese version in preparation.<sup>40</sup> It went on to become a bestseller after its publication but have also attracted criticism by fellow scholars.<sup>41</sup> Despite converging on the same time period, *A Cultural History of Climate* is never mentioned in his monograph on Tambora. Gillen Wood has also written extensively on climate change in history, but from a different background than Behringer.

Gillen D’Arcy Wood is a professor in environmental humanities and English and is currently Associate Director at the Institute for Sustainability, Energy and Environment at the University of Illinois. He is not a historian by craft, but originally a scholar of romantic literature whose most recent publications can be situated within the field of climate history.<sup>42</sup> This academic background colors his study on Tambora where a plethora of poets and novelists serve as important witnesses to the extreme weather in this period. The poems of Li Yuyang which are introduced in chapter 3, for instance, was never translated into other languages before Wood reached out to colleagues in China who assisted in translating Yuyang’s work.

Behringer takes a broad comparative approach through a chronological narrative form and Wood explores the volcanic impact on the climate and societies through more distinct case studies where for instance the first cholera epidemic originating in Bengal in 1817 and the famine in Yunnan makes up one chapter each.<sup>43</sup> Compared to Behringer, Wood sacrifices some spatial coverage to make room for more detailed accounts of regional meteorological processes and the voices of individual witnesses, in many respects akin to Parker’s *Global Crisis*. The

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<sup>40</sup> List of Behringer’s publications: <https://www.uni-saarland.de/lehrstuhl/behringer/publikationen/monographien.html>

<sup>41</sup> See the scolding essay by Rüdiger Hauge ““Keep Calm?” A Critique of Wolfgang Behringer’s “A Cultural History of Climate,” *Journal of Environmental Studies and Sciences*, vol. 9:4 (2019), or Mike Hulme’s more sober review from 2010 in *Reviews in History*.

<sup>42</sup> List of Wood’s publications: <https://experts.illinois.edu/en/persons/gillen-darcy-wood>

<sup>43</sup> Out of 9 chapters in the main body.

descriptions of the climate are based on palaeoclimatological research and reconstructions of the climates for the relevant period, and studies in microbiology and epidemiology also enters the fold. Both rely heavily on secondary literature and the canon in subfields like medical history and migration history, but also include primary sources like chronicles, news gazettes and contemporary literature like the works of Lord Byron, Johann Wolfgang von Goethe, and Mary Wollstonecraft Shelley. Wood shows that many works in romantic literature from this period, particularly Shelley's *Frankenstein*, were largely affected by the anomalous weather. Statistics rarely enters the discussion.

Collectively, Wood and Behringer's syntheses on Tambora make a strong case for the importance of acknowledging the link between human and natural factors and demonstrate convincingly that any historian of this period would be hard-pressed to dismiss the role of climate change in the years after 1815 altogether. Global historian Sebastian Conrad applauds Behringer for compiling a diverse collection sources to make "the best synthesis on the subject to date" but argues that the book is less persuasive "when it transforms the "Tambora crisis" from a circumscribed event with large ramifications into the keystone for a new master narrative of the nineteenth century".<sup>44</sup>

Wood and Behringer goes far in tracing volcanic impact to developments after the Tambora period and into the twentieth century but are seldom concerned with trajectories preceding the eruption – even the immediately preceding Revolutionary and Napoleonic wars are for instance only mentioned in passing. Consequently, the question of appropriate temporal scales is also addressed by climate historian Dominik Collet who notes that some of Behringer's claims, like those related to pauperism, migration, and antisemitism, could benefit from a longer view prior to 1815.<sup>45</sup>

Conrad posits that Behringer's approach of systematic comparisons is reminiscent of an older trend in global history which has been replaced by more attention paid to the connections and mobility, or entanglements, between societies. In Conrad's view, the focus on internal dynamics within different societies running in parallel risks overlooking the possibility that the vulnerability and resilience of these societies to climatic stress were affected by the interconnections between them. He holds that it is likely that they were, considering that this was a period where every continent was deeply entangled through markets, imperialism, and

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<sup>44</sup> Sebastian Conrad, "Tambora und das Jahr ohne Sommer: Wie ein Vulkan die Welt in die Krise stürzte," *The American Historical Review*, vol. 122:4 (2017), 1174.

<sup>45</sup> Dominik Collet, "W. Behringer: Tambora und das Jahr ohne Sommer," *H-Soz-u-Kult* (2016).

cultural exchange.<sup>46</sup> Wood's book on Tambora has received numerous reviews in various journals, but these are generally short and celebratory more than developed and critical. Considering the many similarities between the two monographs on Tambora, however, much of the criticism presented above can arguably be applied to Wood's book as well.

Their claims depend to a large extent on the explanatory power of the climate as an agent of change in historical developments. This requires Wood and Behringer to first demonstrate the presence of anomalous or extreme weather on a global scale in the years after the eruption of Tambora. When this is settled, they must chart the local effects of these changes in the climate and subsequently measure the societal responses to whatever problems that may arise from adverse and unexpected conditions in the natural environment. This is, in theory, what they aim to do, and both are convinced that the insights gained from their treatment of the 'Tambora crisis' are valuable in the context contemporary climate change discourse: "If a three-year-climate change event in the early 1800s was capable of such destructions and of shaping human affairs to the extent I have described in this book", declares Wood, "then future impacts of multidecadal climate change must be truly off the charts."<sup>47</sup> Behringer argues that "those interested in the problems of present and future climate change should know the historical example of Tambora".<sup>48</sup> In other words, there is much at stake.

Wood and Behringer attempt to explain the relationship between climate change and societies, but neither go into much detail on what theoretical and methodological basis they are going to achieve this. The former asserts that his emphasis is "less on nature's impact on history – far less crude environmental determinism – but on Tambora as a case study in the fragile interdependence of human and natural systems."<sup>49</sup> Behringer alludes to a similar perspective; "The reactions to the crisis offer an example of how societies and individuals respond to climate change, what risks emerge and what opportunities may be associated with it".<sup>50</sup> Accordingly, neither of them are conspicuously social nor climatically determinist, but these positions are arguably not just binary antagonists. Hence, this thesis seeks to situate Wood and Behringer on a scale where those two positions represent opposite extremes.

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<sup>46</sup> Conrad, "Tambora und das Jahr ohne Sommer," 1175.

<sup>47</sup> Wood, *Tambora*, 233.

<sup>48</sup> Behringer, *Tambora and the year without a summer*, 16.

<sup>49</sup> Wood, 10.

<sup>50</sup> Behringer, 16.

## 1.2 Theory

Over the last few centuries, efforts to theorize the relationship between humans and nature have according to geographer Mike Hulme often “emphasized the agency of climate over the agency of humans”.<sup>51</sup> For instance, some enlightenment thinkers, e.g. the rationalist Montesquieu, were convinced that the climate shapes the physiology of people, which in turn determines everything from culture to social organization. Geographers in the twentieth century expanded on this conviction to give explanations for racial character, intellectual vigor, moral virtue and why some civilizations thrived while others failed. These notions became however increasingly discredited throughout the twentieth century, but a reincarnation of climate determinism has according to Hulme emerged along with the anxieties about future climate change:

Reductionism is an approach to understanding the nature of complex entities or relationships by reducing them either to the interactions of their parts or else to simpler or more fundamental entities or relationships. In the case of climate change studies, this means isolating climate as the (primary) determinant of past, present, and future system behavior and response.<sup>52</sup>

This conceptualization is distinctly different from the determinism proffered by the geographers whose explanations for racial differences grounded in climatic conditions gave justification for, among other things, the eugenics movement and imperialist interventions in places that God had cursed with wrong climates. In a reductionist perspective, climate does not *make* people as was thought in an older guise of climate determinism, but climate can similarly be elevated to be the primary driver of how societies change. Hulme argues that models and calculations like this ultimately fails to recognize that values and cultures can change, or the capacity of humans to adapt to changes in the natural environment. He posits that the allure with a reductionist perspective in analyzing the past is that it “offers the appearance of ‘naturalistic’ explanations – even justifications – of cultural or economic dominance.”<sup>53</sup> And in the context of thinking about the future, reductionism can make it seem natural that climate change becomes a predictive factor: “If crop yield, economic performance, or violent conflict can be related to some combination of climate variables, then knowing the future behavior of these variables offers a way of knowing how future crop yield, economic performance, or wars will unfold”.<sup>54</sup>

If this held true, the work of historians would be immensely helpful in developing a response to the acute problem of anthropogenic climate change. Most historians are however painfully aware of the extent to which knowledge about events and trajectories of societies in the past

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<sup>51</sup> Mike Hulme, “Reducing the Future to Climate: A Story of Climate Determinism and Reductionism,” *Osiris*, vol. 26:1, 250.

<sup>52</sup> Hulme, 253.

<sup>53</sup> Hulme, 265.

<sup>54</sup> Hulme, 253.

can be directly translated into predictions for the future, so why should studies in this context be any different? Hulme suggests that the reductionist framework is a product of the hegemony exercised by the natural sciences in climate change discourse over the last few decades.<sup>55</sup> Advances in technology and new methods of extracting data from the natural archives have allowed scientists to make increasingly accurate models and reconstructions of past climates which are subsequently used to inform future prognoses. Due to human contingency, or perhaps the failure of the social sciences and humanities in accurately modeling human behavior, quantitative data-based models can thus bring into view the only known variable, namely climate. And so, if we know how the climate affects societies in universal ways, we can easily predict everything from how many people will be forced to emigrate to how many people that will die from droughts and famines caused by climate change.

This brings us full circle back to the structuralist paradigms of the preceding century where human agency was suppressed by material drivers of change and allows for new grand narratives in history. Hulme argues that in a reductionist view, humans are depicted as ‘dumb farmers’, passively awaiting their climate fate. This approach to theorize the relationship between climate and societies is not only lacking in explanatory power, but it is also potentially dangerous. If the numbers add up and the future is all figured out, there is nothing left for us to do. Then, our visions of the future where humans are stripped of any imaginative potential become, in effect, reality, even though it is grounded in a fallacy. Where the determinist thinking of the preceding century gave justification for the optimism associated with allocating new land for imperial states in the name of progress, this new form of climate determinism has the potential to give justification for the current pessimism associated with the painful cost of all that progress. This pessimism, in turn, runs the danger of manifesting itself in disregard, apathy and inertia. Clearly, both variations of determinism should be contested. Environmental historian Stephen Pyne has similar concerns about reductionism in history:

Reductionism is good for extracting resources and for creating instruments, medicines, gadgets; but it does not—cannot—tell us how to use them or when or why. It cannot convey meaning because meaning requires contrast, connections, context ... [Reductionism] cannot tell us what we need to know in order to write genuine history, even when that history involves nature.<sup>56</sup>

Hulme calls climate reductionism an ‘epistemological slippage’ – “a transfer of predictive authority from one domain of knowledge to another without appropriate theoretical or analytical justification”.<sup>57</sup> Moving between vastly different scales in historical studies, as both Wood and

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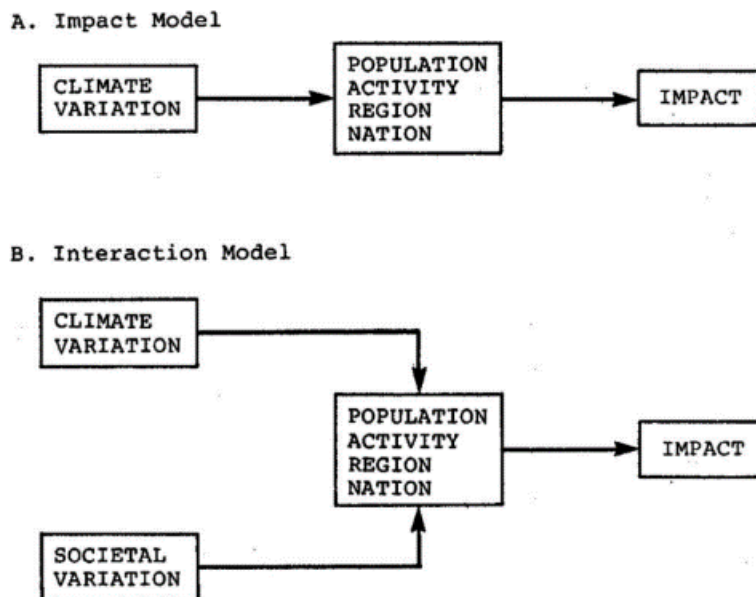
<sup>55</sup> Hulme, “Reducing the Future to Climate,” 245.

<sup>56</sup> Stephen Pyne, “The End of the World,” *Environmental History*, vol. 12 (2007), 650.

<sup>57</sup> Hulme, 249.

Behringer do in their works on Tambora, is fraught with challenges and runs the danger of paving the way for such reductionist explanations. At the macroscopic level, changes in the climate can seemingly be connected to direct societal effects, like for instance famine, in a ‘cause and effect’ relationship, but once an event is examined more closely it becomes evident that relevant human factors are hard to ignore. In other words, how do we translate knowledge about climate change handed down from palaeoclimatological research, working with their own scales independent of humans, into historical narratives?

Concepts like *resilience*, *vulnerability* and *adaptation* offers according to Hulme one way of doing this as they imply that there exists an interactive relationship between nature and society and can be used to explore “sensitivities of socioecological systems to climate perturbations – and other environmental and social stresses – without being dependent upon the predictive claims of climate modeling”.<sup>58</sup> Geographer Robert Kates has also proposed that we move away from attempts to identify how the climate affects societies directly and take societal variation into consideration. In his ‘interaction model’ (figure 1.1), climate is no longer an autonomous determinant, but shares the causal role in an interactive relationship with society. Kates advocates this approach over the ‘impact model’ which can be said to illustrate a reductionist framework.



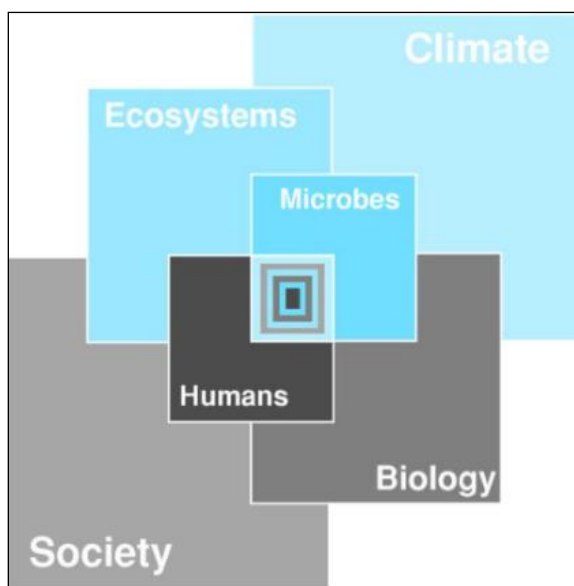
**FIGURE 1.1** “Schematics of impact and interactive models are highly simplified graphic depictions of types of study methodologies. [...] Both models attempt to identify ‘cause and effect’ relationships, with climate the ‘cause’ in the impact model 1.1A and climate and society the joint ‘causes’ in interaction model 1.1B.”<sup>59</sup>

<sup>58</sup> Hulme, “Reducing the Future to Climate Change,” 264.

<sup>59</sup> Robert W. Kates, “The Interaction of Climate and Society,” in *SCOPE 27*, eds., Kates, Asubel, and Berberian (Massachusetts: 1987), 6.



Bruce Campbell follows a similar path in *The Great Transition* to develop a theoretical framework that moves away from attempts to identify ‘cause and effect’ relationships in order to explore the dynamic processes of a socio-ecological system (figure 1.2). He holds that more can be gained from this holistic approach compared to a perspective characterized by a binary divide between humans and nature. “To do justice to a complex past and the dynamism of the natural world in which people lived, worked and reproduced”, Campbell argues, “it is necessary to understand how climate and society, ecology and biology, microbes, and humans, acting separately and in combination with each other, shaped the course of history”.<sup>60</sup>



**FIGURE 1.2** *The six core components of a dynamic socio-ecological system.*<sup>61</sup>

In his study on climate change, disease and late-medieval societies, Campbell notes striking synchronicities between the processes in each component and finds important synergies between them. In this model there are no exogenous developments through which for instance climate can exert force on societies as an external and isolated unit. In other words, no one component can be privileged over the other, because this would create a false dichotomy.<sup>62</sup> Considering that changes in one component affects all the others, straight cause and effect relationships will be difficult to identify. Hence, what we are looking for is likely to be the dynamic processes in the relationship between nature and society.

Calls for climate change to be acknowledged as an actant in historical research does not come solely from within the field of climate history. In the essay “The Climate of History: Four

<sup>60</sup> Campbell, *The Great Transition*, 396.

<sup>61</sup> Campbell, 22.

<sup>62</sup> Latour, *Reassembling the Social*.

Theses” from 2009, Dipesh Chakrabarty developed the concept of the Anthropocene as a cultural category which triggered a debate of what climate and climate change means for historians.<sup>63</sup> He asked, for instance, how historians can productively work with the colliding scales of human and natural histories and discusses the implications of this challenge for the discipline more generally. Chakrabarty expanded on this topic with the essays “On Some Rifts in Contemporary Thinking on Climate Change” and “Postcolonial Studies and the Challenge of Climate Change”<sup>64</sup> and has appeared alongside scholars like Bruno Latour, Ursula Heise and Dag O. Hessen in a collection of interviews about the future of nature.<sup>65</sup> That a figure like Chakrabarty gives due attention to these questions signifies that the role of climate is not just a matter for periphery discussions anymore and that advances in the field of climate history may, in many respects, qualify how historians work in the future.

This thesis seeks to evaluate Wood and Behringer’s claims informed by the theoretical framework presented above. Do they give due consideration to both human and natural factors or do either of them sometimes overextend the explanatory power of one factor alone? This is also closely linked to the question of how they respond to the challenges of a global frame which tends to highlight material factors as main drivers of change and where human agency easily fades out of view.

### **1.3 Approach**

Several of Behringer and Wood’s arguments put forward in their monographs on Tambora are hardly developed and can be called into question for skipping a few steps in demonstrating a clear connection to climate change. The invention of Australia, the Oktoberfest and widespread adoption of steamships for commercial travel are among some of Behringer’s not overly convincing claims and is arguably a consequence of his scattergun approach which leaves the impression that everything in this period were ultimately the product of severe climate change. Wood is similarly bordering the cavalier in his tracing of volcanic impact to some examples of contemporary art and literature. This thesis addresses three of the arguments that Behringer and Wood have developed more thoroughly and not just mentioned in passing. Their focus on these topics, however, differs. Behringer is comparatively more concerned with migration than Wood, and the latter goes into a bit more detail on the Yunnan famine than Behringer, but both

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<sup>63</sup> Chakrabarty, “Climate of History: Four Theses,” 212.

<sup>64</sup> See Chakrabarty, *The Crises of Civilization: Exploring Global and Planetary Histories* (New Delhi: Oxford UP, 2018), “On Some Rifts in Contemporary Thinking about Climate Change,” 191-222 and “Postcolonial Studies and the Challenge of Climate Change,” 223-243.

<sup>65</sup> Ander Dunker, *Gjenoppldagelsen av jorden: 10 samtaler om naturens fremtid* (Oslo: Spartacus, 2019), 57-89.

connect the Great Divergence to this event. Both gives a detailed account of the cholera epidemic but takes a different approach to explore its connection to volcanic impact.

The next three empirical chapters seek to give exposure to both authors' claims and evaluate their merit. In each case, independent sources and research are introduced to critically situate Wood and Behringer's work and serve to verify, challenge, or expand on their arguments. Hence, these chapters are not strictly organized according to their narratives or serve merely as an extended review of their monographs on Tambora. The chapters are structured in a similar format where following the introduction to each chapter is a section that presents research from the natural sciences which shows the presence of anomalous and extreme weather for the relevant study area and its biophysical effects. The remaining sections cover the proposed societal impacts of this link, which are manifested in economic, political, and cultural change.

## CHAPTER 2: MIGRATION

In future projections of potential adverse effects of anthropogenic climate change, migration through forced displacement is one that is often accentuated.<sup>66</sup> This link is based on the underlying assumption that there exists a causal relationship between environmental factors, where climate, climate variability and climate change are central components, and migratory movement. In this view migration occurs when people are unable to offset detrimental consequences of climate change on their activities and are consequently coerced by nature to leave their homes. A conceptual antecedent for this understanding of ‘climate migration’ was developed by anthropologist August R. Grote in 1877 who hypothesized that similar forms of human movement occurred in “more extensive operation in [man’s] early times when he was unprovided with the means of his own intervention against unfriendly changes in his surroundings”.<sup>67</sup> Many have taken issue with this perspective when it is applied to the context of future climate change.<sup>68</sup> One concern here is that analyses of the potential impacts of more frequent weather extremes that considers the environment as an autonomous determinant of migratory movement risks overlooking the multiplex of interactive factors that influences people’s decision making. Another is that such predictions assume that ‘climate refugees’ are a relatively homogenous group making similar decisions in responding to climatic stress.

Looking into the past as well, historical narratives of nature’s role as the monocausal origin of population movement are similarly being called into question.<sup>69</sup> From this debate, history can arguably open an avenue to engage with current climate change discourse. According to IPCC’s fifth assessment report it is countries in the global south that will take the brunt of the adverse effects of future climate change.<sup>70</sup> Those thought to be the most vulnerable are agrarian and resource-based economies in the early stages of industrialization – in many respects akin to the state of European states in 1815. Thus, studies on the impact of climatic stress on western societies who were transitioning to modernity in the early nineteenth century might provide

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<sup>66</sup> See IPCC, R. K. Pachauri and L. A. Meyer, eds., *Climate Change 2014*, 6. and Norman Myers, “Environmental Refugees,” *Population and Environment*, vol. 19 (1997), 168. Myers estimated that there will be 200 million ‘environmental refugees’ by 2050 – a number that was adopted by the IPCC and policy makers around the world.

<sup>67</sup> August R. Grote, “On the Peopling of America.,” *The American Naturalist*, vol. 11:4 (April 1877), 222.

<sup>68</sup> Mike Hulme, “Climate Refugees: Cause for a New Agreement?,” *Environment: science and policy for sustainable development*, vol. 50:6 (2008) and Etienne Piguet, “Migration: The Drivers of Human Migration,” *Nature Climate Change*, vol. 2:6, (2012).

<sup>69</sup> McAnany and Yoffee, *Questioning Collapse*, critique of Diamond’s claim in *Collapse* that the Greenland Norse failed to learn from Inuits in adapting to a different climate and was forced to emigrate back to Europe.

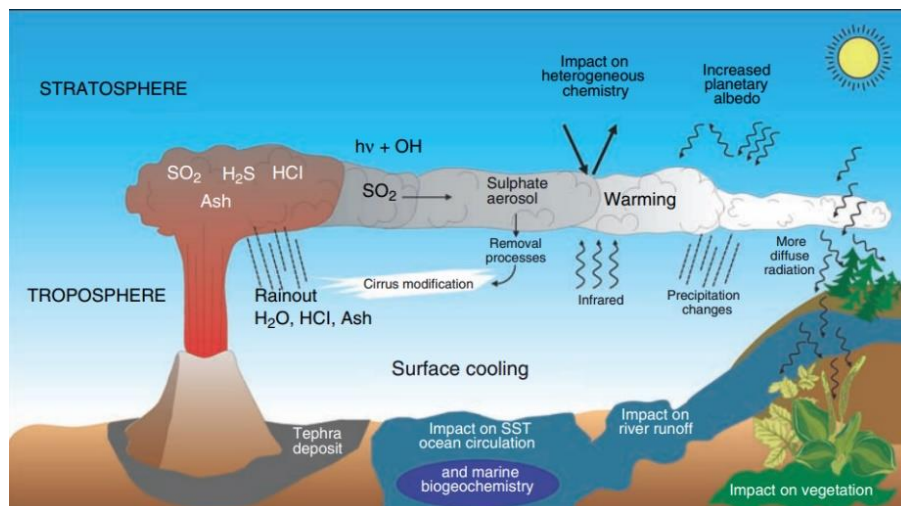
<sup>70</sup> IPCC, Pachauri and Meyer, *Climate Change 2014*, 16.

valuable insight into the tangled networks of causality between societal and natural factors in which complex phenomena like migration can be adequately understood.

The section below describes the relevant meteorological processes triggered by volcanic impact on the climate in the relevant study area where central Europe experienced a decrease in mean temperatures and situates the relevant context where European states were dealing with the aftermath of the Revolutionary and Napoleonic Wars when Tambora struck. The following sections give exposure to both Wood and Behringer’s arguments on the connection between climate change, famine, and migration from the British Isles and the Kingdom of Württemberg between 1816 and 1820 where independent sources and research is also included.

## 2.1 Climate and context

When Tambora’s ejected material reached the stratosphere, particles of ash morphed into droplets of sulfuric acid which scattered sunlight, consequently cooling down the surface of the earth.<sup>71</sup> Conversely, by effect of also reflecting solar radiation, these aerosols warmed the upper stratosphere and altered precipitation patterns. This process produced a relative temperature decrease in Central, Western and to a lesser degree Northern Europe as well as in North America lasting three years. The eruption of Tambora also coincided with a period of reduced solar activity between 1790 to 1830 known as the Dalton Minimum which is thought to have lowered temperatures already.<sup>72</sup>



**FIGURE 2.1** Overview of the climatic effects of large volcanic eruptions<sup>73</sup>

<sup>71</sup> R.K.R. Vupputuri, “The Possible Effects of the Tambora Eruption in 1815 on Atmospheric Thermal and Chemical Structure and Surface Climate”, in *The Year Without a Summer?*, Harington, 47.

<sup>72</sup> J. Eddy, “Before Tambora: The Sun and Climate, 1790-1830,” in *The Year Without a Summer?*, Harington, 11.

<sup>73</sup> C. Timmerck, “Modeling the climatic effects of large explosive volcanic eruptions,” *WIREs Climate Change*, vol. 3:6 (2012), 546.

During the summer months of 1816 in the Alpine regions, snowfall was observed at unusually low altitudes, days of sun were scarce, and glaciers advanced rapidly.<sup>74</sup> In addition to below-average mean air temperatures, unfavorable precipitation during the growth and harvest period in many places led to crop failures and consequent subsistence crises.<sup>75</sup> In the western and northern parts of the British Isles where crops were already vulnerable to exceedingly cold and wet weather, the climate change caused by Tambora had a devastating impact on agriculture where corn never ripened and potatoes rotted in the earth. Climate reconstructions for this period shows that Scandinavia was affected to a lesser extent, but evidence found in a weather diary written by a farmer outside Hamar suggests that anomalies in the weather had adverse effects on harvests in Norway as well.<sup>76</sup> Local variations notwithstanding, the volcanic weather denominating 1816 as the ‘year without a summer’ was felt across many regions on the continent and came at an inopportune moment in European history.

The dust had finally settled after the Revolutionary Wars and subsequent Napoleonic Wars from 1792-1815 when Tambora struck. Exhausted by more than two decades of continuous conflict, ambassadors from European states came together in 1814 to remodel the power structures that enabled Napoleon and his army to wreak havoc on the continent. The Concert of Europe system that emerged from the Vienna settlement in 1815 sought to secure peace and stability between the regions involved in the preceding wars and when the second coming of Napoleon was finally rejected at Waterloo June 18 – the stage was set for old and new European states to prosper in a happy inter-imperial order based on cooperative autocratic leadership. In the following decades, however, the system established by the Congress of Vienna was challenged by public discontent with the status quo and political ideologies which provided alternatives to aristocratic governance.<sup>77</sup> In a shorter view, events of mass protests and political revolt already occurred in several European regions between 1816-1820. According to Behringer, these paved the way for nineteenth century class struggle and can only be explained by considering volcanic impact:

When the literature refers repeatedly to a crisis in the wake of the ‘European wars’, it reveals more than the authors’ refusal to meet the challenge of a worldwide crisis that was precisely not rooted in the political or

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<sup>74</sup> Christian Pfister and Sam White, “A Year Without a Summer,” in *The Palgrave Handbook of Climate History*, White, Pfister and Mauelshagen, 552.

<sup>75</sup> Rüdiger Glaser et al., “Long- and Short-Term Central European Climate Development in the Context of Vulnerability, Food Security, and Emigration”, in *Climate Change and Cultural Transition in Europe*, eds., C. Leggewie and F. Mauelshagen (Leiden: Brill, 2018), 109.

<sup>76</sup> Terje Avner, Året sommeren aldri kom, *Aftenposten*, July 2016. Data found by Elin Lundestad in a weather diary from Todderud gård.

<sup>77</sup> Cemil Aydin, “Regions and Empires in the Political History of the Long Nineteenth Century”, in *An Emerging Modern World 1750-1870*, eds., S. Conrad and J. Osterhammel (Cambridge: Harvard UP, 2018), 70.

military processes so familiar to them. It is almost touching to watch the same historian trying over and over again to attribute the same crisis to a different cause in every European country.<sup>78</sup>

In these years migratory movement from several regions in Europe accelerated rapidly before receding into the 1820s. In Behringer's chapters on 1816 (*The Year Without a Summer*) and 1817 (*The Year of the Famine*), the causal chain linking climate change, harvest failure, rising prices of grain and consequent famine is the crucial connector for a broad range of societal phenomena in this period. With the eruption of Tambora as a catalyst, it is for Behringer in the context of food riots, rebellions, social polarization, famine-related diseases, antisemitism, the emergence of corn associations and new forms of poor relief that migration during the 'Tambora Crisis' must be understood. Focusing primarily on population movement from the British Isles, parts of France and some German states to North America and Russia – Behringer analyzes diverse societal factors while considering climate change in his search for the causes of the European exodus in this period and argues that during the 'Tambora Crisis' "Europe was suffering from 'emigration fever'. Never before had so many people wanted to leave the old continent at the same time".<sup>79</sup>

In contrast to Behringer's broader spatial coverage of volcanic impact on the European continent, Wood narrows his focus to the famine in Ireland and its impact on the poor. He argues that "much emphasis in recent historiography has been placed on the problematic European encounter with different races and nations around the world in the colonial period"<sup>80</sup>, and seeks to explore tensions within geographic regions in Europe with Ireland subjected to the British empire as a case study. Although less concerned with migration specifically, also Wood makes the connection between volcano-induced famine and relocation as one form of adaptation in the face of threatened food security.

## **2.2 The British Isles**

After a bountiful harvest in 1815 the price of bread and grain was at a relative low point in England at the beginning of 1816 before increasing exponentially throughout the year. For the grain producers who were anxious about the prices in January, this was a positive development. For consumers, the opposite was true. High bread prices combined with an oversupply in the labor market due to the great numbers of soldiers returning home from the wars in America, India and the European continent produced a climate of uncertainty and unrest. As prices rose

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<sup>78</sup> Behringer, *Tambora and the Year without a Summer*, 2.

<sup>79</sup> Behringer, 145.

<sup>80</sup> Wood, *Tambora*, 172.

and wages began to fall during the spring, people called for market regulations and fixed prices of bread and meat. Behringer notes that during this period, “acts of vandalism occurred from Suffolk to Essex: barns were set alight and rebels armed with pikes and rifles took power in some towns”.<sup>81</sup> In England, both rural and urban workers were united in this cause. Behringer holds that “English class society emerged in the wake of the Tambora crisis”<sup>82</sup> and that recently adopted protectionist policies exacerbated these tensions.

In 1815 new Corn Laws were enforced in the United Kingdom. These were aimed at restricting food imports by imposing tariffs and trade restrictions on cereals. The background for this mercantilist economic policy was according to Behringer that “during the continental blockade, landowners in the United Kingdom had been encouraged to plant increasing amounts of grain needed to provision the troops” and when the wars ended in 1815 those who had invested their profits and taken up loans to increase production capacity feared plummeting grain prices in a market open for imports from Russia, USA, and other parts of the continent. The British Parliament heeded the landowners worries and passed the Importation Act of 1815 despite petitions and riots seeking to prevent it. In the House of Commons some objected, but the House of Lords was contrived almost exclusively of landowners who had few reservations on this matter. When the volcanic weather in 1816 caused social deprivation in many parts of the country – several hundred thousand gathered in mass rallies seeking to introduce universal suffrage and consequently abolish the Corn Laws. Behringer argues that the main effect of these events known in English history as the Spa Fields riots was to sufficiently frighten the propertied classes into introducing new oppressive policies.<sup>83</sup>

The prices of basic foodstuffs continued to rise and accordingly protests increased in violence, targeting millers, bakers, and grain merchants – those who profited from high grain prices. Similar rebellions took place in Scotland, Ireland, and Wales, many of which were repressed only by military deployment and consequent bloodshed. Behringer shows also that violent food riots in 1816 were by no means exclusive to the British Isles and brings into view synchronous events of unrest in Switzerland, Italy, Catalonia, North Africa and even Norway where the peasants of Christiania looted grain stores.<sup>84</sup>

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<sup>81</sup> Behringer, *Tambora and the Year without a Summer*, 30.

<sup>82</sup> Behringer, 31.

<sup>83</sup> Behringer, 63.

<sup>84</sup> Behringer, 136. This series of events of unrest is sourced from John Post, *The Last Great Subsistence Crisis in the Western World* (Baltimore: The Johns Hopkins University Press, 1977), 73-9. There is however no mention of this event in Christiania in Audun Dybdahl’s long view of the societal consequences of climate change in Norway



In Scotland, the below-mean temperatures of 1816 delayed the already short growing season, and it was not until the middle of July that wheat, barley, and hay began to develop ears. Due to the lack of rainfall, grass grew slow and adversely affected sheep husbandry. The cloudy and stormy weather that followed in August and September gave no respite and further slowed the ripening of grain. In England, Ireland, and Wales, the cold weather was accompanied by torrential rains that also threatened the harvests of wheat, oat, and potatoes. Already on 20 July did *The Times* in London predict dire consequences for “farmers, and even the population at large” if the present weather persisted.<sup>85</sup> It did, and by December the prices of grain had more than doubled from the low point in January. Due to rapidly rising inflation in Wales and Ireland, large numbers of otherwise settled families abandoned their homes and resorted to begging.<sup>86</sup>

Among the peasants in England who struggled to maintain subsistence levels, many migrated within the country in search of employment and food – primarily to urban centers where conditions were not much better. In rapidly growing industrial cities like Manchester and Liverpool this shift put additional stress on the already pressed infrastructure. The winter of 1816/1817 in many parts of the British Isles was brutal on those without the means to defend themselves against the cold showers of hail and overcome the challenges of food scarcity. When money ran out, the poor in Ireland sold away whatever they could spare and was according to Wood faced with an unfortunate conundrum:

In a tragic irony, the peasant’s rational preference for food at the expense of clothing worked against their survival. As their clothes turned to rags and blankets grew scarce, typhus-bearing lice were able to circulate freely within and between households, spreading disease at a breathtaking rate.<sup>87</sup>

Typhus spread throughout many regions in Europe from 1816-1819 and pellagra and limoetonia; or death by starvation affected populations as well. Pellagra is not contagious, but a consequence of a niacin deficiency (vitamin B<sup>3</sup>) and a disease of malnutrition that in its initial phase causes the skin to peel off. Pellagra is associated with a diet solely based on maize or millet and was mainly restricted to Northern Italy where these cereals had been introduced in the late medieval period as a preventive measure against subsistence crises. In areas between the urban centers of Venice and Milan polenta became the only basic foodstuff after wheat

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in *Klima, uår, og kriser i Norge gjennom de siste 1000 år* (Oslo: Cappelen Damm Akademisk, 2016). Dybdahl explicitly dismisses that the eruption of Tambora had any notable impact on the climate in Norway in 1816 and 1817. But then again, the weather diary preserved from Todderud gård (p. 24 above), suggests that there was anomalous weather, at least in some regions of Norway, with an adverse impact on harvests, so this might not be completely resolved.

<sup>85</sup> *The Times*, 20 July 1816.

<sup>86</sup> Behringer, *Tambora and the Year without a Summer*, 34.

<sup>87</sup> Wood, *Tambora*, 179.

crops failed in 1816.<sup>88</sup> Italy is also thought to have been the origin of typhus epidemic of this period which spread to other parts of the continent from autumn 1816. This infectious disease is transmitted through contaminated food or water and primarily affected the poor. In the British Isles typhus was most apparent among the populations of Scotland and Ireland. Absent exact figures, Behringer cites estimates ranging from 65 000-100 000 typhus related deaths in Ireland alone with as many as 1,5 million Irish men, women and children infected.<sup>89</sup>

Wood holds that the fatal combination of two unrelated events of 1815 caused this unexpected period of famine, disease, and homelessness in Ireland. During the Napoleonic Wars, the Irish experienced a steady increase in living conditions because of the trade restrictions imposed on Britain. When these were lifted after Napoleon's defeat at Waterloo, Ireland could no longer ask the same prices for their exports of grain and linen. Volcanic weather exacerbated the impact of this turn of events in economic activity and "destroyed Ireland's fragile economic growth".<sup>90</sup> With limited opportunities of sustenance many resorted to migration within the country and to other parts of the British Isles. When the poor streamed into the city of Cork in southern Ireland, desperate citizens petitioned the British Parliament "to protect them from that ruin into which all ranks appear to be fast sinking"<sup>91</sup>, but to no avail. Drawing lessons from the Irish famine of 1816-1818 Wood argues that "weather deterioration provides only the initial conditions for a humanitarian disaster" and that more depends on a country's resilience and adaptive capacity which is inextricably linked to government resources: "The nation states of Europe – and particularly Britain in its responsibilities for Ireland – largely failed this test in Tambora's aftermath, and were rescued only by the return of seasonable weather in mid-1818 and the subsequent bountiful harvests."<sup>92</sup>

Behringer cites a contemporary who observed that the first wave of emigrants to North America in 1816 came from Ireland and was soon followed by people from Scotland and England.<sup>93</sup> He goes on to consider migration numbers from the United Kingdom between 1815 and 1821 (table 4.1) and notes that emigration from the British Isles followed a very different pattern than of that from the Kingdom of Württemberg. There, migratory movement rose sharply in 1816 as

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<sup>88</sup> Behringer, *Tambora and the Year without a Summer*, 97.

<sup>89</sup> Behringer, 97.

<sup>90</sup> Wood, *Tambora*, 180.

<sup>91</sup> "Petition from Cork Complaining of the Increase of Poverty: From the Mayor, Sheriffs, & Several Inhabitants," *Hansard*, February 27, 1818.

<sup>92</sup> Wood, 195.

<sup>93</sup> Peter Scheitlin (1779-1848), Swiss professor of theology and writer on poor-relief in *Meine Armenreisen in den Kanton larus und in die Umgebungen der Stadt St. Gallen in den Jahren 1816 und 1817*, (1820).

well, but peaked during winter 1816/1817 and immediately trailed off.<sup>94</sup> To explain this discrepancy and why the wave of emigration from the United Kingdom continued to rise after the Tambora Crisis was over, Behringer claims tersely that it was because of “the continuing economic crisis” before moving on.<sup>95</sup>

**TABLE 2.1** *Emigration from the United Kingdom, 1815-1821*<sup>96</sup>

1815	2,000
1816	13,000
1817	21,000
1818	28,000
1819	35,000
1820	26,000
1821	18,000

The access to reliable emigration numbers from Württemberg in these years might explain why several scholars have studied the causes for migration in this country. The picture appears to be less clear regarding the British Isles where population estimates prior to the availability of census data varies a lot, consequently making it difficult to quantify migration. Still, some have worked around these challenges to discuss the connection between climatic impact, famine, and migration from Ireland in the years 1740-1741.<sup>97</sup> Engler et al. use a model-based approach to analyze Ireland’s vulnerability to famine, by considering factors as food availability and food entitlement, and argues that the extremely cold temperatures in Europe in these years caused migration from Ireland. They show that Ireland was particularly vulnerable compared to other countries on the continent because their agricultural production relied heavily on oats and potatoes and that Irish landowners made little effort to make systemic changes to agriculture as they did in other European states. There were no granaries to relieve the population in events of subsistence crises and involvement in wars affected food security. Despite this, Engler et al. stress the point that migration in this context of climate-induced famine was most often a voluntary choice among many alternatives of adaptation.<sup>98</sup>

With ties to the New World, most of the emigrants from the British Isles traveled to the USA and British Canada. Although advocating the crucial role of volcanic impact as the trigger for

<sup>94</sup> See Figure 2.2 in section 2.3.

<sup>95</sup> Behringer, *Tambora and the Year without a Summer*, 148.

<sup>96</sup> Behringer, 148. Migration numbers sourced from G. Moltmann, eds., *Aufbruch nach America*, (Heidelberg: Springer, 1989).

<sup>97</sup> Engler et al., “The Irish famine of 1740-1741: Famine vulnerability and “climate migration,” *Climate of the Past*, vol. 9:3 (2013).

<sup>98</sup> Engler et al., 1176.

mass migration in this period, Behringer also acknowledges social and cultural factors which attracted people towards specific destinations:

The letters of family and community members who had emigrated earlier also played an important role in Emigration to the USA. there were also published accounts of migrant experiences. More or less serious travel agents used newspaper advertisements and other means of drawing attention to their services, mentioning concrete conditions, dates and prices.<sup>99</sup>

He notes that it is unclear whether the emigrants left their home country purely out of desperation. Considering that those who emigrated were not poor, otherwise they could not have afforded the journey, Behringer hypothesizes that this part of the population “were especially adventurous and prepared to take risks”.<sup>100</sup> Thus, he does not make the claim that migratory movement in this period was exclusively coerced by changes in the natural environment, but opens up for a multifactorial approach where the climatic shock produced by Tambora and its impact on these societies caused many to question their prospects of a good future before ultimately making the choice to relocate. To better understand this process, he presents the case of Morris Birkbeck (1764-1825) as a ‘prototypical emigrant’.

As a Quaker in England who was denied the right to vote despite paying taxes – Birkbeck emigrated according to Behringer not due to poverty, but because he hated oppression. It was also the nuisance of paying tithes to a church which he did not belong. In March 1817, he brought his family across the Atlantic Ocean and settled in Illinois in the Midwest. The same year his travel account *Notes on a Journey in America from the Coast of Virginia to the Territory of Illinois* was published and appeared in Philadelphia, London, Dublin, and Cork before being translated into German and Swedish in 1818. Birkbeck conveyed the familiar and seductive tropes characterizing USA as the promised land and one of plenty where those who come from humble beginnings can achieve greatness. He appealed to those who sought refuge from wretched conditions in Europe and welcomed them to the western territory in America where there was no slavery, no harsh winters, and good opportunities of acquiring land: “a delightful region; -healthy, fertile, romantic”.<sup>101</sup> Thus, notions of what kind of climate they could expect in the New World as well as the prospect of a less intrusive state government was according to Behringer important pull factors for emigrants in this period.

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<sup>99</sup> Behringer, *Tambora and the Year without a Summer*, 141.

<sup>100</sup> Behringer, 141.

<sup>101</sup> Morris Birkbeck, *Notes on a Journey in America from the coast of Virginia to the Territory of Illinois* (London, 1818), 34.

Public discontent with the political organization in the United Kingdom stands out as one of the most central factors in Behringer's argument of a causal relationship between the eruption of Tambora and migration from the British Isles. The Corn Laws introduced in 1815 had already revealed a rift in the social order and subsequent volcanic impact intensified these tensions in the following years. Spread of disease, dissolving communities and economic crisis caused some to doubt their opportunities if staying. Crucially, many had access to established social networks at potential destinations, primarily in the New World in which the liberal political institutions coincidentally provided an attractive alternative to the authoritarian nature of British rule. And as Wood shows in the case of Ireland; a rule characterized by a distaste for certain nationalities and a general disregard for the welfare of its most vulnerable subjects. Birkbeck vehemently rejected these character traits and welcomed emigrants from all over the continent to seek their fortune in the land of opportunity:

The most perfect cordiality prevails between the Americans of German and those of English extraction, in every part of the United States, if the assertions of all with whom I have conversed on this interesting topic, are to be relied on. National antipathies are the result of bad political institutions; and not of human nature. Here – whatever their origin, whether English, Scotch, Irish, German, or French – all are Americans.<sup>102</sup>

People from Ireland, Scotland and England streamed into the USA even after seasonal weather returned in 1818. Informed by the sharp rise in immigration numbers in 1816-1818 and the poor medical state many arrived in – the American government passed the Steerage Act in 1819 which sought to regulate the conditions of transportation in passenger ships and vessels coming into the country. This also had the effect of limiting the number of immigrants each ship could carry, consequently reducing immigration into the 1820s. This trend also correlates with the emigration numbers out of the British Isles (table 2.2). Enforced from 1 January 1820 it also required the captains of the ships to provide lists of passengers with information about country of origin. These records from 1820 tells that the Irish accounted for 43% of total immigration and the English 29% followed by the next largest group which were the German states.<sup>103</sup>

### **2.3 The Kingdom of Württemberg**

Behringer holds that the climate change produced by Tambora triggered the largest wave of immigration from Germany since the mediaeval settlement of the eastern periphery of the Holy Roman Empire. Frost and unfavorable precipitation during the growing season in 1816 reduced harvest yields in many regions across central Europe and although farmers here were

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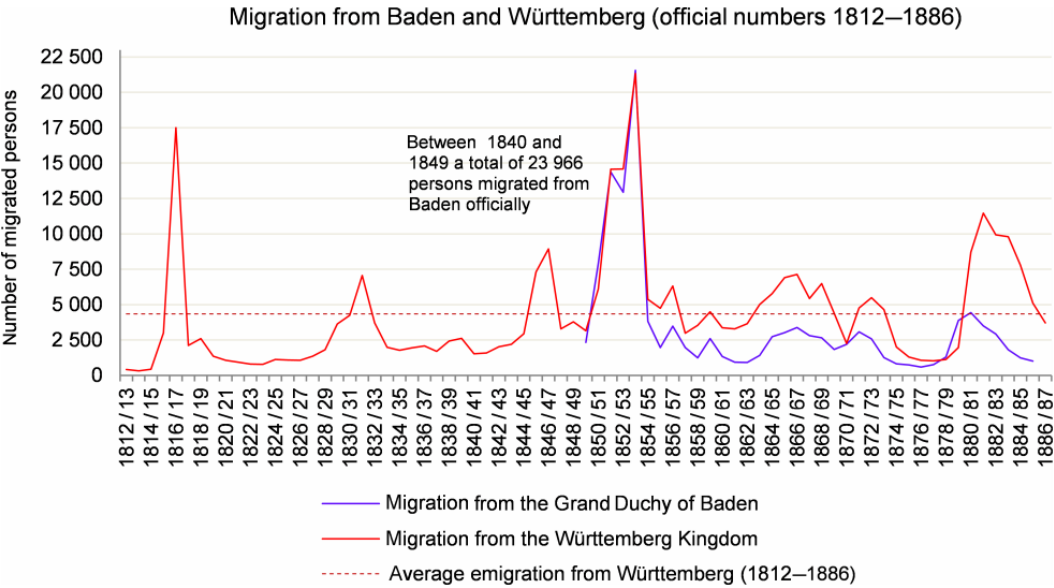
<sup>102</sup> Birkbeck, *Notes on a Journey*, 66.

<sup>103</sup> See "Immigration After the Steerage Act 1820" at <https://immigrationtounitedstates.org/549-history-of-immigration-1783-1891.html>.

accustomed to the occasional cold spell or sequences of excessive rainfall and could prepare accordingly, there were according to Behringer exceptions to this rule:

Frost too late in the year damages nearly all crops, even fruit trees. Grapevines need enough sun in the summer to ripen, and cereal grains can cope with substantial water in the growth phase, but not in high summer before the harvest.<sup>104</sup>

Behringer presents many similar trajectories in the societies of the German states and the British Isles in this period. Adverse weather coincided also in Germany with rising prices of grain and subsequent social polarization. This dynamic did however not assume a universal character across all the German states who coped with the crisis in different ways. In the context of migration, he focuses primarily on the southwest of Germany and Württemberg because this new kingdom kept records due to fears of out-migration. Thus, the availability of more detailed and reliable data provides an avenue to better identify the causes of migration in this period. While most emigrants from the British Isles went to the New World, those who left the German states, including Württemberg, split primarily between North America and Russia. The official migration numbers from this study area strongly suggests a connection between climate change and population movement:



**FIGURE 2.2** Official numbers of emigrants from Württemberg and Baden (1812-1886)<sup>105</sup>

After the Revolutionary Wars, Friedrich I of Württemberg became king with the support of Napoleon and expanded his old duchy by incorporating several smaller states. According to

<sup>104</sup> Behringer, *Tambora and the Year without a Summer*, 50.  
<sup>105</sup> R. Glaser et al., “Climate of Migration? How climate change triggered migration from southwest Germany to North America during the 19<sup>th</sup> century,” *Climate of the Past*, vol. 13:11 (2017), 1579.

Behringer, the new king also took the opportunity to remove the old system of participation in decision-making by the estates and to set himself up as an absolute monarch.<sup>106</sup> Friedrich was a despot, and an obese one at that, who has been held responsible for the famine in 1817.<sup>107</sup> When king Friedrich I unexpectedly died in autumn 1816, his son Wilhelm I ascended the throne alongside his wife Katharina Pavlovna, daughter of the Russian tsar. Considering the acute situation in his kingdom, Wilhelm ignored his father's testament that everything should continue as before and made several efforts to diminish the negative impact of failed harvests on the population in Württemberg. He provided amnesty for petty theft, set up a foundation for poor relief in Stuttgart and instigated negotiations over the reinstatement of a constitution and parliament. "The crisis in Württemberg virtually demanded that the new generation present itself as sympathetic and actively engaged".<sup>108</sup> According to Behringer, these efforts did little to immediately counter the irreversible cycle triggered by the rising prices of grain:

On the part of simple consumers, the immediate effect of the inflation of grain prices was an attempt to reduce costs in other areas in order to ensure basic subsistence. Initially this meant a reduction in consumption. This in turn fed back into the crisis. Falling demands led to a decline in commerce, which led to cancelled orders from industrial producers. This in turn meant there was no longer enough work for all.<sup>109</sup>

Many took to the streets and became a burden on societies which in several German states spawned new legislation that threatened beggars and vagabonds with sanctions like lashing and incarceration. This was also symptomatic of a larger trend across the continent that contributed to the schism between rich and poor. Historian Hans Medick demonstrates this through the analysis of primary sources like poor lists, inventory and partition documents, tax registers etc. in the small Württemberg town of Laichingen in the famine year where he finds that 61% of the inhabitants of Laichingen had exhausted all cash reserves by January 1817 and qualified for poor relief. Come May, some 80% of the population were paupers.<sup>110</sup>

Medick found that a privileged few profited on the hardship of the majority of the population. The traditional upper class consisting of bakers, innkeepers, butchers, merchants, and a few rich farmers could still lend money against interest or buy cheap land from those forced to sell. These issues were also tied to the question of grain exports and the portion of the population who profiteered from buying up scarcely available cereals to sell abroad and what role the state

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<sup>106</sup> Behringer, *Tambora and the Year without a Summer*, 69

<sup>107</sup> Paul Sauer, *Der schwäbische Zar. Friedrich – Württembergs erster König* (Stuttgart: Deutsche Verlags-Anstalt, 1984).

<sup>108</sup> Behringer, 70

<sup>109</sup> Behringer, 51.

<sup>110</sup> Hans Medick, *Weben und Überleben in Laichingen, 1650-1900. Lokalgeschichte als allgemeine Geschichte*, (Göttingen: Vandenhoeck & Ruprecht, 1996), 247.

should assume in this matter. Behringer holds that the polarization in Württemberg “during the famine raised issues of the justice and legitimation, or rather legitimacy, of state power”.<sup>111</sup>

In this struggle over resources some resorted to theft. In Laichingen, there are records of apprentices stealing money or food from their masters, neighbors from neighbors and even more serious cases. Farmers hired guards to watch over the fields and careful supervision of storehouses, barns and granaries was similarly required to prevent theft. Behringer notes that in the Grand Duchy of Baden, which kept records of crime, “the number of cases of theft that came to trial tripled between 1815 and 1817”.<sup>112</sup> Among other transgressions in this period was child murder – echoing the distress to the east in Yunnan. Although less common, these cases were also associated with the famine and Behringer notes that they “generally referred to the killing of newborns by mothers who had no idea how to support them”.<sup>113</sup> Interpreting Behringer’s narrative, this sharp rise in criminality was not so much a symptom of state oppression than it was a symptom of the despair that was ultimately at the root of phenomena like migration from German states. Thus, despite one of king Wilhelm’s first decrees which was amnesty for petty theft – the first forty families from his kingdom to leave for Russia did so in the autumn of 1816 and were followed by many more. To complicate the question of a causal relationship between climate change and migration however, the choice to relocate appears to have been largely influenced by political circumstances in the potential destinations:

Paradoxical as it may sound in the light of tsarist autocracy and serfdom, for immigrants, early nineteenth century Russia was a land of freedom. Since the ascension to the throne of Catherine the Great, Russia had been ruled by a German dynasty that felt bound by enlightenment ideas and guaranteed religious tolerance. French and German aristocrats had fled there in droves during the years of the terror in France and the Napoleonic occupation.<sup>114</sup>

Existing social networks that emigrants could tap into is an important factor in this context as well and helps explain why relocation to Russia was according to Behringer was primarily a phenomenon in the German-speaking states. Russia also went to great lengths to accommodate their new citizens who according to Behringer offered “free land, travel expenses and initial capital, the duty-free import of their belongings, free health care, interest-free loans to build houses and freedom from taxation the next thirty years” as well as “exemption from military conscription and feudal services, freedom of movement, complete self-administration and jurisdiction and their own market rights in autonomous settlements.”<sup>115</sup> Freedom of conscience

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<sup>111</sup> Behringer, *Tambora and the Year without a Summer*, 59.

<sup>112</sup> Behringer, 60.

<sup>113</sup> Behringer, 70.

<sup>114</sup> Behringer, 143.

<sup>115</sup> Behringer, 144.



and religion was also guaranteed which might explain why 53.1% of emigrants from Württemberg decided to journey east:

**TABLE 2.2** *Destinations of emigrants from Württemberg, 1816-1818*<sup>116</sup>

Destination	Number	%
Russia	9,233	53.1
USA	6,009	34.6
Austria-Hungary	1,559	9.0
Prussia	43	0.2
Other German states	539	3.1

Many made the choice to leave Württemberg, but not everyone made it all the way to their destination. Those going to America were funneled to the ports of Amsterdam awaiting room on ships to take them across the Atlantic. This was the focal point for many Europeans emigrating to North America: “In May 1817 some 30,000 would-be emigrants from southern Germany, Alsace and Switzerland were stranded in Amsterdam and had to change their plans because of poverty or broken contracts”.<sup>117</sup> Waiting several months for a ship caused many to exhaust their scarce savings before being able to travel and some unfortunates bought tickets from the wrong travel agent who took away with their money. A Württemberg official in Hague witnessed a dire reality:

‘In the environs of Amsterdam, in towns and villages, there are several thousand people from Alsace, Switzerland and Württemberg, most of whom can pay nothing and find themselves in the greatest poverty and hardship. Many parents die before their children, the poor, abandoned and helpless orphans wander around and must alas seek their bread at the doors or strangers. This misery is beyond words.’<sup>118</sup>

This social burden on Amsterdam and other Dutch ports led to restrictive measures at borders across central Europe aimed to slow migration. In Württemberg this began in May 1817 from which point the state only issued passports to those who could prove that they had enough funds to pay for the journey to their destination. With this came a change in tone towards the emigrants who during winter 1816/1817 had been forced to relinquish their citizenship when leaving the country. Originally banned from returning, the state gradually parted with the grudges toward the emigrants who in their view had betrayed the kingdom upon the choice to leave. This in turn inspired others to come back. Many of those who came back faced resentment in their local communities for having left with their assets only to return without them and become a burden, but the kingdom introduced legislation that forced these communities to accept the returnees.

<sup>116</sup> Wolfgang von Hippel, *Auswanderung aus Südwestdeutschland. Studien zur württembergischen Auswanderung und Auswanderpolitik im 18. Und 19. Jahrhundert* (Stuttgart: Klett-Cotta, 1984), 138.

<sup>117</sup> Behringer, *Tambora and the Year without a Summer*, 149.

<sup>118</sup> Cited in Moltmann, *Aufbruch nach Amerika*, 194.

Several towns in Württemberg also established spinning and weaving rooms so that the unemployed could do meaningful work. A ‘poor colony’ was established for those who had unsuccessfully tried to emigrate to Russia.

King Wilhelm also pledged money to wide range of initiatives aimed at poor relief in his kingdom. Raw materials were provided free of charge to artisans so they could continue working, collection points where people could sell handicrafts and goods manufactured at home were established and in May 1818 the Württemberg Landessparkasse was founded. Behringer argues that this state savings bank can be counted “among the immediate responses to the crisis, as it was intended to make it easier for citizens to provide for themselves come the next crisis.”<sup>119</sup> The king and queen also joined the newly established Agricultural Association whose aim according to Behringer was to “make the cultivation of land and animal husbandry more effective through targeted advice for farmers and the dissemination of innovations and new implements”.<sup>120</sup> That many returned to Württemberg can to some extent be attributed to the dynamic response of the state institutions that shaped policies informed by the consequences of the crisis in these years, but Behringer notes other aspects as well:

Other emigrants had found it hard to adjust to living conditions in the new country or returned when they learnt that close relations had fallen ill or died. In contrast to emigration, where religious, political or economic motives dominated, the motives for returning were often more familial in nature.<sup>121</sup>

In a qualitative study from 2017 on the connection between climate change and migration from Baden and Württemberg over the course of the nineteenth century, Glaser et al. largely agrees with the claim that migratory movement in this period can be connected to climate change:

The main reason for the crisis and famine of 1816 was the harvest failure in large parts of Europe due to the adverse climate consequences of the Tambora eruption in 1815, amplified by a number of specific circumstances, like a lack of preparedness, harvest failures in the preceding years, the situation after the Napoleonic era and poor crisis management.<sup>122</sup>

They did however arrive at this conclusion by also considering the impact of the preceding Napoleonic Wars on both countries’ resilience and its populations food security; because of conflict in this area the granaries had not been filled since 1812. Additionally, due to the disruption of war large parts of the agrarian country had not been cultivated which increasingly reduced harvest yields. Thus, no one was prepared for the volcanic weather in 1816 and when politicians first responded to the crisis in November by implementing tariffs on exports it was too late. They show that in Württemberg “several thousand bushels of grain – worth 1.4 million

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<sup>119</sup> Behringer, *Tambora and the Year without a Summer*, 159.

<sup>120</sup> Behringer, 161.

<sup>121</sup> Behringer, 196.

<sup>122</sup> Glaser et al., “Climate of Migration?,” 1582.

guilders – had been exported instead of supplying domestic population.”<sup>123</sup> Attempts to remedy this by importing grain from foreign markets was at this point impossible because freezing rivers which did not clear up until in spring the following year and hindered transportation. These factors are perhaps what Behringer alluded to when noting that king Friedrich I has been held accountable for the famine, but in which ways did not make it into his study.

James Boyd, on the other hand, rejects the primary focus on natural and material factors altogether and holds that the emigration from Baden and Württemberg to North America in 1816-1817 must be analyzed in a longer view that “establishes this episode as an important link between the mass-migration periods of the eighteenth and nineteenth century”.<sup>124</sup> Complaining that many studies have treated this event as an anomalous and isolated event, Boyd recognizes this episode as “the product of continuities, rather than just material anomalies, and which, in turn, catalyzed major change, shifting German migration to America away from its eighteenth-century precedents, and into the model of nineteenth-century massmigration.”<sup>125</sup> He primarily considers logistical, religious, and familial networks that were developed over time as the crucial factors that defined German Atlantic migration in this period. These points are mentioned by Behringer in the context of both German and British emigration, but Boyd might take issue with how they are subsumed into Behringer’s argument that still regards Tambora as the culprit in a study that pays little attention to the periods preceding the eruption in 1815.

## **2.4 Conclusion**

Evidence from both the human and natural archives strongly suggests that the climate change produced by the eruption of Tambora caused failed harvests resulting in economic hardship in several European states, particularly in 1816 and 1817. Behringer argues that this development triggered events of unrest and revealed internal tensions within the affected societies which, in turn, caused many to question the prospects of a viable future if staying. Thus, emigration was not forced by natural factors alone, but a choice of adaptation made by those with sufficient capital and the willingness to take risks, echoing the conclusions of Engler et al. on Irish emigration during the famine in 1740-1741. This also aligns with the perspective of Hulme and Piquet that there exists substantial entanglement of socio-ecological factors in cases where climate change can be connected to migratory movement. Thus, Behringer paints a rather nuanced picture of this wave of emigration from the British Isles and Württemberg in

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<sup>123</sup> Glaser et. al, “Climate of Migration?,” 1582.

<sup>124</sup> James Boyd, “The Rhine Exodus of 1816/1817 Within the Developing German Atlantic World,” *The Historical Journal*, vol. 59:1 (2016), 99.

<sup>125</sup> Boyd, 100.

Tambora's aftermath. He shows also, in the case of Württemberg, that systemic changes made by King Wilhelm led many back to the Kingdom, despite having relinquished their citizenship upon leaving.

Transatlantic migration from the British Isles, on the other hand, appears to have been more permanent, where the bulk of migrants came from Ireland – the region most adversely affected by climate change. Wood and Behringer argues that the devastation for the Irish population can be attributed to their position as subjects of the British Empire who made little effort to mitigate the impact of famine in this periphery state. That migration numbers continued to rise even after seasonable weather to return suggests, however, that other factors also affected emigration during these years. Behringer argues that “continued economic hardship” was the reason, but taking a longer view of migratory movement might further nuance this claim that still relies heavily on volcanic impact on the climate as the main cause.

For policy makers in the Global North who are anxiously awaiting the inevitable burden of 200 million ‘environmental refugees’ by 2050<sup>126</sup>, the example of Tambora can serve to illustrate that these fears are not completely unfounded, in the sense that climate change can be connected to migratory movement, but also that social, political, economic and cultural factors largely affects who within a society that can relocate, why they make the choice to do so, what their destination is and that it is not necessarily a permanent solution. This insight can allow us to shift the focus away from the present concerns about that potential burden on western societies and over to the actual impact of climate change on to those who might not have the option to relocate as one alternative of adaptation in the face of climatic stress. It can also challenge the narrative of how anthropogenic climate change is something that is only going to adversely affect countries in the Global South and that any negative consequences for countries in the Global North is, by affiliation, collateral damage from those countries incapability of properly responding to climate change. This is grounded in the worldview that progress can always fend off nature, but that this is of little use if less developed countries remain vulnerable. Hurricane Katrina in 2005 revealed, however, that western societies are not exempt from natural disasters.

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<sup>126</sup> Myers, “Environmental Refugees,” 168.

### CHAPTER 3: FAMINE

Ever since the publication of Kenneth Pomeranz' *The Great Divergence: China, Europe, and the Making of the Modern World Economy* in 2000, the nagging question of why and how the western world managed to transcend the Malthusian cycle and accelerate into modernity while at the same time east Asia did not has been a hotbed of vigorous debate among historians.<sup>127</sup> In a comparative study of England and several regions surrounding the Yangtze delta, Pomeranz hypothesized that something must have gone awry for China in the nineteenth century after noting that both countries were on rather equal footing going into the 1800s. His thesis is complex, but Pomeranz ultimately argues that the crucial and contingent factors for the separate pathways was the discovery of fossil fuel, forced mercantile expansions and imperialist interventions of European countries which "relieved the strain on Europe's supply of what was truly scarce: land and energy".<sup>128</sup> This development, in turn, allowed the western countries to hone their skills in inventing new technologies and exploiting subtropical regions in a revolving cycle for profit. In this narrative, China's comparatively less adaptive agricultural and technological development coupled with conflicting markets within the empire consequently led to the decline in the nineteenth century. This is contested however, and it appears that Pomeranz forgot to consider Tambora which blew up right in the middle of this mess.

To understand the role of Tambora in China's ill-fated development throughout the nineteenth century, we must according to Wood move away from Pomeranz' study area in the Yangtze delta and further up the river to the southeastern part of China and the province of Yunnan which borders to Vietnam, Laos and Myanmar. Known for its great biodiversity and seasonable weather with neither cold nor hot extremes, the fertile lowlands in between the mountainous topography of Yunnan were particularly accommodating to cereal cultivation – crops which the people in this province heavily relied on for sustenance. After volcanic impact and consequent temperature decrease starting already in spring 1815, failed harvests sent large proportions of the agrarian population in Yunnan into a devastating famine lasting three years. Wood posits that the "Tambora-driven weather emergency and ensuing famine of 1815-18 fatally altered the course of Yunnan's development and played its part – as we shall see – in bringing down an empire".<sup>129</sup>

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<sup>127</sup> Prior to Pomeranz' monograph as well, like W.H. McNeill's *The Rise of the West* (1963), but there the narrative is primarily centered on the internal developments of Western countries.

<sup>128</sup> Kenneth Pomeranz, *The Great Divergence: China, Europe, and the Making of the Modern World Economy*, (Princeton: Princeton UP, 2000), 23.

<sup>129</sup> Wood, *Tambora*, 102.

Behringer regards the famine of these years as one of several episodes of climatic stress that can provide a background for the Qing state's decline in the nineteenth century and does not make the same connection as Wood who claims that the devastating famine caused a transformation of Yunnan's agricultural production where many farmers replaced cereals with opium crops. Over the course of the nineteenth century, Yunnan became the largest opium growing region in China. Wood holds that a focus on domestic opium production and not just the societal and economic consequences of imported opium provides an important background for the First and Second Opium War decades later – wars that became symbolic of China's failure to assert its power and resist the imperialist interventions of Britain.

Both authors tap into the divergence debate, albeit somewhat more carefully than in their approach to other claims of Tambora's impact. The argument that China's decline in the nineteenth century in many respects can be attributed to volcanic reverberations is but one of many of the long-term effects that Wood and Behringer alludes to in their respective monographs on Tambora. The following section gives an overview of the climate change caused by the eruption of Tambora in the Yunnan province and relevant historical context. Section 3.2 gives exposure to Wood's argument of the connection between climate change and consequent famine in Yunnan where the poet Li Yuyang stands in as a central witness to this period. It is against the background of these famine years that the agricultural production in Yunnan allegedly pivoted to opium crops which Wood argues played an important role in China's decline in the nineteenth century. His argument as well as other studies on this subject is presented in section 3.3. Finally, section 3.4 situates Tambora's role and natural factors more generally in the 'divergence' debate.

### **3.1 Climate and context**

Yunnan is located in the southwest of China where the Eastern Asian monsoon and Qinghai-Tibetan cold region converge and within a transition zone between the Indian summer monsoon and western North Pacific summer monsoon.<sup>130</sup> It is thus a region with a complicated circulation system wherein agricultural production is especially vulnerable to changes in the climate.<sup>131</sup> Several studies suggest that volcanic impact caused changes in the climate with consequent loss in harvest yields in several regions across China between 1815 and 1817, and that one of the most severely affected was Yunnan where the anomalous weather arrived just one month after

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<sup>130</sup> Chaochao Gao, Yuijuan Gao and Chuming Shi, "Climatic Aftermath of the 1815 Tambora Eruption in China," *Journal of Meteorological Research*, vol. 31:1 (2017), 34.

<sup>131</sup> Zhibin Zhang et al., "Periodic climate cooling enhanced natural disasters and wars in China during AD 10-1900," *Biological Sciences*, vol. 277:1701 (2010), 3751.

Tambora's eruption in April.<sup>132</sup> In spring 1815, the winds that usually dispersed of the clouds to give way for sunlight never reached the province. Heavy clouds persisted throughout the summer months and flooded the winter crops of wheat, barley, and broad beans. The rice harvests could have been the rescue that year, but exceedingly cold temperatures in August devastated this staple crop as well.

Rice is relatively resilient and can still thrive under anomalous conditions, but as a tropical plant it is particularly vulnerable to sustained periods of temperatures below 20°C. In the following autumn and winter, food prices rose according to Wood along with mortality numbers.<sup>133</sup> A period of normal rainfall in spring 1816 gave only false hope before episodes of unprecedented snowfalls in July. Frosty weather continued in August and the rice harvest failed once more. Only in 1817 did seasonable temperatures return, but a lack of rainfall in June and July – and at a crucial point where the rice plants were flowering – caused a third year of failed harvests in the province. After three consecutive crop failures Yunnan was in shambles and caught the Emperor's attention who finally opened the doors to the state granaries.

Behringer notes that the Tambora Crisis coincided with the reign of Emperor Jiaoqing (1796-1820), “whom recent research has identified as the monarch under whose rule the economic decline of the empire began.”<sup>134</sup> In the preceding century China had expanded its territories and experienced a period of rapid economic and demographic growth. In the Yunnan province alone, the population increased manifold from three million in 1750 to a staggering twenty million in 1820.<sup>135</sup> The Qing state's agricultural economy had over the course of this period intensified and a complex network of transportation of goods within the empire had been established. One other study also argues that favorable climatic conditions over the course of the eighteenth century supported this development.<sup>136</sup> Economic historian R. Bin Wong similarly holds that “the pressure of population growth in the eighteenth and nineteenth century China on the resources of environmentally vulnerable areas became the setting for a range of peasant uprisings and subsistence crises”.<sup>137</sup>

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<sup>132</sup> Gao, Gao and Shi, “Climatic Aftermath of the 1815 Tambora Eruption in China,” 32.

<sup>133</sup> Wood, *Tambora*, 105. Wood does not cite any source for those mortality numbers.

<sup>134</sup> Behringer, *Tambora and the Year without a Summer*, 31.

<sup>135</sup> Wood, 101.

<sup>136</sup> Cao, Li and Yang, “Mt. Tambora, Climatic Changes, and China's Decline in the Nineteenth Century,”

<sup>137</sup> R. Bin Wong, “Possibilities of Plenty and the Persistence of Poverty,” in *An Emerging Modern World*, Conrad and Osterhammel, 357.

### 3.2 Li Yuyang and the famine

One of the first studies to make the connection between the eruption of Tambora and famine in Yunnan was by Yuda et al. in 2005.<sup>138</sup> They found that there were scant records from the province between 1815 and 1818 and argues that the ramifications of the famine were likely to have been more severe than the available source material suggests. Wood takes an interesting approach to work around this problem and brings in the young poet Li Yuyang as a witness to the famine years in Yunnan: “The accounts of environmental breakdown and human tragedy left by survivors such as Li Yuyang must stand in for countless histories of individual and community trauma from the Tambora period that are lost forever”.<sup>139</sup> He is for Wood one who gives voice to the millions of poor and illiterate in this period – and perhaps more important to his claims of volcanic impact in China – an individual whose life and work can give a unique insight into the Chinese empire in the early nineteenth century at large.

Li Yuyang belonged to an ethnic minority in Yunnan which the Ming and subsequent Qing dynasty had made efforts to assimilate into the empire over the course of many generations. The Bai’s, like many other minorities, had according to Wood been encouraged to adopt “the manners, language, and customs of their conquerors”.<sup>140</sup> During the colonization of the southwest during the Ming dynasty – Li Yuyang’s ancestors were displaced from the lowlands to the mountain hills so that the Chinese empire’s intensified cultivation of land could run its course. By the time Yuyang was born however, sufficient Sinicization of the Bai’s had enabled him to leave his village to study at a Confucian academy in the Yunnan capital Kunming – one of the few avenues of upwards social mobility in nineteenth century Qing China.

Li Yuyang excelled in his studies, but not enough to differentiate himself from other students through the imperial examination system. Unable to show the necessary distinction in these exams, he could not claim a desirable government appointment and Wood notes that he had to abandon his aspirations of completing the transition “from ethnic provincial subject to imperial Chinese ruling class”.<sup>141</sup> After residing some time in an intellectual neighborhood in Kunming he received news of his family’s bankruptcy. To support them he moved to the outskirts of the city to work the rice fields alongside illiterate peasants. After a few years working as a small-acre

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<sup>138</sup> Yang Yuda, Man Zhimin, and Zheng Jinguyn, “Jiaqing Yunnan Daijhuang (1815-1817) u Tanbola Huoshan Penfa,” *Fudan Daxue Xuebao*, vol. 1 (2005).

<sup>139</sup> Wood, *Tambora*, 11.

<sup>140</sup> Wood, 106-107.

<sup>141</sup> Wood, 107.



farmer, Tambora's weather hit Yunnan. Li Yuyang's poems from the subsequent years gives a chilling account of the famine years.

His poems were written in an ancient Chinese poetic mode called Poetry of the Seven Sorrows which experienced a renaissance in China in the early nineteenth century. In a Seven Sorrows poem "the poet dramatizes the five bodily senses under assault, overlaid with the twin mental afflictions of injustice and bitterness: seven sorrows in all."<sup>142</sup> As a poet of the people, Li Yuyang portrayed the societal impact of extreme weather to which he himself and his family were also victims – as evident in his first poem from the famine years; "A Sigh for Autumn Rain" (1815):

The clouds like a dragon's breath on the mountains,  
Winds howl, circling and swirling,  
The rain God shakes the stars, and the rain  
Beats down on the world. An earthquake of rain.  
Water spilling from the eaves deafens me.  
People rush from falling houses in their thousands  
And tens of thousands, for the work of the rain  
Is worse than the work of thieves. Bricks crack. Walls fall.  
In an instant, the house is gone. My child catches my coat  
And cries out. I am running in the muddy road, then  
Back to rescue my money and grains from the ruins.  
What else to do? My loved ones must eat.  
There are no words for the bitterness of  
An empty September. The flood-drowned fields  
Harvest three grains for every ten of a good year.  
And from these three grains? Meals and clothes till next September.<sup>143</sup>

This was the first year of volcanic weather and before life for many got much worse. Central themes of his later poems are the sale or killing of children, the despair in facing the taxman claiming what is due, foul odors everywhere, grueling hunger, and death. The changes in tone and content in Li Yuyang's poems reflects a rapidly deteriorating situation for the populations in Yunnan during the famine years. They also reveal in which ways that it was not just the

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<sup>142</sup> Wood, *Tambora*, 11.

<sup>143</sup> Wood, 108. Poems translated by Rong Guangqi, from "Ji yuan shi chao," in *Cong Shu Ji Cheng*, vol. 178 (Xinwenfeng chu ban gong si, 1989).

weather that caused pains, but also the repercussions of inflated grain prices which sent shockwaves through the agrarian population in Yunnan. And when government relief finally arrived, it was hardly any relief:

You open the Li Gate, and the hungry millions moan [...]

You give a bowl to the grown man, half to the child. But don't you see the strong men push forward, while the old stumble? [...]

Your porridge is like water. I will come again tomorrow, if I am not already dead. I will beg again

For porridge, but quietly, so not to anger you.<sup>144</sup>

Some scholars have suggested that China's intensification of agriculture in the preceding centuries is an important background for the episodes of subsistence crises in the nineteenth century.<sup>145</sup> Liberal logging and land clearance policies made many areas more vulnerable to flooding. The increasingly more efficient agricultural production and consequent exploitation of arable land could support a larger population, but in the event of failed harvests a lot more people were accordingly exposed. Yunnan, usually an exporter of cereals to the eastern parts of the empire, struggled to feed its own population after Tambora struck. Local sages were according to Wood "quick to blame the bad weather on some lapse in conduct of the people, in the loyalty of sons or the chastity of daughters".<sup>146</sup> This bear semblance to the simultaneous reactions in Europe where people also struggled to make sense of the weather and its societal effects. Some gave moral interpretations, others materialistic, political, or administrative explanations. This suggests that pursuing climatological perspectives can bring up interesting connections on a global scale. The Chinese emperor, for instance, scolded the administrative class and government officials:

Had they managed affairs diligently and in a completely public-spirited manner, all cooperating with each other, there would not have been a situation such as this ... The wheat harvests have already proved deficient. If the great fields are not sown in good time, there will be no supply of food for the humble folk.<sup>147</sup>

This excerpt was from an imperial edict in 1816. Wood notes that later that year "the provincial government of Yunnan had taken some measure of the humanitarian disaster and turned its attention from taxing the people to saving them".<sup>148</sup> There were however several problems. The

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<sup>144</sup> Wood, *Tambora*, 113.

<sup>145</sup> Robert Marks, *Tigers, Rice, Silk, and Silt: Environment and Economy in Late Imperial South China*, (New York: Cambridge UP, 1998).

<sup>146</sup> Wood, 109.

<sup>147</sup> Quoted in Mark Elvin, "Who Was Responsible for the Weather? Moral Meteorology in Late Imperial China," *Osiris*, vol. 13, 229.

<sup>148</sup> Wood, 110.

harvest in 1814 had failed in many parts of China and consequently left the state granaries wanting. For centuries, the empire regulated the prices of staple foods by purchasing grain after the autumn harvest for storage before it could be sold during winter and spring when the supply diminished and prices rose. In the seminal study *Nourish the People: The State Civilian Granary System in China, 1650-1850*, R. Bin Wong and Pierre-Etienne Will charts the sophisticated development of the granary system in China. Wong argues that because of Yunnan's location at the periphery of the empire, the government perceived the region as especially vulnerable to subsistence crises and consequently the granaries in the province was supposed to be well-supplied.<sup>149</sup> These granaries had operated in Yunnan for more than a thousand years and according to official numbers, a one-month supply of food for every grown man in the province was supposed to be stored.<sup>150</sup> Newer studies have however shown that there are reasons to doubt these figures.

In the early nineteenth century, the emperor's court received reports of the weakened state of granaries in the provinces which is thought to have been the consequence of years of deliberate neglect. Carol H. Shiue have found that "granary storage levels were systematically lower in provinces that received more frequent central government disaster relief".<sup>151</sup> This suggests that the Chinese granary system was more vulnerable to short-term shocks than previously thought. Because of the cost of managing the granaries, state officials realized that it was more efficient to use the grain market for food distribution.<sup>152</sup> This system could not sustain the pressure produced by volcanic impact and combined with a long-term national trend of neglect and poor management of state granaries – efforts to diminish the consequences of famine were quickly exhausted. Realizing that they could not count on the government for relief in the case of subsistence crises, the farmers in Yunnan responded according to Wood by initiating preventive measures on their own by planting opium crops.

### 3.3 The Opium Problem

Wood is not alone in his thesis that the distribution of opium was a big problem for China from the nineteenth century and until Mao made quick work of opium production, consumption, and

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<sup>149</sup> R. Bin Wong, "Decline and its Opposition, 1781-1850," in *Nourish the People: The State Civilian Granary System in China, 1650-1850*, eds., Pierre-Etienne Will and R. Bin Wong (Michigan: University of Michigan Press, 2020 [1991]), 88.

<sup>150</sup> Wood, *Tambora*, 111.

<sup>151</sup> Carol H. Shiue, "Local Granaries and Central Government Disaster Relief: Moral Hazard and Intergovernmental Finance in Eighteenth and Nineteenth Century China," *The Journal of Economic History*, vol. 64:1 (2004), 100.

<sup>152</sup> Shiue, 101.

addiction in the process of transforming China to a communist paradise in the *Great Leap Forward* from the late 1950s. Mao succeeded, admittedly at an enormous cost, where previous emperors failed in the campaign against the opium poppy and exiled its production to the bordering regions between Laos, Thailand, and Myanmar – commonly referred to as the *Golden Triangle*. From the 1950s, these were the largest opium producing areas in the world until being surpassed by Afghanistan in the early 21<sup>st</sup> century. While many agree that the widespread use of opium in China produced many and severe social, economic, and political problems – the causes of these are debated.

In *Late Victorian Holocausts: El Niño Famines and the Making of the Third World*, Mike Davis argues that British interventionism and the Opium wars was important factors in China's decline in the nineteenth century, but does not, as Wood does, trace these developments back to the early nineteenth century. Davis holds that “an interaction of endogenous stresses and the loss of sovereignty over foreign trade in the aftermath of the Opium wars undermined the famous state commitments to the “normalization of grain prices” and that China's subsequent efforts to reduce the trade deficit by supplantation of subsistence agriculture with opium crops had detrimental effects on peasant food security.<sup>153</sup>

Others seek to exonerate the British by arguing that the Chinese over many centuries had acquired a taste for opium in the same way as tea drinking lodged itself in British material culture. In this narrative, the British simply tapped into an existing market when starting to move opium from the Bengal region in India and into China in the late eighteenth century.<sup>154</sup> Hans Derks vehemently reject these notions and shows in a lengthy work that it was the British East India Company who established the Chinese market for opium and that imperialist interventions are to blame for the far-reaching consequences of domestic opium consumption and production in the nineteenth century.<sup>155</sup> Derks acknowledges that opium has been used for medicinal purposes for many centuries in China and recreationally by a very select few in the upper tiers of the socioeconomic hierarchy but maintain that the widespread addiction of the nineteenth century and first part of the twentieth century was an effect of the chain of supply

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<sup>153</sup> Mike Davis, *Late Victorian Holocausts: El Niño Famines and the Making of the Third World* (London: Verso, 2002), 60 and 76.

<sup>154</sup> R. Murphy and K. Stapleton, *East Asia: A New History* (Boston: Longman, 2010), 167: “Chinese consumers and their merchants and middlemen created the market for imported opium, which was thought to be superior to the domestic supply that had earlier provided the major source.”

<sup>155</sup> Hans Derks, *History of the Opium Problem: The Assault on the East, ca. 1600-1950*, (Leiden: Brill, 2012).

and demand set in motion by the British. Cultural histories of Chinese opium consumption support this latter argument.

Yangwen Zhen shows also that a culture for opium consumption in China can be traced back several centuries and that it was reserved for the wealthy. From the fifteenth century and onward it was used in China as an aphrodisiac by the emperor and his court. In the following centuries, opium was recreationally consumed by the rich after acquiring a taste for its potential to provide fleeting sensations of bliss. Zheng cites the eighteenth century contemporary Xu Boling who wrote that opium served “mainly [...] to aid masculinity, strengthen sperm and regain vigor”.<sup>156</sup> And the end of the eighteenth century, “opium smoking accompanied by sex recreation on leisure boats was well established in Canton”.<sup>157</sup> She notes that up until this point, opium was mainly enjoyed by the upper classes, but this changed from the turn of the nineteenth century when also soldiers, women, students, eunuchs, rich peasants, and the urban middle class developed a habit. Thus, patterns of Chinese opium consumption appear to have changed at the same time as the British intensified the imports of the drug. Informed by the great toll of opium consumption in this period, the Qing emperors in the nineteenth century made several efforts to curb this development, but to no avail. According to Wood, volcanic induced climate change can be blamed for this.

At the turn of nineteenth century, the opium consumed in China was mainly imported. One hundred years later, however, crops sourced from regions within China supplied its population with the plant and most of it came from the Yunnan province which over the course of the nineteenth century had established itself as the heart of domestic opium production.<sup>158</sup> Wood holds that the experiences of famine years after the eruption of Tambora caused many Yunnan farmers to plant opium which had better potential as a cash crop than cereals like wheat, barley and even rice. Consequently, the trajectory of opium consumption and production runs parallel to that of China’s decline in the nineteenth century and Wood suggests that there is a correlation between these synchronous developments. Considering that there was no cultivation of opium in Yunnan before the eruption of Tambora, he argues that the shift to opium production in the 1820s was the consequence of a new dynamic which had been painfully exposed during the famine years:

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<sup>156</sup> Yangwen Zhen, “The Social Life of Opium in China, 1483-1999,” Published online by Cambridge University Press (January 2003), x, from Xu Boling, *Yinjing juan*, (Taipei, 1971 reprint of 1776 edition), 14-15.

<sup>157</sup> Zheng, 12.

<sup>158</sup> Derks, *History of the Opium Problem*, 422.

By the time of the Tambora emergency, the commercialization of agriculture had evolved to the point where self-sufficiency was not the dominant working rationale of the common Yunnanese farmer. Rather, he found himself forced into the marketplace to raise money for taxes and buy grain in the off-season.<sup>159</sup>

The opium plant could be sown in the fall, grown to maturity during winter and harvested in summer. Consequently, it could be cultivated together with or as an addition to subsistence crops and Wood holds that “the desperate peasant farmers of Yunnan came to the collective realization that opium was as good as money and more reliable than food”.<sup>160</sup> The opium plant is relatively forgiving with respect to soil and climate and was worth twice as much per acre of yield than more conventional crops and was thus ideal as a cash crop. When word of this agricultural transition in Yunnan reached the central government in 1820, initial attempts to slow it down by anti-cultivation measures were set in motion. These programs did however little to stem the tide of opium transported down the Red River through Vietnam and from Hanoi by sea to Hong Kong and Canton. Wood argues that once the opium land conversion had occurred, local officials had little reason to enforce these anti-cultivation measures when they could claim taxes from the crop instead. Before long, Yunnan was growing almost nothing but opium and several tribes brought with them their knowledge of opium cultivation south down the Mekong River and to the highlands of the *Golden Triangle* in Laos, Myanmar, and Thailand. Wood situates this agricultural transition at the beginning of a path toward devastation:

That this evolution began in the aftermath of the Tambora emergency shows the sinuous correlation that can exist between high-impact climate change events – such as a three-year famine – and social disruption on global scales and centennial time frames.<sup>161</sup>

At the turn of the twentieth century, China produced a large majority of opiates for the global market and in the same period some 90% of the male population in Yunnan is thought to have been drug users, half of which addicts.<sup>162</sup> To illustrate the devastation of opium, Wood turns to contemporary witnesses, like Francis H. Nichols, a western observer who depicted what met him in a Chinese village in the late nineteenth century:

The roofs of the houses are dilapidated and full of holes ... No one is selling vegetables in the road, and the one or two shops which the village possessed are closed. In the shadow of the houses a few men and women are lying or squatting – apparently in a stupor. Their faces are drawn and leathery, their eyes glazed and dull ... Even some of the babies the women carry in their arms have the same parched skins and wan, haggard faces. And the cause of all this is opium.<sup>163</sup>

Traveler accounts like this are of course the most readily available when the local source material is scant, or when the language barrier makes investigating primary sources difficult.

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<sup>159</sup> Wood, *Tambora*, 118.

<sup>160</sup> Wood, 119.

<sup>161</sup> Wood, 119.

<sup>162</sup> C. P. Giersch, *The Transformation of Qing China's Yunnan Frontier*, (Cambridge: Harvard UP, 2006), 111.

<sup>163</sup> Francis H. Nichols, *Through Hidden Shensi*, (New York: Scribner's, 1902), 56-57.

Nichols' account may not be entirely false, but the 'lazy, opium-smoking Chinese' was a powerful trope in the Victorian era and functioned as one of many justifications for imperial interventions in China.<sup>164</sup> Because evidently, they had no self-control and were in no condition to take care of themselves. Hence, being informed by western observers whose agenda was to appeal to a home audience is fraught with problems, despite Nichols' assertion in the preface of *Through Hidden Shensi* that "This narrative offers no solution of Chinese problems, points no morals, and draws no conclusions."<sup>165</sup>

Wood and Behringer argue that those Chinese problems in the nineteenth century were rooted in climatic and environmental stress starting with the 'Tambora crisis'. Wood highlights Yunnan's transition to opium farming after the famine years as important and Behringer explains this development in the context of the succession of natural disasters to which China ultimately failed in responding to, consequently leading them down the path of becoming a "failed state".<sup>166</sup> Of course, because of the language barrier and global scope of their studies, they are primarily informed by secondary literature to make these claims and do not ground this in empirical evidence. Wood admittedly brings in the anecdotal evidence at the local level with Li Yuyang but extending this to the general decline of the Chinese empire is not entirely persuasive.

### 3.4 The 'Great Divergence'

In conventional Marxist historiography in China, Western imperialism has largely been blamed for the "lost" nineteenth century. Since the 1980s, however, scholars have reflected on the internal difficulties in the Qing state and Cao et al. notes that, in those studies, factors as "population pressure, class struggle, and even Neo-Confucianism were blamed for the decline".<sup>167</sup> From the 1990s, climate and the environment entered the fold and investigations into a series of devastating floods in the first half of the nineteenth century in China opened for a debate on the consequences of environmental factors.<sup>168</sup> This is where Behringer situates the impact of the Tambora crisis – as a prologue to the succession of floods in 1823, 1833 and 1850

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<sup>164</sup> Mathew Brundage, "Somewhere Between Civilization and Savagery: American Rhetoric of Stagnation and Opportunity between the Opium Wars, 1843-1856," *The Journal of American-East Asian relations*, vol. 23:3 (2016).

<sup>165</sup> Nichols, *Through Hidden Shensi*, ix.

<sup>166</sup> Behringer, "Climate and History: Hunger, Anti-Semitism, and Reform During the Tambora Crisis of 1815-1820," in *German History in Global and Transnational Perspective*, ed., David Lederer (London: Palgrave Macmillan, 2017), 28.

<sup>167</sup> Cao, Li and Yang, "Mt. Tambora, Climatic Changes, and China's Decline in the Nineteenth Century," 604.

<sup>168</sup> Yuping Ni and Martin Uebele, "Size and Structure of Disaster Relief when State Capacity is Limited," *Australian Economic History Review*, vol. 59:1 (2019), 25.

which “followed each other so rapidly that there were insufficient time to recover”.<sup>169</sup> These events have been connected to other events of harvest failure and consequent famines in China.<sup>170</sup> When seen in conjunction with the deteriorating granary system, British imports of opium and its unsettling effect on the Chinese society as well as the Taiping rebellion from 1851 – this acknowledgement of natural factors functions more as an addition and does more to corroborate with the existing research than to challenge it more fundamentally. After Wood and Behringer have embedded Tambora into existing research, it is not entirely clear in which ways their studies are innovative, beyond suggesting that climate also matters in explaining the deterioration of the Chinese empire in the nineteenth century.

Cao et al. do however agree with Wood and Behringer in that the internal difficulties contributing to China’s decline which is thought to have started under the reign of emperor Daoguang might be traced even further back when considering the eruption of Tambora and its societal impact in the years 1815-1818. But to get a better grasp on this connection, they ask for more empirical studies at a local level that can show how “local societies respond to climatic changes and consequent calamities with their own traditions, institutions, mechanisms and resources” and whether these efforts “have influenced the process of divergence, if not actually been part of its origin.”<sup>171</sup>

### **3.5 Conclusion**

In his chapter on the Yunnan famine, Wood strikes an emotional chord or two to argue that the failure of state granaries to provide disaster relief and consequent experiences of volcano induced famine had major repercussions for the people in the province. The horrors of hunger exemplified through stories of deluded and desperate people who shape lumps of clay to look like food before eating it and of parents who see no other way than to kill or sell their children out of failure to feed them are central components in the argument that climate change have the potential to cause a shock severe enough to trigger a permanent change in the direction of historical developments. In Yunnan, this turning point occurred through agricultural production in adapting to the threat of future subsistence crises. Consequently, and based on the assumption that opium played an important role in China’s fate, this new trajectory triggered by the eruption of Tambora is for Wood a crucial factor in the story of China’s decline in the nineteenth century.

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<sup>169</sup> Behringer, *Tambora and the year without a Summer*, 255.

<sup>170</sup> Ni and Uebele, “Size and Structure,” 25.

<sup>171</sup> Cao, Li and Yang, “Mt. Tambora, Climatic Changes, and China’s Decline in the Nineteenth Century,” 605.



Thus, what Wood ultimately does is to correlate large-scale developments, based on secondary literature, before connecting these to qualitative, in this case anecdotal, evidence from the poems of Li Yuyang and traveler accounts. While this narrative is persuasive at a glance, the lack of more empirical evidence to substantiate his claim makes the argument somewhat suggestive and does not do much to challenge what is already known. This is symptomatic of Wood and Behringer's monographs on Tambora which often draw circles around bullet holes left by other studies and where climate change constitutes an additional factor. In other words, somebody else has marked the transition and Wood and Behringer attempt to nuance this by attributing a different causality. Hence, they are not really arguing against something.

This is however not entirely negative. If Wood and Behringer were Chinese scholars they might have been confident in challenging the traditional narratives, but they are not, and productively make use of secondary literature to bring into view interesting connections that otherwise might have gone by unnoticed. Wood's cultural focus appears also to be a welcome contribution to Chinese climate history. Readily available administrative sources of recorded weather in China going back a thousand years have according to Fiona Williamson inclined scholars to base their studies on statistical data rather than looking in the human archives.<sup>172</sup> Against this background, she calls for more attention given to how cultures in China have responded to climatic stress, something Wood have already made an effort to do by situating the poems of Li Yuyang in the context of how the population in Yunnan were affected by and consequently responded to climate change between 1815 and 1818. But the question of whether that response "influenced the process of divergence" is still very much open.

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<sup>172</sup> Fiona Williamson, "The "cultural turn" of climate history: An emerging field for studies of China and East Asia," *WIREs Climate Change*, vol. 11:3 (2020), 3.

## CHAPTER 4: CHOLERA

A major epidemic is currently raging through every continent, and it has done so for more than a year. Covid-19 has put serious strain on societies on a global scale and it is still unclear as to when we will be able to suppress the virus and halt the spread. It is now widely accepted that the origin of the epidemic occurred through a zoonosis of the virus where it was transferred from bats to human hosts and that it is unlikely to have escaped, or been deliberately released, from a clandestine Chinese laboratory.<sup>173</sup> Several studies have suggested that land management practices and environmental perturbations may have caused the virus to make this jump before spreading across the world.<sup>174</sup> In other words, chopping down forests may have forced bats to come into contact with humans they normally shy away from. This suggests that the initial trigger is rooted in socionatural entanglements, but that once the virus has entered a human body, further transmission is up to societies, and how they deal with the spread. The question of global distribution of vaccines has also revealed the potential of epidemics in highlighting tensions that under normal circumstances looms just under the surface:

Epidemics, and perhaps other major calamities, do not create abnormal situations, rather they emphasize normal aspects of abnormal situations ... An epidemic intensifies certain behavior patterns, but those patterns, instead of being aberrations, betray deeply rooted and continuing social imbalances.<sup>175</sup>

On national scales, there is a general pattern that those who are most adversely affected by the Covid-19 epidemic is the part of the population that makes up the lower end of socioeconomic hierarchy – even in Norway where egalitarian social structures have been the bedrock of the nation ever since WW2. The same can arguably be said for extreme climatic stress or natural disasters which similarly puts temporary stress on societies.<sup>176</sup> The preceding chapters have shown that it is not primarily the rich who take the brunt of famines caused by climate induced crop failure, but rather the poor, weak and marginalized within a society. This final empirical chapter addresses what happens when taking the worst of two worlds, namely disease and extreme climate change, and place them in the context of early nineteenth century history. What we get then, according to Wood and Behringer, is cholera – one of the most devastating diseases of the modern era. In their studies on Tambora, volcanic impact abruptly the seasonal monsoon

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<sup>173</sup> David Morens et al., “The Origin of COVID-19 and Why it Matters,” *The American Journal of Tropical Medicine*, vol. 103:3 (2020), 958.

<sup>174</sup> H. Li et al., “Human-animal interactions and bat coronavirus spillover potential among rural residents in Southern China,” *Biosafety and Health*, vol. 1:2 (2019) and a 2018 study warning against this: C.Monagin et al., “Serologic and behavioral risk survey of workers with wildlife contact in China,” *PLoS One*, vol. 13:4 (2018).

<sup>175</sup> Robert E. McGrew, “The First Cholera Epidemic and Social History,” *Bulletin of the History of Medicine*, vol. 34:1 (1960), 71.

<sup>176</sup> Susanna Hoffman and Anthony-Oliver Smith, *The Angry Earth: Disaster in Anthropological Perspective*, (London: Routledge, 2020 [1999]), 20.

patterns in the Indian subcontinent and consequently triggered the first of seven waves of cholera outbreaks to kill millions across the globe throughout the nineteenth and twentieth centuries. Cholera had been endemic to India for centuries, and Wood and Behringer argues that the drought in 1816 and following floods in 1817 transformed the *Vibrio cholerae* genome at the DNA level into an epidemic form that was more aggressive than its endemic ancestors. They argue that the volcano induced famine in 1816 and 1817 rendered the population in India more vulnerable to disease and that British troops were largely responsible for the global spread.

Spread of disease is however not linear – as all the preventive measures related to the current epidemic is a constant reminder of. Accordingly, an explanation that isolates changes in the climate, or environmental upheavals like those in present day China, to be the sole cause of any infectious disease is likely to be wanting specificity. Social and political involvement, as well as the specific cultural context, largely affects how epidemics spread. Furthermore, these collective responses, or lack thereof, are arguably dynamic expressions of evolving knowledge and changing conceptions of the disease in question.

The following section presents meteorological research that connects the eruption of Tambora to the deteriorated monsoonal conditions of 1816 and 1817 on the Indian subcontinent where it is generally accepted among scientists that the volcanic ash in the atmosphere hindered seasonal precipitation in 1816 and subsequently intensified the east Asian monsoon in the following year. Section 2.2 on the relationship between climate change and cholera is informed by recent epidemiological research which has suggested that extreme weather events have the potential of being a strong driver of cholera outbreaks. Section 2.3 looks at the 1817 episode in its initial phase and how cholera was perceived by contemporaries and consequently responded to it. Section 2.4 charts the global spread from the Indian subcontinent to other parts of Asia and east Africa and brings in the arguments of Wood and Behringer on the implications and consequences of global cholera outbreaks for nineteenth century history.

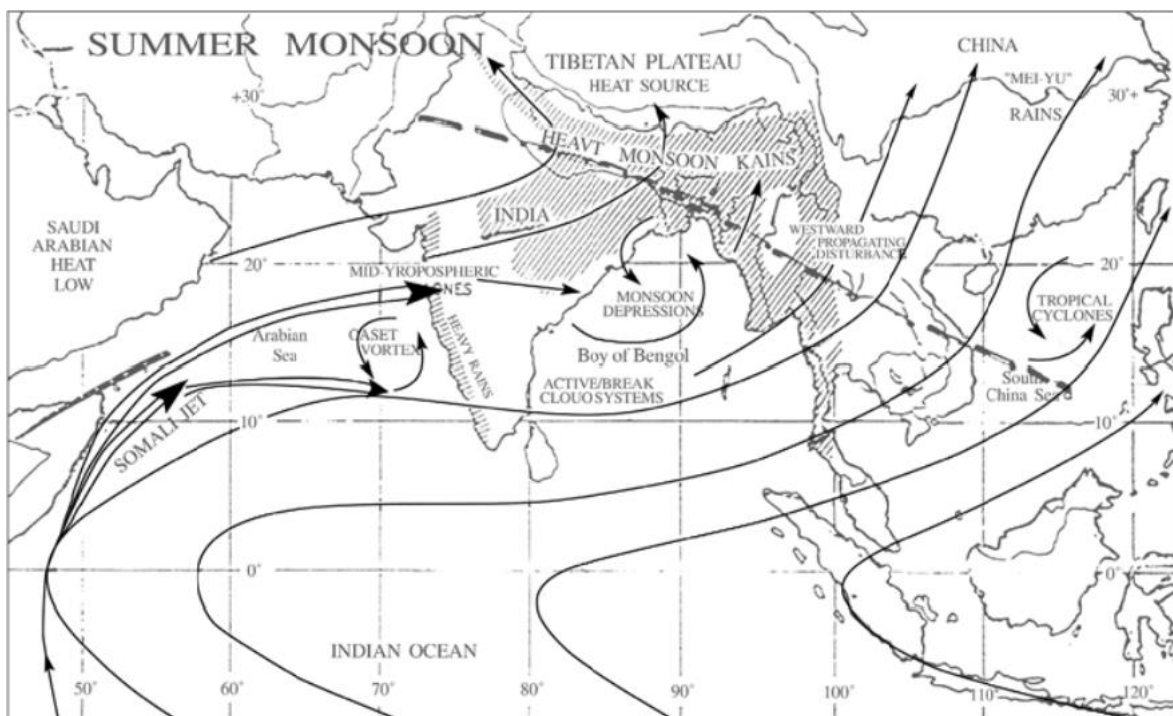
#### **4.1 Abnormal monsoon patterns and a new cholera**

Soon after the eruption of Tambora in April 1815, volcanic ash was carried west by winds in the upper atmosphere and made up a large cloud which hovered over the Indian subcontinent. One of the immediate effects was a drastic temperature decrease; meteorological instruments in Madras on the southeastern coast of India showed a change in morning temperatures from 10°C to -3°C over the course of the last week of April.<sup>177</sup> Once rainfalls shed the volcanic cloud

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<sup>177</sup> J. J. Higginbotham, ed., *Selections from the Asiatic Journal and Monthly Register* (Madras, 1875), 14.

of most if its material, the residual cloud of minerals and sulfur aerosols persisted in the sky until 1817.<sup>178</sup> These droplets of sulfuric acid affected temperatures both at the earth's surface and the upper stratosphere, but more important for the populations in south Asia was the disruptive effect on the annual monsoon which over the course of three months every year replenishes the otherwise dry land. During these summer months, the monsoon engine transports moisture from the Indian and Pacific Oceans and releases it in heavy rainfalls over south and east Asia. During the winter dry season in India, a high-pressure system created by winds from the north disperse of any lingering condensation in the air, but in May these winds are reversed and move according to the earth's rotation over the Bengal delta where a consequent low-pressure system releases the much-anticipated deluge:



**FIGURE 4.1** Synoptic-scale weather systems associated with summer monsoon fluctuations in South Asia.<sup>179</sup>

Considering that these cycles in the weather are an important part of the rhythms of life, culture, and economy in these regions – an abnormal monsoon may have far-reaching consequences for the populations that are affected. And in 1816, the rain never came. The veil of volcanic ash floating in the stratosphere and its thermal effects prevented any evaporation from the ocean

<sup>178</sup> C.C Gao and Y.G Gao, “Revisited Asian Monsoon Hydroclimate Response to Volcanic Eruptions”, *Journal of Geophysical Research: Atmospheres*, 123 (2018), 7883.

<sup>179</sup> Yihui Ding and D.R. Sikka, “Synoptic systems and weather,” in *The Asian Monsoon*, ed, Bin Wang (Heidelberg: Springer, 2006), 145.

which in turn switched off the main engine in the monsoon system.<sup>180</sup> This climatic inertia caused a drought followed by crop failure and subsequent famine in the Bengal region.<sup>181</sup> When the east Asian monsoon finally regained its strength in 1817, it arrived three weeks earlier than usual and with a vengeance. Compared to the previous year of drought, the monsoon of 1817 went to the opposite extreme by unleashing unprecedented hailstorms and torrential rains followed by severe flooding which caused a second year of failed harvests in Bengal. The spring crops were devastated and Wood notes that winds “tore up orchards of dates, bananas, and papaya all across the fragile alluvial plain.”<sup>182</sup> And out of this misery, a new strain of pathogenic cholera emerged from the rivers of Jessore in the Bengal delta.

#### 4.2 Cholera and climate change

The ‘father of British medical writers on cholera’, James Jameson, hypothesized already in 1820 that the cholera epidemic that broke out in 1817 could be traced back to the unusual weather in the Bengal region in the two-year period from 1815. Jameson concluded in his extensive report to the Calcutta Medical Board that a combination of high humidity, drought and unusual winds of those years were the causes for the Indian cholera.<sup>183</sup> In the coming decades, however, Jameson’s theories of cholera’s connection to conditions in the natural environment were sidelined by a paradigm maintained by western physicians who held that infectious diseases were primarily social and the manifestation of poverty, squalor, and neglect.<sup>184</sup> In this view, cholera represented according to Wood the failure of nation-states “to regulate and sanitize their colonial ports of trade and booming industrialized cities”.<sup>185</sup>

Wood argues that the early theories of the connection between climate change and cholera “rapidly lost ground during the heroic age of nineteenth-century sanitarianism”.<sup>186</sup> This paved the way for an approach to deal with the spread of cholera where preventive measures consisted primarily of improving sanitary conditions. It made sense then, that the overpopulated region of Bengal with its uncivilized inhabitants was the birthplace of a disgusting disease like cholera and that the only way to get rid of it was through the fruits of progress. Findings in recent

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<sup>180</sup> Eryuan Ling et al., “Strong link between large tropical volcanic eruptions and severe droughts prior to monsoon in the central Himalayas revealed by tree-ring records,” *Science bulletin* (Beijing), vol. 64:14 (2019), 1018.

<sup>181</sup> Christoph C. Raible et al., “Tambora 1815 as a test case for high impact volcanic eruptions,” *WIREs Climate Change*, vol. 7:4 (2016), 576.

<sup>182</sup> Wood, *Tambora*, 82.

<sup>183</sup> James Jameson, *Report on the epidemick cholera morbus: as it visited the territories subject to the Presidency of Bengal, in the years 1817, 1818 and 1819*, (Calcutta: 1820), LXVI.

<sup>184</sup> Mark Harrison, “A Dreadful Scourge: cholera in early nineteenth century India”, *Modern Asian Studies*, vol. 54:2 (2020), 503.

<sup>185</sup> Wood, 87.

<sup>186</sup> Wood, 87.

epidemiological research suggests however that there is reason to question the white supremacist consensus that cholera was the product of human filth and poor people living in slums.

*Vibrio cholerae* has two known reservoirs: the aquatic environment and humans.<sup>187</sup> It thrives in the former and given the microbe's flexible genetic structure it adapts to survive in the latter. It has been traced to aquatic systems all over the world, but pathogenic strains – those that causes disease – are found mainly in waters at low elevation in subtropical regions where the weather is characterized by temperature and humidity extremes and heavy seasonal precipitation. Cholera emerges usually, but not exclusively, from the rivers of the Bengal delta where it feeds on organic hosts like plankton, algae, and small insects.<sup>188</sup> During the monsoon each year, reversed winds coupled with heavy rainfall has the potential to facilitate favorable conditions for explosive algal blooms to transport colonies of the cholera pathogen along the coast of East India. This helps explain why cholera has been endemic to Bengal for ages, but not why an epidemic strain was developed in 1817.

New methods have allowed scientists to do a complete sequencing of the cholera aDNA which showed that the pandemic strains of the bacteria after 1817 followed a different path than their endemic predecessors.<sup>189</sup> This improved understanding of the cholera genome has allowed other scientists to search for the causes of the 1817 pathogen. These studies suggest that James Jameson was on to something in his thesis that the unusual weather in the wake of Tambora's eruption was a cause for the first cholera outbreak. Ecologist Mercedes Pascual, for instance, have studied the influence of meteorological events like ENSO<sup>190</sup> cycles on the spread of cholera in the context of nineteenth century history and have found that anomalies in the weather – like flood, drought, and abnormal temperatures – may constitute a forceful driver of outbreaks.<sup>191</sup> Wood refers to the work of cholera epidemiologist Rita Colwell who similarly singled out extreme weather events with “their impacts on water temperature, salinity, and conditions of flood or drought, as capable of both amplifying transmission of cholera and producing the non-linear transformation of organic pathogens into new and potentially deadly

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<sup>187</sup> Donatella Lippi, Eduardo Gotuzzo and Saverino Caini, “Cholera,” *Microbiology Spectrum*, vol. 4:4 (2016), 1.

<sup>188</sup> Sirajul M. Islam et al., “Environmental reservoirs of *Vibrio cholerae*,” *Vaccine*, vol. 38 (2019), 52.

<sup>189</sup> J.F. Heidelberg, “DNA Sequence of Both Chromosomes of the Cholera Pathogen *Vibrio Cholerae*,” *Nature* vol. 406 (2000).

<sup>190</sup> Wikipedia: El Niño Southern-Oscillation: “[...] irregular periodic variation in winds and sea surface temperatures over the tropical eastern Pacific Ocean.”

<sup>191</sup> Mercedes Pascual et al., “Cholera Dynamics and El Niño-Southern Oscillation,” *Science*, vol. 289 (2000), 1769.

forms.”<sup>192</sup> Thus, and central to his argument on the connection between volcanic impact and the cholera outbreak in 1817 – is that the severity of Tambora’s impact on the climate system surely must have had the potential to create a new strain of cholera. Also, that the population in the Bengal delta – already debilitated from two consecutive harvest failures – were at this moment particularly vulnerable to the spread of disease.

Of course, this sounds a bit tenuous, but this is exactly what Bruce Campbell argues in *The Great Transition* after tracing the long chain of causation between climate change and the spread of the *Yersinia pestis* from Asia and across the world from the fourteenth century. And this might be what we are seeing again with Covid-19, admittedly with environmental and not climatic factors. Campbell demonstrated the potential of integrating aDNA research in history with *The Great Transition* by explaining in detail how a sustained wet period created more food for rodents, the primary host of the *Yersinia pestis* which was transmitted by fleas. More food caused these hosts to multiply which, in turn, meant that more fleas fed on them. When these rodents died, the fleas became desperate and started looking for hosts that they do not usually bind to – namely humans in the fourteenth century. Thus, maybe these entanglements are that complex, and despite the lack of clear ‘cause and effect’ relationships, these new methods can allow us to interpret these complex processes and think differently about the connections between nature, disease and humans, also in the context of history.

Microbes change all the time, so why was 1817 special? Behringer is very brief in his description of the chain of causation, but Wood goes in more detail and suggests that volcano induced climate change in 1816 caused a change in *Vibrio cholerae* at the DNA level after which a *new strain* became more aggressive. Changes in water temperature in and salinity in 1817 facilitated the bloom of zooplanktons carrying this *new* cholera. Subsequent flooding transported the pathogen into the water systems of human communities. “From there”, Wood argues, “the *v. cholerae* is but a cup of water, rice pot, or shellfish meal away from colonizing its first human host”.<sup>193</sup>

If this argument is valid, then the eruption of Tambora plays an important role in the first wave of cholera. Behringer is more concerned with the societal factors that facilitated further spread, like with the movement of British troops. The following sections seek to look at these

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<sup>192</sup> Wood, *Tambora*, 89.

<sup>193</sup> Wood, 90

entanglements between nature and society in more detail by critically situating Wood and Behringer claims in the context of cholera historiography.

In August 1817 in Jessore, then primarily occupied by tigers and covered by forests, *Vibrio cholerae* began its journey by killing some 10 000 people before moving on to Calcutta in August. By November it had spread to a British military camp in north-central India where the pathogen came across an army of 10 000 soldiers along with 80 000 camp followers where some ten thousand perished from acute illness.<sup>194</sup> This first cholera epidemic subsequently spread south to the Indonesian archipelago, west along the Persian Gulf and to parts of the Ottoman Empire before reaching Siberia, east to China through the ports of Canton and Japan before finally stalling in 1823/1824.<sup>195</sup> There are no exact mortality numbers for this first wave, but the first three epidemics between 1817 and 1860 is thought to have claimed more than 15 million lives and another 23 million in the next three waves until 1917.<sup>196</sup> Most historiography on cholera has regarded the 1817 outbreak merely as a prologue to the succeeding and more far-reaching epidemics of the nineteenth century and have not been studied in depth, but recent contributions to the field of medical history asks that more attention should be given to this episode of origin as well.<sup>197</sup>

### **4.3 The Blue Death in India**

Previous events of endemic cholera in Bengal mainly broke out during the winter months and ran out of victims – mostly children who lacked immunity – before spreading to other regions. Inherent in the new pathogen of 1817, however, was the capability to transcend the flock immunity built up by the local populations. The new *Vibrio cholerae* microbe embraced its human hosts and in the process of passing through their intestines it went into a temporary ‘hyperinfective’ state.<sup>198</sup> Cholera is easily treatable with antibiotics and by rehydration promptly after infection, but this was of course not available knowledge at the time. During the second wave in the 1830s and still a century before the advent of penicillin, Irish physician William O’Shaughnessy hypothesized that oral rehydration therapy (ORT) could in many cases cure a patient after a cholera infection. His theory was met with doubt, and it was not until the beginning of the twentieth century that it was widely accepted that ORT significantly decreased

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<sup>194</sup> Christopher Hamlin, *Cholera: The Biography*, (Oxford: Oxford UP, 2009), 34.

<sup>195</sup> Lippi, Gotuzzo and Caini, “Cholera”, 2.

<sup>196</sup> Hamlin,, 3.

<sup>197</sup> Harrison, “A Dreadful Scourge,” 503.

<sup>198</sup> Mercedes Pascual et al., “Hyperinfectivity in Cholera: A New Mechanism for an Old Epidemiological Model?,” *Public Library of Science*, vol. 3:6 (2006).



cholera's mortality rate of 70% if left untreated.<sup>199</sup> Thus, over the course of the nineteenth century, millions of unfortunates across the globe died in excruciating pain, as described by medical historian Christopher Hamlin:

Cholera did not merely kill, and rapidly, but it distorted lives and bodies. It took hold, drawing out the body's heat, twisting muscles into spasms and cramps, producing insatiable thirst but taking away voice. It liquefied a body as fluids streamed uncontrollably and insensibly from both ends. It quickly wrung the water from the body, leaving a shriveled form and thickened blood. All this in a few hours. Cholera bypassed both the cathartic crisis of fever and the advances and declines of consumption; it was not a disease that a person lived with.<sup>200</sup>

Hamlin holds that cholera's greatest insult was to progress itself. Not merely as a horrible disease that claimed many lives, but "as an invader of continent, state, or town, cholera violated a sense of European identity that was being applied to other places as they succumbed to civilization".<sup>201</sup> Following this rationale on the part of contemporaries, there was no wonder that the *Yersinia pestis* took a large bite of the world's population in the fourteenth century, because those societies were yet to be enlightened and consequently lacked the scientific knowledge and highly developed reason to deal with it. Thus, events like this belonged to a benighted past and could not be allowed in a time of progress, science, and optimism about all to come. nineteenth century theories of cholera's transmission appear to have been largely determined by these notions spawned by modernity. The philosophy of cholera according to Hamlin "is not of science alone, but rather of the entanglement of the epistemic and the ethical"<sup>202</sup> – thus, investigations into the cultural constructions and different conceptions of cholera may reveal a clearer picture of how societies have responded to the disease and consequently, in which ways and why it spread across the world.

The rivers of the Bengal delta which millions of people depended on for a wide range of daily activities were one of the central pathways for cholera to spread to other parts of India in the nineteenth century. The local *ghaut* – steps of stone leading down to the water functioned as a town square where people gathered to bathe, wash their clothes, or fetching water for drinking or preparing food. Wood notes that the banks of Ganges offered "the gratifying sight of monkeys, buffalo, and occasional elephants wallowing in the mud".<sup>203</sup> During cholera outbreaks, however, these places mutated into something else entirely – as observed by the British clergyman James Statham during his travels in India:

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<sup>199</sup> Hamlin, *Cholera*, 242.

<sup>200</sup> Hamlin, 2.

<sup>201</sup> Hamlin, 4.

<sup>202</sup> Hamlin, 150.

<sup>203</sup> Wood, *Tambora*, 83.

None but those who have witnessed the distressing sight can form an adequate picture of human misery which the *ghauts* afford at the time when the cholera rages. The dead and dying are all huddled together in a confused mass, and several fires are blazing at the same time, consuming the bodies of the more rich and noble, who have just died, whilst the poor creatures who are expiring feel certain that in a few minutes their bodies must share the same fate, or be hurled into the flowing stream, to become the prey to jackals and vultures, which infest the spot. Fresh arrivals every hour multiply the misery, as groans and cries increase, while the stench proceeding from the burning bodies, and the lurid gleams of the blazing fires reflected by the water, and giving somewhat of an unearthly appearance to the features of the suffering victims around, furnish a scene of woe which completely baffles the power of description to portray.<sup>204</sup>

Statham appears to have overcome this bafflement to portray a horrific picture of what met him at the *ghauts* along the Ganges. If he had brought a camera with him, one can imagine it looked something like this:



**FIGURE 4.3** *Covid-19 funerals in India*<sup>205</sup>

What here looks like a scene from Dante’s journey through the seventh circle of hell is a picture taken on 23 April 2021 where Covid-19 victims in Delhi are being wheelbarrowed to the pyres by the dozens. These open-air morgues serve to relieve the stress on crematories where the chimneys are currently melting from the continuous disintegration of human bodies.<sup>206</sup> On the photographer’s Twitter account, there are also pictures of people celebrating the Khumb Mela festival in Haridwar earlier in April – mass gatherings which are thought to have intensified the spread of the virus in India. Khumb Mela is celebrated every 12 years and is based on the relative astrological position of the sun, moon, and Jupiter.<sup>207</sup> It was not supposed to be held until 2022, but the planets aligned a bit earlier in this cycle and it was consequently pushed

<sup>204</sup> John Statham, *Indian Recollections*, (London: 1832), 214.

<sup>205</sup> Danish Siddiqui, Twitter post, 25 April 2021, <https://twitter.com/dansiddiqui>.

<sup>206</sup> Gunnar Kage, *Situasjonen i India er prekær*, *Aftenposten*, 27 April 2021.

<sup>207</sup> ‘Aligned’ is subsequently used to describe this relative position, but that might not be accurate. It appears to be somewhat ambiguous what planetary order constitutes this position and sources on this matter differ widely, but this is astrology and not astronomy.

forward. Normally lasting four months, the Khumb Mela has in 2021 been reduced to just the one in April considering Covid-19. “Death is inevitable, but we must maintain our traditions”, said the Hindu Sadhu and guru Mahant Narayan Giri on 17 April.<sup>208</sup> A few government officials voiced concerns prior to the festival, saying that it might become a ‘super-spreader event’, but the Ministry of Health dismissed this as ‘fake news’.<sup>209</sup>

In the context of cholera epidemics in the nineteenth century, Hamlin holds that “Haridwar came to embody the tension between freedom of religious practice and restrictive health-based-government”.<sup>210</sup> In 1817, the sun, moon, and Jupiter also aligned at an inopportune moment and during the Khumb Mela festival of that summer, cholera broke out and was carried by pilgrims to the British capital of India where it arrived early in August.<sup>211</sup> Calcutta derives its name from Kali, the Hindu goddess of death and destruction, and as the new epicenter of cholera – the city lived up to its name. From this densely populated area in the Bengal delta the pathogen spread in all directions. Some British troops brought the disease to neighboring Myanmar where it subsequently found a second pathway into China in addition to the route through the ports of Canton. Other British troops transported the bacteria to parts of India where the East India Company had unfinished business with some persistent locals who were reluctant to submit to their new ruler.

In autumn 1817 the British Grand Army marched out of Calcutta under the command of Lord Hastings towards the independent regions south of Delhi in north-central India. The third Anglo-Maratha war of 1817-1818 was the final stage in series of conflicts between the East India Company and the Maratha Empire. Dissolving the rule of the Marathan Peshwa was one of the last obstacles before Britain could claim complete domination over the Indian subcontinent. A minor setback in this campaign came while Hasting’s army was camped on the banks of the River Sinde on November 8. In the afternoon that day, soldiers brought two Indian stretcher-bearers to Jeremy Corbyn, a medical officer in Hastings’ army. He observed their sunken eyes, weak pulse, and clammy skin before one of them abruptly started vomiting a clear and odorless fluid. Corbyn consulted with the superintending surgeon who told him to “break camp immediately and find safer ground”.<sup>212</sup> Before he could initiate this move an officer

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<sup>208</sup> Shuddhabrata Sengupta, Leaders Listened to Astrologers, so Haridwar Mela Happened after 11 Years, not 12, Science – The Wire, 23 April 2021.

<sup>209</sup> Ministry of Health (India), Twitter post, 6 April 2021, [https://twitter.com/MoHFW\\_INDIA](https://twitter.com/MoHFW_INDIA).

<sup>210</sup> Hamlin, *Cholera*, 72.

<sup>211</sup> Hamlin, 72.

<sup>212</sup> Wood, *Tambora*, 74.

arrived and reported that camp followers and soldiers alike were dead or lay dying with a blue hue on their lips and fingers.

Cholera did the rounds around camp and claimed the lives of thousands of men, women and children and all combat seized while the entire camp was “transformed into a hospital and open-air morgue”.<sup>213</sup> Between November 15 and 20 alone, 5000 died.<sup>214</sup> When the spread of disease finally withered down among the soldiers and camp followers, Hastings had lost half of his numbers – some 10 000 to death and the rest to either desertion or death in attempts of desertion. Thomas Medwin, an officer in Hasting’s army recalled his experiences from these fateful weeks in November 1817:

One march I shall never forget ... I was in the rear-guard, and did not get to my new ground till night, and then left eight hundred men, at least, dead and dying, on the road. Such a scene of horror was perhaps never witnessed ... We lost a whole troop.<sup>215</sup>

Cholera did of course little to stop Hastings in his campaign to subsume the Maratha empire into the British empire, but this experience was nevertheless a shock and caught the attention of government officials and science communities around the world who scrambled to understand how the disease could be prevented. Medical historian Mark Harrison argues that “the official to reaction to cholera in India was initially ameliorative, in keeping with the East India Company’s response to famines and other supposedly natural disasters” and that this view was gradually replaced with notions of cholera as a social disease and a man-made problem which required preventive measures.<sup>216</sup> At first then, the response of British officials was to provide relief through the guise of fatalistic paternalism. This approach had earlier been deployed in events of famine “which was regarded as a natural and unavoidable calamity, requiring no more than remedial action.”<sup>217</sup> This bears semblance to other government responses to the calamities of this period, like the previously mentioned Qing emperor who opened the doors to the state granaries for the starving population in Yunnan, admittedly with mixed results. Or in contrast to King Wilhelm I of Württemberg’s efforts to instigate more systemic changes informed by the impact of famine.

Based on existing literature on the first cholera epidemic, it appears that the first wave was not a trigger of social unrest which has been associated with the succeeding outbreaks. The Calcutta Board of Revenue did complain that “Much mischief has arisen from the great alarm of people,

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<sup>213</sup> Wood, *Tambora*, 74.

<sup>214</sup> Hamlin, 34.

<sup>215</sup> Thomas Medwin, *The Angler in Wales*, (London, 1834), vol. 2:346.

<sup>216</sup> Harrison, “A Dreadful Scourge,” 502.

<sup>217</sup> Harrison, 523.

their quitting their habitations and their proper pursuits”<sup>218</sup>, but this is more likely to be an expression of the general and aimless trepidation among the population and noted by the Board of Revenue because the misbehavior on the part of the Indians threatened the flow of income. Wood notes that the Indian camp followers in Hasting’s army laid dead bodies in front of the tents of army commanders as to signify that the British were somehow responsible, but Harrison holds that it was not until the following decades that cholera outbreaks triggered uprisings that were anticolonial in nature. The consensus in 1817-1821 was that there were many and varying predisposing causes for cholera. Consequently, Harrison argues that “few entertained the notion that the government—either in India or Britain—had a duty to relieve them.”<sup>219</sup> Charting the role of the British colonialists in spreading the first cholera outbreak, however, suggests that the sentiments of Hasting’s Indian camp followers were not unfounded.

#### **4.4 Global cholera**

The first wave of cholera diminished before reaching Europe and the Americas, something that might explain the lack of research on this episode, but it managed to cause much harm all over Asia and parts of Africa and was a wake-up call for governments all over the world. Hays notes that the mortality numbers from the first wave often were grossly exaggerated which is likely to have exacerbated the anxieties in Europe: “these estimates inspired fears of a New Black Death in the West”.<sup>220</sup> Behringer argues that five factors were crucial for the spread of cholera after 1817:

First, it was caused by an especially aggressive pathogen; second, the conditions were very favorable (weakened immune systems, high humidity); third, the British East India Company had its headquarters in Bengal; fourth, British troops spread the disease, and fifth, globalized trade networks also facilitated the spread”.<sup>221</sup>

In 1821, a British expedition from India arrived in Oman, consequently introducing cholera to the Arabian Peninsula and East Africa. Behringer cites recent studies that have shown that Sub-Saharan Africa was struck by the first cholera epidemic and that Zanzibar, at the time politically allied with Oman, was especially affected. Zanzibar was also the center of the international slave trade at the time which helped the further proliferation of cholera. It subsequently spread to Muscat and Bahrain before arriving in the city of Basra where the rivers Euphrates and Tigris converge. There, 15 000 people died over the course of three weeks before the bacteria spread upriver to Baghdad and then to Syria where it followed the caravan route to Aleppo in

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<sup>218</sup> Calcutta Board of Revenue to Fort George, 28 November 1818.

<sup>219</sup> Harrison, “A Dreadful Scourge, 553.

<sup>220</sup> Jo N. Hays, *Epidemics and Pandemics: Their Impacts of Human History*, (Santa Barbara: ABC-CLIO, 2005), 195.

<sup>221</sup> Behringer, *Tambora and the Year without a Summer*, 242.

November 1822. In Yerivan further north, a Persian Army had just conquered an Ottoman Army, but was infected by cholera and had to demobilize. The Persian soldiers returning home brought with them the disease to Tabriz and Baku in Azerbaijan where it killed more than 20 000 people in the summer of 1822.<sup>222</sup> This trajectory is a powerful reminder of how society affects spread of disease. Cholera appeared in places where there was societal conflict, be it war or slave trade, and exposed these areas as with a magnifying glass.

From Myanmar, the epidemic spread to British Singapore, Bangkok, and further south to the Sunda Islands in the Indonesian Archipelago which a few years prior had been devastated by the tsunami triggered by Tambora's eruption. The death toll of cholera on Java has been estimated to some 100 000.<sup>223</sup> Cholera then followed the sea route to the Philippines, Canton and from there to Japan. The opium trade intensified in 1821 and ships from Bengal were constantly docking in Canton – providing a steady supply of cholera and opium. That year it reached the Chinese capital Peking and with its population of one million people it became the epicenter for further spread in north Asia. From Peking it followed caravan routes beyond the Great Wall and through Mongolia before reaching the eastern parts of Siberia.<sup>224</sup>

Hamlin's account of the spread of this first wave of cholera stops in Siberia just short of Europe, but Behringer describes the transmission to progress further to Moscow, then to St. Petersburg and via the Baltic Sea to Prussia. This is debated among medical historians where some have argued that the 1817 cholera just lost traction at this point, but never went away, before regaining strength in 1829 when this 'Asiatic cholera' reached Moscow.<sup>225</sup> Most recent studies argues that a new epidemic originated in Bengal in 1826 where the pathogen embarked on a three-year journey by land to Moscow before finally wreaking havoc across European states in the early 1830s.<sup>226</sup> This distinction is important in the discussion of volcanic impact and nineteenth century cholera and it makes sense that Behringer would favor the position that regards the first and second wave of cholera to be one long epidemic as a long rest period does not sit well with his hypothesis. If there were no continuation, that would of course weaken Wood and Behringer's argument of a direct line between Tambora and nineteenth century cholera epidemics.

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<sup>222</sup> This paragraph is based on Behringer, *Tambora and the Year without a Summer*, 264-266.

<sup>223</sup> Hays, *Epidemics and Pandemics*, 193.

<sup>224</sup> Behringer, 265.

<sup>225</sup> N.H Jones, Cholera nomenclature and nosology: a historical note," *Bulletin of the World Health Organization*, vol 51:3 (1974), 318.

<sup>226</sup> Hays, 195.

In 1830, Europeans were not unfamiliar with cholera which during the preceding decade had raged through Asia and parts of sub-Saharan Africa. Colonialists had informed the governments back home of the potential impacts of disease who were aware of the looming threat. Thus, cholera was according to Wood the first disease to “come under modern public health surveillance and gave rise to entire new bureaucracies across the European nation-states”.<sup>227</sup> As a response to the second cholera epidemic the first British Board of Health was established in 1831 and twenty years later the first International Sanitary Conference commenced in Paris where cholera was the only subject on the agenda.<sup>228</sup> Still, increased government interventions to stop the spread along with advances in biology did little to stem the tides of outbreaks from the Indian subcontinent.

Wood holds that the impact of cholera in this period was transformative on the character of nineteenth century colonialism and global race relations:

Writings on the impact of climate on human physiology and character post-1817 show a marked shift from an optimistic theory of acclimatization – in which even European skin color might naturally be expected to change – to a rigid hereditarian model, whereby distinct races were tied to their respective environments by virtue of their indigeneity – that is, their long-term, continuous habitation of place. History, according to this new logic, became biology, and eighteenth-century environmental determinism began its insidious evolution toward nineteenth-century biological theories of race”.<sup>229</sup>

The initial encounter that British soldiers had with cholera in 1817-1818 in India and then during the subsequent epidemic of the 1830s at home helped according to Wood “to consolidate views of India as a dangerous, alien environment to which Europeans could never adapt”.<sup>230</sup> And that this, in turn, contributed to cementing cholera discourse as a cornerstone of Western orientalism and consequent social polarization which has defined geopolitics ever since. David Arnold has argued, however, that the perception of the lazy and fatalistic Indian can be traced even further back and to the Great Bengal Famine in 1770 where India, in the eyes of the British, went from being a garden of plenty to a cesspit.<sup>231</sup>

#### 4.5 Conclusion

Thanks to new methods in aDNA research, climate impacts on society and disease can now be linked more suggestively. Bruce Campbell demonstrated the potential of this approach in history with *The Great Transition*. In connecting volcano induced climate change to the cholera

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<sup>227</sup> Wood, *Tambora*, 93.

<sup>228</sup> Hamlin, *Cholera*, 17.

<sup>229</sup> Wood, 93.

<sup>230</sup> Wood, 94.

<sup>231</sup> David Arnold, “Hunger in the Garden of Plenty,” in *Dreadful Visitations. Confronting Natural Catastrophe in the Age of Enlightenment*, ed., Alessa Jones (New York: Routledge, 1999).

outbreak in 1817, Wood and Behringer are far less detailed in demonstrating a chain of causation, but that does not necessarily mean that they are wrong in their claim. This chapter has shown that climate impacts and disease can be connected, but that this suggests substantial entanglement. Climate change induced cholera did not emerge from the Bengal delta, and millions consequently suffered. Wood and Behringer argue that a new and more aggressive strain of cholera emerged in Bengal after two abnormal monsoon seasons and that changes in the environment led zooplanktons carrying the pathogen to human communities where the drought in 1816 and floods in 1817 had led to famine and higher susceptibility to disease. Considering that research in other contexts that make similar connections, Wood and Behringer's claim on volcano induced cholera is entirely plausible, but it is not based on empirical evidence showing that it happened as they suggest. With regards to the global spread, social conflict, imperialism and connected markets were important factors. Thus, society and nature are interlinked on many levels.

The current Covid-19 epidemic reminds us that these entanglements still exist, and that global spread of disease does not belong to a benighted past. Research into the societal effects of epidemics in history can give insight into how culturally situated knowledge about disease largely determines the human responses to it. The cholera epidemics on the nineteenth century showed that the impact of disease is both physical, in terms of people dying, and psychological, in terms of advocating colonialism, racism and superiority. Today, the psychological damage of Covid-19 is manifested in the question of global vaccine distribution and tensions between countries as well as in the socioeconomic polarization within nations.



## CHAPTER 5: DISCUSSION

Volcanic impacts on the global climate clearly affected a large part of the world's population from 1815 and until the veil of sulfur aerosols dissipated in 1818 and seasonal weather returned. Wood and Behringer demonstrate convincingly that historians of this period who sideline the role of climate change do so at their own peril. This generalization does however only get us so far if we want to explain in more detail, for instance, why a certain culture or a very distinct part of the population within a society was more adversely affected by these changes in the climate than others. Sustained extreme weather did not discriminate in its devastation of rice plants in Yunnan, potato crops in Ireland or barley in the fields of Württemberg. One can certainly attribute agency to climate, but arguably no agenda.

In their respective monographs on Tambora, Wood and Behringer aim to bring into view how one random natural event can serve as a global connector powerful enough to send a large portion of the world's population into a state of crisis. The preceding chapters have however shown that socio-ecological relationships are complex and that once we move beyond the biophysical effects of climate change, e.g. in the form of crop failure or zoonosis of the cholera pathogen, it becomes increasingly less discernible to what extent natural factors play a decisive role. Consequently, the demands of evidence for their chief claim are high. By evaluating Wood and Behringer's arguments in contrast to the relevant independent sources presented above, this chapter seeks to answer the questions of (1), whether the Tambora years constitute a turning point in nineteenth century history and if climate change was a strong driver in this development, and (2), what can be gained from these two studies on Tambora.

Implied in their argument is that the years preceding 1815 marks a rupture for societies on a global scale and in this they are in good company. This perspective aligns with most accounts of periodization where the early modern era gives way for the modern era in 1815, but those are often grounded in processes between the French revolution and the Concert of Europe system that emerged from the Congress in Vienna as well as intensified industrialization. Wood and Behringer contest this and suggest instead that it was developments rooted in volcano induced climate change that largely defined the first half of the nineteenth century and by extension how modernity played out. Behringer, especially, is quite vocal about this point. Transformative events obviously occurred in this period, so it is crucial to distinguish between which of these that are just synchronous, those that can be connected to the acute problems of climate change and those which are rooted in longer trajectories.

This chapter addresses three points where their claims can be disputed and argues that Wood and Behringer can be situated slightly to the side of climate determinism and that it is unclear whether climate change was a strong driver, to the extent that they claim, in the series of transformative events in the early nineteenth century that are presented in this thesis. Societal factors have obviously not been disregarded in their studies, but because of the broad approach, limited temporal scope and application of some ambiguous concepts, like ‘crisis’ which reveals little of what lies underneath – climate change emerges as a disproportionately forceful driver of European migration and China’s decline, but not so much with respect to the first cholera epidemic where both authors paint a rather nuanced picture of the entanglements between climate change, disease and human societies.

The claim on the connection between migration and climate change is arguably the strongest but can be nuanced by taking a longer view. Wood argues persuasively that the three-year famine in Yunnan is an important background for the pivot to opium farming in the province, but his thesis that this development brought down an entire empire is more speculative. There is strong evidence for climate change to have been a catalyst for the initial outbreak of cholera in Bengal and Wood and Behringer contrast this with relevant societal developments to explain the first wave of global cholera from 1817.

The concept of a ‘Tambora crisis’ does arguably little to explain the developments in this period, but it brings into view some pressing concerns regarding the importance of semantics in how we understand the link between society and nature which, in turn, invites us to ask what is to be gained from studies into this complex relationship.

## **5.1 Global history**

Is a truly global frame doable? Historians who make efforts to bring the whole world into view open themselves up for criticism from those who have dedicated their whole scholarly life to one region, country, or continent. Of course, Wood and Behringer could never match that expertise in every place they cover in their monographs on Tambora, nor can they be proficient in every language. This is a big challenge and one that historians in most fields seeking to write global histories make efforts to overcome. “All historians are world historians now”, C.A. Bayly have argued, “though many have yet not realized it”.<sup>232</sup> Considering the constant stream of works that claim the global or world history label, this trend is not likely to fade away any time

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<sup>232</sup> C.A. Bayly, *The Birth of the Modern World, 1780-1914: Global Connections and Comparisons* (Malden: Blackwell Publishing, 2004), 469.

soon and it invites historians to develop new methodologies and theories in areas where the tools handed down from previous paradigms prove to be insufficient. Both syntheses on Tambora demonstrate in different ways the limitations of writing histories that are supersized in spatial scale, but they also reveal the many opportunities that comes with expanding the scope of historical studies.

In terms of global coverage, Behringer covers more of the world than Wood. The effect of this is evident in the structure of his book which is comprised of 121 short thematic chapters in the main body of some 250 pages. Many of these chapters converge on the same topics from time to time, but this format allows for little depth. But where it is lacking in specificity and detail, it does compensate by bringing into view shared trajectories, connections, comparisons, and striking similarities that otherwise might not be discernable or possible to detect at all. And at the center is climate change, not as a universal predictor, but as something that affected many societies simultaneously and revealed internal tensions within them.

In the case of the Yunnan famine, failed harvests put stress on the long-established granary system in the Chinese empire which ultimately failed in feeding the desperate population in the province. This failure can be attributed to the government officials who, over the course of the preceding decades, had found that the increasingly efficient agricultural market based on principles of supply and demand could transport grain to crisis ridden regions in times of need. This made more sense than always keeping large amounts of grain in storage and susceptible to spoilage by rodents or humidity. The population in Ireland was affected by a similar dynamic. Subjected to the British empire, grain was funneled out the country to the open market. When Tambora struck, the British government looked the other way and left the Irish with their rotten potatoes, ominously foreshadowing the more severe famine three decades later which really spurred Irish emigration. In Württemberg as well, the inflated prices of basic foodstuffs in 1816 was in part a consequence of king Friedrich selling off reserve grain to other European states. These developments triggered, in turn, simultaneous episodes of social unrest and rebellions. Their studies show also how certain aspects of famine appear to be universal to the human condition, like people resorting to eating clay or creating markets for desperate parents to sell their children.<sup>233</sup>

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<sup>233</sup> Rain Jordan, Famines in the Modern Day: What Madagascar's Current Crisis Means to the World, Nature World News, May 2021. After a drought induced famine in Madagascar, hungry citizens resorted to mixing white clay with tamarind.

There is also the transition of Yunnan agriculture to opium farming after the famine years which bears semblance to findings from a study on fisheries in the Gulf of Maine in the same period.<sup>234</sup> In 1816 and the ‘year without a summer’ in North America, a combination of interactive human and natural factors caused a permanent shift in the local fishing industry on the east coast of the USA where fishers went from targeting alewives to primarily fishing mackerel. Extensive dam construction and reduced temperatures coupled with increased fishing activity to compensate for failed harvests quickly exhausted the alewife population. Fishers consequently adapted by catching mackerel which are less vulnerable to climate change instead. Even after normal weather and alewives returned, this shift persisted. These synchronous, yet independent developments, is suggestive of the potential of climate change as a global connector, but this macroscopic view is also counterbalanced by Wood’s recourse to human archives at the local level which, in turn, allows us to see in more detail what happens at the interface of society and nature.

Synoptic-scale climate change, large-scale famine, and dwindling population numbers visible only in a bird’s eye view easily lose sight of the human experience, which in turn, may give precedence to natural factors as drivers of change. Climate change did not force Yunnan farmers to opt for opium production and is something that must be understood in the context of the human consequences of the Chinese granary system that cracked under the pressure of the famine years from 1815. This is something Wood shows through the eyes of Li Yuyang. Wise from damage, Yunnan farmers found that silver was a better security against potential harvest failures in the future and consequently adapted by shifting to opium farming. Thus, volcano induced climate change served as a catalyst that exposed a weakness in the organization of the granaries in China. While this agricultural transition can convincingly be attributed to Tambora, the long-term effects it had the Chinese empire’s development in the nineteenth century are less visible. China is big and many regions were not affected by climate change, so Wood’s claim relies heavily on the damage done by opium sourced from within the empire.

Behringer and Wood’s syntheses on Tambora are primarily based on secondary literature, a characteristic they share with many global histories.<sup>235</sup> The benefits are of course that it allows for coherent and strong narratives based on already digested material, but, on the other hand,

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<sup>234</sup> Karen E. Alexander et al., “Tambora and the mackerel year: Phenology and fisheries during an extreme climate event,” *Sciences advances*, vol. 3:1 (2017).

<sup>235</sup> Jürgen Osterhamel omitted all the primary sources he initially planned to include in *The Transformation of the World – A Global History of the Nineteenth Century* (Princeton: Princeton UP, 2015) which is based solely on secondary literature.

human agency is less discernable in this approach. Hence, the inclusion of Li Yuyang makes the Yunnan chapter one of the strongest and most persuasive parts of D'Arcy monograph, save the extended connection to the Great Divergence. That is not to say, however, that strict adherence to the human archives is always the answer in writing global history. Asking, for instance, contemporary colonists to inform us on whether the Indian population were discontent during the famine and subsequent cholera years might not give us reliable answers.

In 1790, French colonist Gaspard Alexis de la Barre wrote to his wife of the tranquility he enjoyed in Haiti just a few months prior to the unthinkable revolution: "There is no movement among our Negroes. They don't even think of it. A revolt among them is impossible. Freedom for Negroes is a chimera."<sup>236</sup> A year prior and in another letter to his wife, la Barre also wrote this: "As Montesquieu has quite rightly observed, each climate must have its particular laws, and what is good in Europe is worth nothing in Asia."<sup>237</sup> This legacy owed to Enlightenment was at the core of nineteenth century race relations, and it is probable that British colonists in India were equally inept in discerning any looming dismay, no matter how accentuated. Wood noted that the Indian camp followers laid dead bodies in front of the tent of army commanders as to assign guilt, but medical historian Mark Harrison argued in his study on the first cholera epidemic that there was no social unrest among the Indians until the later waves. Is it possible that the Indian population were more discontent with how the British responded to the distress of this period than what the available source material suggests?

Gayanendra Pandey, one of the founders of Subaltern Studies, and his concept of 'un-archived histories' might prove a way around this problem. Pandey challenges the traditional conception that "there can be no history without an archive". He argues that many of the sources from "the early modern and the colonial state's archive of land relations was sharply focused on the question of (the enhancement of) revenue, just as the colonial state's archive of peasant protest and rebellion was built around the category of crime."<sup>238</sup> This corresponds well with the Calcutta Board of Revenue's account of how "some mischief has arisen" during the cholera epidemic, but that there was generally no opposition targeted at the British. Writing history based on silenced voices is obviously not an easy task, but nevertheless important to challenge the hegemony of narratives where important historical facts lie buried deep beneath racist

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<sup>236</sup> Cited in Raoul Peck, *Exterminate all the Brutes*, ep. 2, (HBO, 2021).

<sup>237</sup> Malick W. Ghachem, "The "Trap" of Representation: Sovereignty, Slavery and the Road to the Haitian Revolution," *Rèflexions Historiques*, vol. 29:1 (2003), 123.

<sup>238</sup> Gyanendra Pandey, "Un-archived Histories: The 'Mad' and the 'Trifling'," *Economic and Political Weekly*, vol. 47:1 (2012), 37.

prejudices. Thus, perhaps one can investigate further into the meanings of that mischief during the cholera years or whether laying cholera victims at the feet of the colonists constituted a stronger revolt than what can immediately be inferred from the available source material. But the broad global scope, often drawing on secondary literature, does not necessarily make this approach doable. A different conception of what global history can be, however, may help in this regard.

In *What is Global History?*, Sebastian Conrad suggests that global history does not need to be the object of a study and defined by spatial breadth alone, and that it can usefully denote a perspective, or a lens, through which we analyze historical processes. Freed from the requirement of coverage, microhistories from below can, if properly contextualized, constitute valuable contributions to global history.<sup>239</sup> And if the aim is to understand and explain human responses to climate change, it is arguably at this level that we must seek the answers. Hence, broad studies like those of Wood and Behringer serve to provide that big context and bringing into view a plethora of stories that all can be connected to a shared experience of climate change, but they fall short in adequately explaining the complex relationship between human and natural factors in every case. And this is ultimately what their claims rely on – a connection between climate change and societal developments that can be clearly demonstrated. Their broad scope and reliance on secondary literature often limits the potential to do this persuasively. But, on the other hand, studies that set out to chart global climate change necessarily calls for wide coverage and although Wood and Behringer’s contributions do not really challenge any traditional narratives, they do invoke questions that we otherwise would not ask, which in turn, might lead to more focused studies which end up testing the validity of their many claims.

## **5.2 Relevance of climate**

Both authors make big claims that the eruption of Tambora was a main changing event in the nineteenth century. The temporal scope of their studies is however primarily limited to the years between 1815 and 1820. And without giving due consideration to preceding developments, the role of climate change is arguably overrepresented. When taking a longer view, a more complex picture emerges where preceding trajectories can nuance the explanations proffered by Wood and Behringer. Population movement, for instance, happened before and after the eruption of Tambora, so how do we explain this specific wave of migratory movement from European states?

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<sup>239</sup> Conrad, *What is Global History?*, 8.

When inspecting the graph of emigration numbers from the Kingdom of Württemberg in the nineteenth century it will be hard to explain the sudden spike in 1816/1817 solely with factors that are unrelated to climate change and the economic hardship caused by failed harvests in the region. In an agrarian society where most of the population are at the mercy of the seasonal harvest; it makes perfect sense that a severe disruption to that harvest will have an adverse effect on those who are most vulnerable and lack the means to compensate for bad times by other measures. Of course, Malthus already figured this out in his calculus of demographic growth. One can then hypothesize that, in the lack of food security, some will consider their opportunities of attaining that security somewhere else, perhaps anywhere, depending on viable options for maintaining subsistence levels.

Behringer shows however that it was not primarily the poorest and those on the brink of death who emigrated from the British Isles and Württemberg, but rather those who might very well have managed to push through a couple of hard years to come out more or less fine on the other side. These people decided they would rather not and made efforts to relocate. This required capital, but also a willingness to make the tough choice of leaving family and communities behind. Changing conditions in the natural environment may have created a temporary space for these options to be seriously contemplated in the first place, but this does not alone explain why the alternative of emigrating was ultimately acted upon.

The population of Württemberg had been subjected to the rule of a despot in the decade preceding the famine years and those who had been discontent with King Friedrich may have finally gotten the push they needed after Tambora erupted. Admittedly, when the emigrants were surveyed about the motives for leaving the kingdom, most answered scarcity of food as an important reason.<sup>240</sup> These accounts support the claim of a direct relationship between volcanic impact on the climate and migration, but when considering this specific context, it is probable that failed harvests served merely as a pretext for many of the Württemberg emigrants to spite the warnings of having their citizenship relinquished forever upon leaving the kingdom. Framed this way, climate change can be connected to migration, but not in a coercive relationship. Thus, the explanation is to be found at the interface of socioecological factors and in the dynamic relationship between them.

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<sup>240</sup> Franz Mauelshagen, "Migration and Climate in World History," in *The Palgrave Handbook of Climate History*, White, Pfister, Mauelshagen, 423.

Would emigration from Württemberg have played out differently had Friedrich died five years prior? Perhaps this could allow his son to earlier set in motion the systemic changes in the kingdom which in turn could have repelled the most adverse impact of harvest failure. Or were the acute problems in Württemberg in 1816 exactly the reason for why King Wilhelm decided to not adhere to his father wishes that things should ‘continue as before’? And what if King Friedrich thrived into the 1820s, would that many to returned to his kingdom after seasonable weather returned? All these scenarios would arguably affect emigration differently. And once we take a longer view, something Behringer hardly does, things get more complicated.

Sustained population growth in the preceding century put strain of the food situation in many European states. On top of this were all the soldiers returning home from the Napoleonic Wars who struggled in acquiring employment. This development constitutes important push factors but must also be viewed in relation to the pull factors that had been established through the existing social networks which emigrants could enter at their destinations. It was also the attraction of the New World which had been conveyed to the people in European states over the course of the preceding centuries. The climate induced subsistence crisis in Ireland between 1740 and 1741 was in many respects like the situation in 1816-1818, but that event did not trigger migration of similar scale.<sup>241</sup> The cost of emigration and legal restrictions in many European states strongly influenced opportunities for many to emigrate in the preceding century and with increased transatlantic mobility at the time when Tambora struck, more people had the opportunity to emigrate. Thus, a longer view gives an important background, but there is also a strong point to be made for this event being formative of the later waves of migratory movement in the nineteenth century.

Emigration during the Tambora years triggered unprecedented legislation both in the USA and in many European states which sought to regulate emigration so to avoid the scenes in the ports of Amsterdam, or that vessels fully packed of disease-ridden Europeans sailed into New York. This, in turn, restricted migratory movement, but it also made it a safer and more viable option for many, even in more stable times when climatic stress was not an issue. Emigrants during the Tambora years contributed also to more extensive social networks which later generations could tap into and while volcanic impact did not directly define nineteenth century migratory movement, this event can arguably be said to have long-term effects on the organization and patterns of later waves of emigration.

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<sup>241</sup> Engler et al., "The Irish famine of 1740-1741,".



The question of Tambora's role in the first cholera epidemic, and by extension later epidemics is also complicated, and the connection involves substantial entanglements of human and natural factors. Against the background of recent research that are making connections between climate change, environmental factors and humans and disease, Wood and Behringer's claim that volcano induced climate change was the catalyst for the first wave of cholera is entirely plausible, but this is only alluded to and not demonstrated empirically. And once the pathogen made the jump to a human host, the spread was largely determined by social factors.

On 23 May 2021, Mount Nyiragongo in the Democratic Republic of Congo erupted, killing some 30 people and displaced more than half a million. And in the middle of this, cholera broke out.<sup>242</sup> This is not mentioned to make a cheap point, because this can of course not be compared directly to the societal effects of volcano induced climate change between 1815 and 1818. But the current upheavals in Congo do illustrate the same complex relationship between human and natural factors. A volcano erupted, but it was not pathogenic microbes that was blasted into the atmosphere and infected those in proximity to Nyiragongo. Cholera is endemic in Congo, and when that half a million was forced to leave their homes, lack of clean water and poor sanitary conditions led to its transmission. This is reminiscent of early nineteenth century cholera that similarly exposed any weakness in social organization where it could gain footing and spread. This suggests that natural factors can serve as a catalyst for disease and that the subsequent spread is very much socially mitigated.

### **5.3 What crisis?**

Bruce Campbell showed in *The Great Transition* that there was a long crisis in the late Middle Ages, Geoffrey Parker found similar turmoil for societies in the seventeenth century in *Global Crisis* and Wood and Behringer identified yet another crisis in the early nineteenth century. Between the eruption of Tambora and today there has been no lack of crises and today we are now facing the pressing corona crisis, climate crisis and a plethora of political, economic, and social crises. Does it really denote a state of emergency or is the condition of crisis more of a default position for human societies across time and space? It is obviously used frequently as a clickbait as well as a tool for analysis, but it is not always clear what 'crisis' means or whom it concerns. According to Reinhart Koselleck, the concept usually indicates "insecurity, misfortune, and test, and refers to an unknown future whose conditions cannot be sufficiently

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<sup>242</sup> Médecins Sans Frontières, Further assistance urgently needed for people following DRC volcano eruption, 31 May 2021.

elucidated”.<sup>243</sup> This could also very well be the diagnosis of a fortune teller, admittedly a bad one, who manages to eloquently put into words exactly how I feel about life. How could she possibly know? This is of course the attraction of traveling concepts like this – it can be made to fit anything and nothing. Hence, Koselleck has more than a few quarrels with the inflationary use of crisis:

Applied to history, ‘crisis,’ since 1780, has become an expression of a new sense of time which both indicated and intensified the end of an epoch. Perceptions of such epochal change can be measured by the increased use of crisis. But the concept remains as multi-layered and ambiguous as the emotions attached to it. Conceptualized as chronic, ‘crisis’ can also indicate a state of greater or lesser permanence, as in a longer or shorter transition towards something better or worse or towards something altogether different.<sup>244</sup>

Koselleck made efforts to deconstruct ‘crisis’ by distinguishing between different structural features of how the concept is often used. Theoretically less demanding out of the three models of ‘crisis’ that Koselleck develops is the one where it is understood as an ‘iterative periodizing concept’. This is arguably the model that aligns best with Behringer’s application of ‘crisis’. Instead of listing examples of scholarly work that embodies this understanding of ‘crisis’, Koselleck lets Franklin D. Roosevelt explain what it can mean: “Out of every crisis mankind rises with some greater share of knowledge, higher decency, purer purpose”.<sup>245</sup> In this view, ‘crisis’ is inextricably linked to progress, and failure in responding to the crisis means to regress. This is at the core of Behringer’s argument that some societies, like Württemberg, were able to cope “effortlessly”<sup>246</sup> during the ‘Tambora crisis’, while others, like the Chinese empire, did not and consequently went into “protracted decline” on the path to become a “failed state”.<sup>247</sup> This implies that the eruption of Tambora can be connected to a ‘crisis’ for the Chinese empire, which it is unclear that it can, and that the climate is the primary driver of how societies evolve, which it is arguably not.<sup>248</sup>

It is curious that Wood and Behringer, on highly speculative grounds, seek to tap into the Divergence debate. The thesis of Kenneth Pomeranz is also contested, but he made efforts to de-center Europe and challenge the metanarrative of how unique transformations in Western societies over the course of centuries had prepared them for the dominating role exercised from

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<sup>243</sup> Reinhart Koselleck [trans. by Todd Samuel], “Some Questions Regarding the Conceptual History of “Crisis,”” in *The Practice of Conceptual History: Timing History, Spacing Concepts*, Koselleck (Stanford: Stanford UP, 2002), 236.

<sup>244</sup> Koselleck [trans. by Michaela Richter], “Crisis,” *Journal of the History of Ideas*, vol. 67:2 (2006), 358.

<sup>245</sup> Koselleck, “Some Questions Regarding the Conceptual History of “Crisis,”” 243.

<sup>246</sup> Behringer, *Tambora and the Year without a Summer*, 12.

<sup>247</sup> Behringer, “Climate and History: Hunger, Anti-Semitism, and Reform During the Tambora Crisis of 1815-1820,” in *German History in Global and Transnational Perspective*, ed., David Lederer (London: Palgrave Macmillan, 2017), 28.

<sup>248</sup> Hulme, “Reducing the Future to Climate,”

the nineteenth century. Pomeranz relativized this view by highlighting the contingent factors of the discovery of fossil fuel and expansion of markets to the New World. The way climate change is situated as an agent in this context is arguably just some added flair to the narratives of the rise of the West which Pomeranz sought to contest in the first place. In Behringer's framing, the success or failure of different societies boils down to the question of how well they were able to adapt to climatic stress. The 'Tambora crisis' was then a test in which some states passed, due to features inherent in their economic, political and social organization, and on the other side those who failed because they lacked these qualities. This reveals one of the dangers with a comparative approach which requires a yardstick or some measure by which different states can be compared. Sanjay Subrahmanyam argues that, in this context, perhaps we should not compare at all:

We must abandon the developmental perspective that comes down to us with two fathers (Marx and W.W Rostow), and which believes that the only question worth asking is that of Who Succeeded and Who Failed on the long road to modern industrial capitalism, from a list of modern nation states.<sup>249</sup>

Behringer goes to great lengths to demonstrate the human responses to volcano-induced climate change, but the adoption of this social-Darwinian rhetoric in his grand conclusions runs counter to those efforts and alludes to climate as the primary driver of change. Considering that he explicitly renounces climate determinism, it is doubtful that this was the impression he intended to leave behind. Hence, semantics and the application of concepts like 'crisis' as tools of analysis largely determines how we explain and, in turn, understand how societies are affected by climate change. In this view of 'crisis' as a means to an end, the catastrophic consequences of this 'crisis' on a human level becomes less important.

The poems of Li Yuyang serve as a powerful reminder of what we are dealing with in studies like this. Heartbreaking accounts of hunger, disease, hopelessness, and death. Although we cannot attribute this despair to climate change alone, natural factors clearly played a part. This implies, however, that human agency can affect the consequences of climate change, one way or the other, but also that it is a complex relationship. One of the reasons that climate history attracts much attention is because of the current anxieties about anthropogenic climate change and the fear we will be unable to halt global warming. These feelings are often grounded in prophecies of inevitable migration, famine, disease, and death.

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<sup>249</sup> Sanjay Subrahmanyam, "Connected Histories: Notes towards a Reconfiguration of Early Modern Eurasia," *Modern Asian Studies* vol. 31:3 (1997), 745.

Perhaps contributions in this field can help us to imagine more hopeful possible futures informed by past experiences. If the concept of the Anthropocene does, in fact, not stand in for modernity, there is arguably much potential in this regard. But the organization of forager societies, or early modern societies for that matter, were distinctly different than that from the deeply interconnected societies of today. It is hard to see then, how knowledge about how past societies have responded to changes in the climate can usefully inform our choices in the face on anthropogenic climate change. So, what can be gained from looking back? Koselleck holds that “prognoses are only possible because there are formal structures in history that are themselves repeated, even while their concrete content is unique in each case and remains surprising to those most involved and affected”.<sup>250</sup> If history is not always entirely new, then one pursuit can be to identify what repeats in moments of transformation.

#### **5.4 Opportunities**

In Eleonora Rohlands’s *Changes in the Air: Hurricanes in New Orleans from 1718 to the Present*, the recurrence of hurricanes over the course of three centuries can be said to constitute these repeated formal structures in history. In this major study, Rohland charts how the city of New Orleans has adapted, or not adapted, to a long series of hurricane disasters.<sup>251</sup> When Katrina hit the east coast of the USA in August 2005, New Orleans was devastated by a storm surge that wrecked existing flood protection structures before submerging 80% of the city in water. One million people were evacuated, 1 800 died and come October, some 300 000 refugees had yet to return to the city where all schools remained closed and only two out of eight hospitals were in operation.<sup>252</sup> A widespread conception of natural disasters is that they are usually something that is confined to the Global South where those who do not know any better are unable to fend off nature.<sup>253</sup> So how could something like this happen in a country that is the embodiment of progress? Clearly, it was not knowledge that they lacked.

By taking a long view, Rohland shows that the measures taken to mitigate the adverse effects of hurricanes did not, as a rule, get incrementally more effective by experience out of which something entirely new emerged, but that they were largely the product of contingent, often political, factors and that racist and discriminatory discourses left certain districts of New

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<sup>250</sup> Reinhart Koselleck, “The Unknown Future and the Art of Prognosis,” in *The Practice of Conceptual History: Timing History, Spacing Concepts*, Koselleck, 236.

<sup>251</sup> Eleonora Rohland, *Changes in the Air: Hurricanes in New Orleans from 1718 to the Present*, (New York: Berghahn Books, 2018).

<sup>252</sup> Cathy Thomas, New Orleans Today: It’s Worse than You Think, CNN, November 2005.

<sup>253</sup> Gregory Bankoff, “Rendering the World Unsafe: ‘Vulnerability’ as Western Discourse,” *Disasters*, vol. 25:1 (2001).

Orleans more vulnerable to flooding than others. In a country where it is every man for himself, disaster relief was never properly institutionalized and due to the temporary nature of aid, every hurricane highlighted the racial differences in the city. In effect, poor choices made by one generation defined the choices of later generations, conceptualized by Rohland as ‘path dependencies’. How this can be translated to the larger context of anthropogenic climate change hardly needs to be spelled out. Rohland’s study seriously challenges any notion of a quick-and-dirty technological fix to global warming and brings into view that deeply rooted trajectories may have a larger influence on possible futures than we would like to admit. That is not to say that the future is determined by the past, but that what we might hold as new and better values, ideas and conceptualizations are not new at all, even though their “concrete content is unique”.

Hence, making what repeats discernable, however abstract, can be one way to shift the focus away from the need to learn from how societies have either failed or succeeded in responding to climate change. A society is not homogenous, global societies even less so, and Wood and Behringer have demonstrated that climate change in the form of famine and disease targets those most vulnerable and marginalized with surgical precision. Not because that is what nature does by some inherent attribute, but because choices made by those with power largely affect this dynamic. Still, the implicit lesson in both studies, Wood frames his as a “cautionary tale”<sup>254</sup>, is that some societies ‘got it right’ while others ‘got it wrong’. Human-nature relationships are arguably more complex, something Rohland shows in her study on hurricanes in New Orleans.

While Wood and Behringer have not disentangled this relationship completely in every case, they have allowed us to see, on a global scale, the potential in climate change to play a part in the devastation of lives and communities and that what may appear as synchronous events at the local level are, in fact, connected by climate change. This overview is an invaluable starting point for further research into the societal impacts of climate change in this period. Whether the consequences of the ‘Tambora crisis’ constitute a new master-narrative for the nineteenth century is another matter altogether and is something that, due to the complex relationship between humans and nature, might never be settled. Behringer argues that “those interested in the problems of present and future climate change should know the historical example of Tambora.”<sup>255</sup> We should, but if this knowledge is ultimately based on representations of how societies ‘rise’ or ‘fall’ due to conditions in the natural environment, it can also be limiting.

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<sup>254</sup> Wood, *Tambora*, 234.

<sup>255</sup> Behringer, *Tambora and the Year without a Summer*, 16.

## CHAPTER 6: CONCLUSION

The reluctance of historians to allow agency to nature is not unfounded and puts constant pressure on those seeking to engage with environmental impacts. Integrating research from the natural sciences into historical studies is new territory that requires reflexivity and invites scholars to talk across boundaries that for a long time has been insurmountable. The separation of human and natural histories was a consequence of the Enlightenment and now are we asking whether this compartmentalization and purification of the sciences might have served as a straitjacket for the ways in which we think about the relationship between humans and nature. The concept of the Anthropocene forces us to revisit this problem, no matter how messy it gets.<sup>256</sup> It is against this background that Wood and Behringer have written their syntheses on Tambora, heeding the call for nature to be reinserted into history while at the same time opening themselves up for scrutiny from every specialist field they tap into, from migration history to microbiology. With this, they have demonstrated the potential in stepping outside the established frames of history and allowed us to see how charting climatic impacts on societies can bring into view connections and developments that we would otherwise miss.

This thesis has argued that the cost of these efforts are unsubstantiated explanations where they have done more to correlate large-scale developments on a global scale than to demonstrate a clear linkage between them. Thus, the hypothesis that the societal reverberations of volcanic impacts on the climate constitutes a new master-narrative for the nineteenth century, effectively challenging existing narratives, is questionable. The main point in Wood and Behringer's monographs on Tambora is for taking human and natural factors into account, which they admittedly do, but the evidence they present to support their chief claim does not adequately explain how climate change caused a turning point in 1815 with large ramifications for nineteenth century history at large. That is not to say that volcanic impacts on the climate did not play a role in migratory movement from 1816 in Europe, the famine in Yunnan and the first cholera epidemic. Clearly it did, but once Wood and Behringer move beyond the individual cases to assert their overall thesis of a general and all-encompassing 'Tambora crisis', they land in a reductionist framework where the climate is elevated to be a primary driver and where the failure or success of different societies ultimately depends on their adaptive capabilities to climatic stress – ignoring the possibility that these societies thrived or deteriorated for other reasons altogether.

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<sup>256</sup> Chakrabarty, "The Climate of History,".

Bold claims and a steep hypothesis notwithstanding, Wood and Behringer have showed that climate change can link events across the globe and suggested that the eruption of Tambora might be a partial explanation for why this period in the early nineteenth century was so busy. The complications that we have seen in this thesis were usually long established, and the acute crisis in Tambora's aftermath served as a springboard and catalyst more than a mono-causal origin. To understand in more detail how and why climate change was a trigger in this context, this thesis has suggested that a smaller spatial scope or a longer temporal scope in a local context can be a fruitful avenue for further research. This way, cultural particularities and fragmented histories from the margins of society are not subsumed into the familiar narratives of traditional global histories that assembles events into a larger aggregate which, in turn, easily allows for determinist explanations that suppresses human agency.

But of course, this necessarily requires a basis for which these fragments can be related to that larger context, something Wood and Behringer has given us for the Tambora years. Thus, the global and micro are not antagonists but can be productive allies. This thesis has no quarrels with their contribution in this respect, only when they overextend the explanatory power of climate change because their spatial and temporal scope cause them to overlook other and important factors that would nuance or contradict their claims. Wood and Behringer argues that it only makes sense to investigate an event like the eruption of Tambora in a macroscopic view, but following global climate change does not automatically call for a broad scope. Choice of scale has arguably no intrinsic value, and its utility depends on theoretical awareness and what the historian seeks to answer. Most proponents of microhistory during the cultural turn would probably reject any existence of universal processes, especially non-human material ones. That does not make histories from below in this context obsolete, on the contrary, it is at the local level the different responses to extreme natural events are discernable, something we could see through the eyes of Li Yuyang.

If this approach can provide us with a way out of 'predicting' the past, it can usefully give us valuable insights to make prognoses for the future where the natural sciences are currently the predictive authorities. They are primarily concerned with the biophysical effects of climate change and less with the social impacts. History studies grounded in a theoretical framework that allows us to disentangle the complex relationship between humans and nature can provide good opportunities to engage with the current debates of global warming and may contest the linear models of causality between climate change and for instance migration, famine and

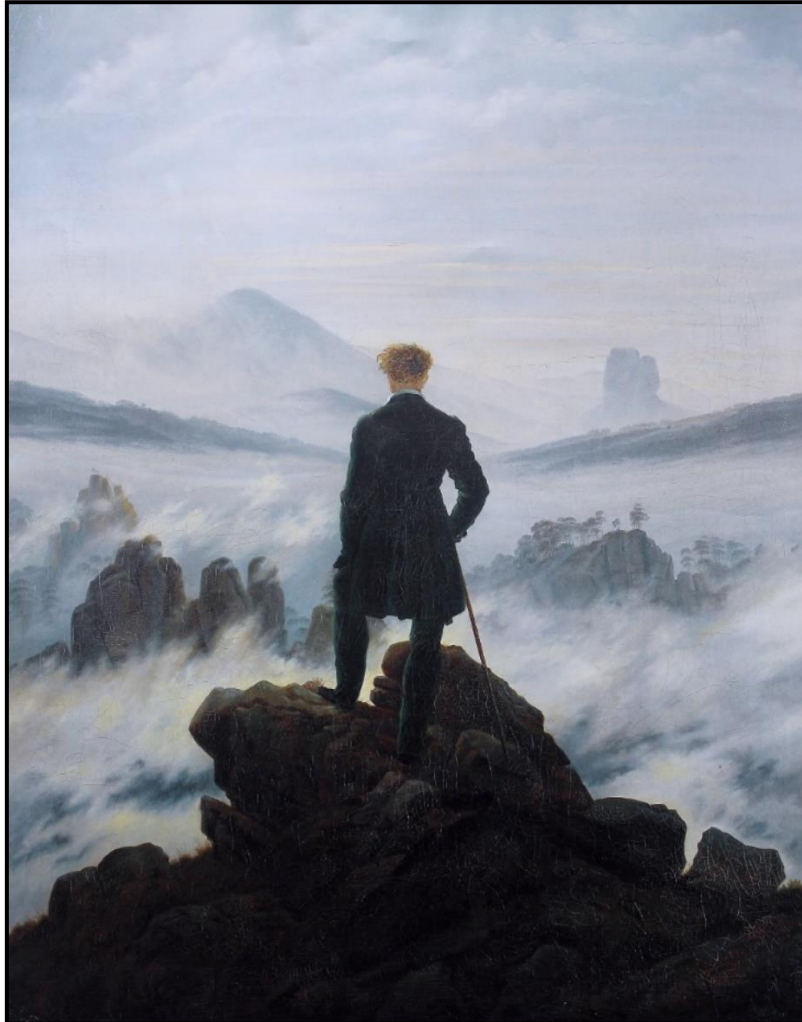
spread of disease. Social inequality and long-term trajectories of power structures largely affects the risks of climate change – issues that historians are well-equipped to address. But history alone cannot provide all the answers to the multifaceted challenges of climate change and must be put into conversation with research from other fields in the humanities and the social sciences where the natural sciences provide the material boundaries for this research.

Wood and Behringer’s texts are reflective of a larger historiographical trend that asks new questions to history, and which make efforts to transcend the dividing lines between disciplines. The benefits are many, but so are the pitfalls. This thesis does not claim to have presented the definitive answer to this conundrum but has suggested some ways in which historians can productively incorporate some of the tools handed down by previous paradigms in developing a model that allows us to work with the colliding spatial and temporal scales of human and natural histories and one that is adequate to the real interactions of humans and nature. History can provide real-life experiments on how extreme climate change impact different societies simultaneously and by gauging the different responses, we might find that the current climate crisis is not necessarily so unique that it is useless to look back for answers and insights. This is not to downplay the comparatively severe and potentially irreversible threat of global warming. But knowledge about how people in the past responded to similar conditions, or the social dynamics exposed by extreme climatic stress, may allow us to move our heads a bit more freely in responding to the challenges that we are facing in the future. After all, it is not global warming that first caused us to contemplate our place in the natural world.

In *Wanderer Above the Sea of Fog* from 1818, Caspar David Friedrich depicts a lone individual gazing over a mountainous landscape with rocky formations emerging from the fog. At the center is a man, observing nature from what could be interpreted as a confrontational posture, perhaps signaling the modern condition of humanity as conquerors of the natural world. But we can only see his back, not his reaction to the landscape so it is unclear whether it is one of awe, greed, humility or tranquility. One could read this picture as an escape, a refuge to nature which does not pass any moral judgement and where the man in the green overcoat, mesmerized by the sublime view, can finally clear his mind. This would of course imply that there exists a clear separation between humans and nature, and that once the man was sufficiently calm, he could return to society, his family, and leave that foreign wilderness behind until it could serve some purpose again, be it for extracting resources or mental relief. That the man is the focal point does however not have to symbolize this subjugation of nature. Although centered, he appears small in relation to the vast space that surrounds him. The lighting on the coat creates a dark



silhouette which grounds him to the rocks beneath his feet. Like the equally dark colored rocky formations in the distance, he also emerges from nature. Friedrich becomes the mediator, the man is us, and we are drawn into the picture, immersed in the unknown and unpredictable landscape that we are inextricably part of.



**FIGURE 6.1** "Wanderer Above the Sea of Fog", 1818 (oil on canvas), Caspar David Friedrich (1774-1840).<sup>257</sup>

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<sup>257</sup> Hamburger Kunsthalle. Sourced from the museum website.

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