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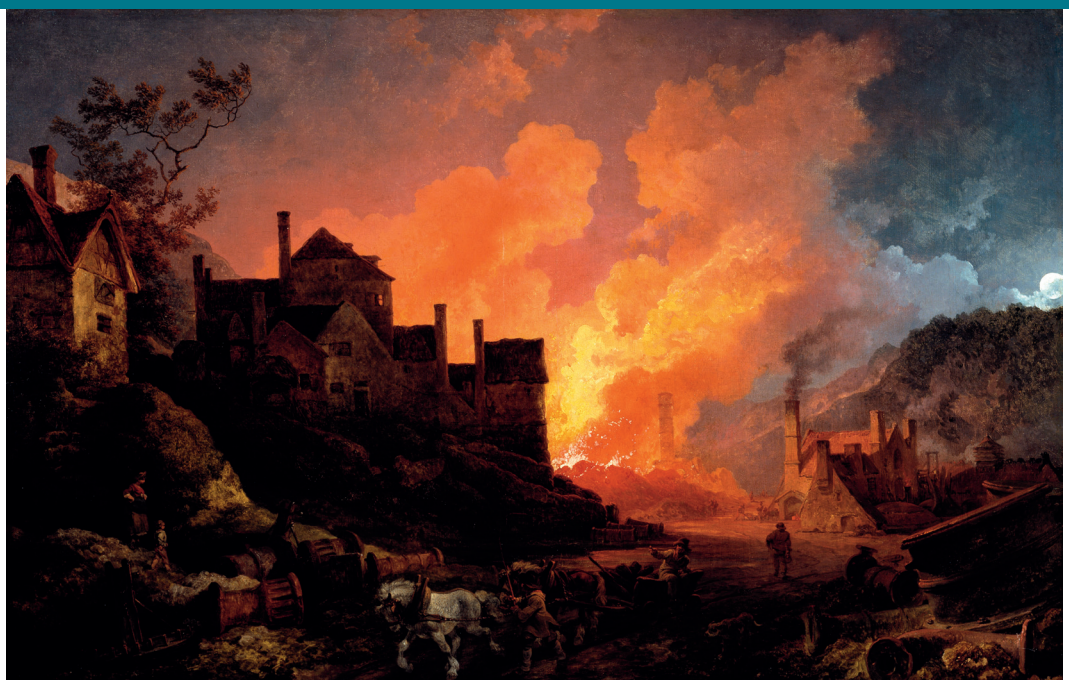

A COMPANION TO GLOBAL ENVIRONMENTAL HISTORY

EDITED BY
J. R. McNeill and
Erin Stewart Mauldin

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A Companion to Global Environmental History

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WILEY-BLACKWELL
A John Wiley & Sons, Ltd., Publication

This edition first published 2012

Blackwell Publishing was acquired by John Wiley & Sons in February 2007. Blackwell's publishing program has been merged with Wiley's global Scientific, Technical, and Medical business to form Wiley-Blackwell.

Registered Office
John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, UK

Editorial Offices
350 Main Street, Malden, MA 02148-5020, USA
9600 Garsington Road, Oxford, OX4 2DQ, UK
The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, UK

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Library of Congress Cataloging-in-Publication Data

A companion to global environmental history / edited by J. R. McNeill and Erin Stewart Mauldin.
p. cm.
Includes index.
ISBN 978-1-4443-3534-7 (cloth)
1. Human ecology–History–Cross-cultural studies. 2. Global environmental change–History–Cross-cultural studies. 3. Environmental policy–History–Cross-cultural studies. 4. Environmental protection–History–Cross-cultural studies. I. McNeill, John Robert. II. Mauldin, Erin Stewart.
GF13.C63 2012
304.209–dc23
2012002776

A catalog record for this book is available from the British Library.

Cover image: Philip James de Loutherbourg, *Coalbrookdale by Night*, 1801, oil on canvas. Science Museum, London / The Bridgeman Art Library
Cover design by Richard Boxall Design Associates

Set in 10/12pt Galliard by SPi Publisher Services, Pondicherry, India

1 2012

To Julie, once more
And to Daniel

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Acknowledgments

This book represents a team effort. As editors, we wish to register our appreciation to the platoon from Wiley-Blackwell. Tessa Harvey initiated the project and gracefully agreed to every modification of plans along the way. Gillian Kane and Isobel Bainton crisply and cheerfully helped us navigate the inevitable bumps in the road. Leah Morin, copy-editor extraordinaire, deserves our gratitude in full measure.

When editors are rash enough to agree to assemble a book that depends on original contributions from a roster of 28 authors, the probability that something will go badly wrong is considerable. Our authors defied the odds, writing their chapters promptly, answering our queries swiftly, and tolerating tweaks to their pearly prose with equanimity worthy of Marcus Aurelius or a Zen master. We thank them for that.

We also thank Peter Engelke and Yubin Shen, who translated chapters into English from German and Chinese respectively.

Finally, we wish to express our appreciation to the students and faculty of the Georgetown University History Department. Our book is a little better, and our lives a lot better, for the collegiality and support this community of scholars has offered over the years.

J. R. McNeill
Erin Stewart Mauldin

Global Environmental History: An Introduction

J. R. McNeill and Erin Stewart Mauldin

Since the 1970s, environmental history has evolved into a self-conscious and self-aware scholarly field that boasts journals, university programs, and international organizations devoted to its practice and promotion. Global environmental history, however, is much younger. Although a dynamic field with a steadily increasing number of practitioners, global environmental history remains, as yet, unclear in its structure, shape, and place within the historical profession.

This volume aims to orient readers to the fast-growing arena of scholarly inquiry known as global, or world, environmental history. It is a collection of new essays by 28 scholars from all six inhabited continents, many of whom have been instrumental in the establishment of environmental history. It surveys past developments in the field, current contours of scholarship, and possible approaches for the future. The *Companion to Global Environmental History* is intended to be useful not only to people who are coming to environmental history for the first time – serving as the equivalent of a road map to the field – but also to people who have long labored in one province of environmental history, and, for whatever reason, seek to broaden their horizons and begin to develop comparative perspectives – or deepen their existing ones.

What Is Environmental History?

Like every other subset of history, environmental history represents different things to different people. Our preferred definition of the field is the study of the relationship between human societies and the rest of nature on which they depended. Humankind has always been a part of nature, albeit a distinctive part. While the natural world has shaped and conditioned the human experience, over time, humans have made increasingly far-reaching alterations to their surroundings. Environmental history recognizes that the natural world is not merely the backdrop to human events, but evolves in its own right, both of its own accord and in response to human actions. Nature is now both natural and cultural, at least in most places on Earth. Indeed human influence upon nature has attained such proportions that some scholars maintain life on Earth has entered a new geological era, the Anthropocene. This term, while gaining acceptance, is

by no means conventional yet. But its increasing use signifies growing awareness in scientific circles of the burgeoning human environmental impact.[1]

The vast scope of environmental history invites many and varied approaches. There are, we think, three chief areas of inquiry, which of course overlap and have no firm boundaries. First is the study of material environmental history, the stories of human involvement with forests and frogs, with cholera and chlorofluorocarbons. This entails the examination of human impact on the physical environment as well as nature's influence upon human affairs, each of which is always in flux and always affecting the other. This form of environmental history puts human history in a fuller context, that of the Earth and life on Earth, and recognizes that human events are part of a larger story in which humans are not the only actors. A full extension of this principle is the so-called "Big History" of David Christian and Fred Spier,[2] which places humans into the unfolding history of the universe, and finds recurrent patterns over the largest timescales. In practice, however, most of the environmental history written in the material vein stresses the economic and technological side of human actions, and thus concentrates on the last 200 years when industrialization (among other forces) greatly enhanced humankind's power to alter environments.

Second is a form of cultural and intellectual history. It concerns what humans have thought, believed, and written that treats relationships between society and nature. It emphasizes representations and images of nature in art, literature, religion, and oral traditions, how these have changed, and what they reveal about the societies that produced them.[3] The great majority of cultural environmental history is drawn from published texts, as with intellectual history, and often treats the works of influential (and sometimes not-so-influential) authors from Lucretius and Mencius to St. Francis to Mohandas K. Gandhi. This sort of environmental history tends to focus on individual thinkers, but it can also extend to the study of popular environmentalism as a cultural movement. The largest debate within this wing of environmental history, however, is the relative impact of various religio-cultural traditions on the natural world. This scholarship evaluates the texts and practices of Judeo-Christian, Islamic, East Asian, and indigenous traditions, attempting to determine their effects on the environment.[4]

The third main form is political and policy-related environmental history. This concerns the history of deliberate human efforts to regulate the relationship between society and nature, and between social groups in matters concerning nature. Although there are early examples of soil conservation, air-pollution control, and royal efforts to protect charismatic animals for a monarch's hunting pleasure, usually policy-related environmental history extends back only to the late nineteenth century. Only in the era since 1880 have states and societies mounted systematic efforts to regulate interactions with the environment generally. Between 1880 and 1965 these efforts were normally spasmodic and often modest in their impacts, so much of this sort of environmental history deals with the decades since 1965, when both states and explicitly environmental organizations grew more determined and effective in their interventions. Political environmental history is the approach that most easily dovetails with mainstream history for it uses the nation-state as its unit of analysis. Other types of environmental history tend to ignore political boundaries.

In practice, environmental history is all this and much more. More than most varieties of history, environmental history is an interdisciplinary project. Many scholars in the field trained as archeologists, geographers, or historical ecologists. In addition to the customary published and archival texts of the standard historian,

environmental historians routinely use the findings culled from bio-archives (such as pollen deposits which can tell us about former vegetation patterns) and geo-archives (such as soil profiles that can tell us about past land-use practices). The subject matter of environmental history is often much the same as that in historical geography or historical ecology, although the choice of sources emphasized normally differs. An illustration is the field of climate history, which is pursued by scholars from at least half a dozen disciplines, including text-based historians. Textual historians have found useful records for climate history going back many centuries, for example, the dates of grape harvests in European vineyards. Compiling and comparing these dates over centuries allows historians to draw strong inferences about warming and cooling trends.[5]

Global Environmental History

Global environmental history has a compelling logic but presents a daunting aspect. Many ecological processes are global in scope, such as climate change or sea-level rise, and many others are found here and there around the world, such as deforestation and urban air pollution. Several of the cultural trends concerning the environment have been nearly global too, most obviously the modern, post-1960s, expression of ecological anxiety, although of course it finds different forms in different cultures.[6] But global-scale environmental history, like global and world history in general, is built upon the foundation of local work and regional surveys. No single historian can master the details of soil history or the history of water pollution around the world, just as no one can fully master the global history of wages and prices, or of women's movements. All global and world history presents this problem, and for many historians this alone suffices to make the venture illegitimate.

A moment's reflection, however, should redeem the ambition of global-scale history. Something is gained and something lost with any choice of scale. If historians required true mastery of their subjects, they could aim no more broadly than autobiography. There is no purely intellectual reason to prefer microhistory to macrohistory, whether environmental or otherwise. But it remains true that, practically speaking, bringing coherence to the subject of the global history of air pollution is much more difficult than, say, to the history of the killer fog of London in December 1952. Global environmental history, then, is often a process of stitching together scholarship from multiple geographic scales and perspectives to craft a narrative or an analysis of global ecological change.

For decades the only global environmental history syntheses came from authors who were not professional historians, and therefore less inhibited by their training and the anti-global expectations of the historical profession. British geographers and a former civil servant of the United Kingdom wrote the first notable general surveys, the former in sober style and the latter with the panache of a muckraking journalist.[7] Sociologists too joined the fray.[8] Eventually natural scientists took aim at global historical treatments of subjects such as nitrogen and soil.[9] A multidisciplinary magnum opus from 1990, B. L. Turner et al.'s *The Earth as Transformed by Human Action*, helped spur historians to try their hand at global environmental history.[10]

Professional historians began by taking slices of the whole, such as the books on global fire history by Stephen Pyne, or environmentalism by Ramachandra Guha.[11] Pyne's work,

which grew out of his earlier studies of fire in American history, sought to discuss every aspect of the human relationship with fire, from cooking and the physiology of digestion to the cultural perceptions of wildfires. Guha's short treatise on modern environmentalism showed the contrasts between the social movements that go by that name in, above all, India and the US. Joachim Radkau was perhaps the first to bring the sensibilities of the historian to general global-scale environmental history in his *Natur und Macht: Eine Weltgeschichte der Umwelt*.[12] His was not a survey aiming at worldwide coverage, but a sprawling series of soundings and reflections on everything from animal domestication to contemporary tourism in the Himalaya. It reads a bit like Arnold Toynbee's *A Study of History* with its bold comparisons and juxtapositions across time and space. Unlike Toynbee, Radkau was reluctant to offer grand pronouncements, preferring to honor historians' traditional respect for the particularities of different times and places.[13]

A small platoon of professional historians brought out global-scale environmental histories of one sort or another around the same time as Radkau. Brief surveys, apparently intended for classroom use, poured forth from Europe and the US.[14] A pair of longer studies took on slices of time that, their authors claimed, exhibited some coherence: John F. Richards surveyed the early modern centuries so strongly affected by European expansion, and J. R. McNeill portrayed the twentieth century as an era of unprecedentedly tumultuous environmental change.[15] Still others presented thematic slices of global environmental history, penning accounts of deforestation or malaria over several millennia.[16] Wide-ranging anthologies added to the sudden outpouring – and sidestepped the main limitation of global history, the inability of any single author to know enough.[17] The British Empire, on which the sun famously never set, provided a framework that added coherence to global environmental history as shown in the overview by William Beinart and Lotte Hughes.[18] To date no one has chosen to follow their example with respect to any other modern empires. However, imperialism more generally served as the occasion for one of environmental history's foundational texts, Alfred W. Crosby's *Ecological Imperialism*, which, if it isn't global environmental history, surely comes very close to it. Crosby sought to explain the successes and failures of European imperial ventures from the Crusades and Greenland Norse onward in environmental terms.[19]

So global environmental history has come a long way in a brief time. The persistent presence of environmental issues in modern life has made environmental history a permanent fixture of historiography rather than a passing fancy. The growing salience of climate concerns, deforestation, water shortages, and loss of biodiversity has convinced some historians, previously working far from environmental history, that it is no longer appropriate to write history without taking the environment, especially climate change, into account.[20] Furthermore, global-scale environmental history has benefited from the rise of world or global history, an intellectual response to the recent surge of globalization and, in the US at least, a practical response to political pressures upon school curricula.[21] But, as always, further opportunities abound. Some day someone will write a global environmental history of railroads, of mining, of war, of cattle, of the oceans, of religion, of odors, of things as yet unimagined.

The *Companion*

Although there are countless ways in which one could organize the endeavor of global environmental history, this volume combines temporal, geographic, and thematic approaches. With contributions from an international roster of historians, the content of

the chapters that follow is as diverse as the approaches to environmental history. Some authors emphasize natural and cultural history, while others focus on political and economic developments. Some chapters are surveys, others are historiographical, and many are a mix of the two.

Each author was given the freedom to write his or her chapter as the subject required. Consequently, there are occasional overlaps in the subjects under discussion. For instance, the impact of the first human migrations into the Americas appears in four chapters, although the authors approach the subject with differing purposes and with sometimes contrasting conclusions. Readers will also notice that some subjects recur with regularity throughout the *Companion*, such as agriculture, industrialization, and biological exchanges. That is as it should be: these are central themes for environmental history. In this volume you will find regions, themes, and time periods not as yet well represented in the historiography, new evidence for old debates, and inventive new ways of approaching the practice of environmental history.

The *Companion* is split into four parts. Part I, entitled "Times," shows how the issues and trajectories of the relationship between society and nature have evolved over time, and how they differ from one period to the next. Authors cover major milestones in human history, helping readers develop a sense of the deep past so often neglected in environmental, and indeed in all, history. Chapters in this section discuss the latest findings in the study of human origins, the methods by which environmental historians and other scholars understand ancient landscapes, and how environmental factors contributed to the rise and fall of human societies over time. The scope of this section is vast, and the authors' work demonstrates how the coevolution of humans and nature over a very *longue durée* can illuminate not only current environmental issues, but also political and economic ones.

The next section, Part II, is entitled "Places." It is a series of regional or national narratives and historiographies that show how the pieces of the global puzzle fit together. Place, although it can be defined and construed in many ways and at many scales, is usually a central concept for environmental history. In practice, most environmental history is written about specific places, some as small as a few farms, others as large as a continent. We felt that it is important to include the regional and local, for they are the foundation of the global. Many areas around the world have experienced similar historical processes that drive ecological change – biological invasions, colonialism, industrialization, conservation movements – and this section allows readers to see how geographical variations in climate, terrain, and availability of natural resources, as well as cultural patterns, political frameworks, and economic structures, have influenced the map of environmental change. Not every country or region is represented; readers will note, for example, the absence of Europe and India. In chapters that cover areas of the globe which have rich historiographies, such as the US, authors have tried to point to new issues for debate or study. Other chapters, however, provide the first surveys of areas such as the Arctic and the Middle East, regions of the globe which have yet to receive their due from environmental historians.

The third part of the *Companion* moves away from chronological and geographical organization. Here, each author examines one thematic issue across the globe and across time. There are chapters which outline the human relationship to natural elements, such as forests, rivers, and oceans, as well as chapters on how the evolution of technology, warfare, and industrial processes altered the world's environment. Authors focus partly

on the biogeophysical changes themselves, but also upon the social, economic, and political forces behind them. Some chapters present familiar themes, such as fishing or agriculture, but use an expanded temporal or geographical scope to present readers with new, global perspectives. Other chapters, such as those on grasslands and evolution, challenge readers with unfamiliar comparisons and unfettered imagination.

The final section of the *Companion*, Part IV, surveys different types of environmental thought and action around the world, giving readers a sense of the variety of cultural, intellectual, and political engagements with the environment in modern times. While the first two parts have significant chronological depth, Parts III and IV exhibit a strong bias toward the modern period (since 1500 CE). This is partly a reflection of the current literature in the field, and partly due to the practicalities of scholarship in global environmental history. This section contains in-depth chapters on two of the largest and fastest-growing economies in the world – Brazil and China – while the remaining two chapters highlight broader themes within environmentalism and environmental thought.

Global environmental history is a fast-moving field with porous boundaries and a wide range of interdisciplinary connections. The chapters in this volume are by no means comprehensive, and do not provide complete coverage of all themes and all places, but the chapters help provide an understanding of how people actually work in environmental history and reflect the major approaches within the field's scholarship. We hope that all readers of the *Companion* will find something illuminating and entrancing in global environmental history as it is currently practiced. Consciously or unconsciously, scholars provide scholarship for the times in which they live. Whether or not we ought to understand our own times as the Anthropocene, we live in an age of conspicuous environmental change, of pinching environmental constraints upon people's lives, and of fast-track globalization. This *Companion* aims to offer a guide to environmental history scholarship written in, and for, our ecologically dynamic and globalizing times.

Notes

1 See for example the special issue of the *Philosophical Transactions of the Royal Society A: Mathematical, Physical, and Engineering Sciences* 369, 2011, which is devoted to the concept of the Anthropocene.

2 D. Christian, *Maps of Time: An Introduction to Big History*, Berkeley, University of California Press, 2004; F. Spier, *The Structure of Big History: From the Big Bang until Today*, Amsterdam, University of Amsterdam Press, 1996; F. Spier, *Big History and the Future of Humanity*, Oxford, Wiley-Blackwell, 2011.

3 Remarkably the most comprehensive work in this vein as regards the Western world was written over 40 years ago: C. Glacken's *Traces on the Rhodian Shore: Nature and Culture in Western Thought from Ancient Times to the End of the Eighteenth Century*, Berkeley, University of California Press, 1967. Glacken's massive work explored the conceptions of nature among several dozen prominent writers from ancient times through the European Enlightenment. Other examples include D. Worster's *Nature's Economy: A History of Ecological Ideas*, New York, Cambridge University Press, 1985, and P. Coates, *Nature: Western Attitudes since the Ancient Times*, Cambridge, Polity, 1998.

4 See, for example, L. White, "The Historical Roots of Our Ecologic Crisis," *Science* 155, 1967, pp. 1203–7; Y. Tuan, "Discrepancies between Environmental Attitude and Behaviour: Examples from Europe and China," *Canadian Geographer* 3, 1968, pp. 175–91; H. Amery, "Islam and the Environment," in N. I. Faruqui, A. K. Biswas, and M. J. Bino (eds.), *Water Management in Islam*, Tokyo, United Nations University Press, 2001, pp. 39–60.

5 E. Le Roy Ladurie, *Histoire du climat depuis l'an mil*, Paris, Flammarion, 1967. Le Roy Ladurie revised his positions substantially in *Histoire humaine et comparée du climat*, 3 vols., Paris, Fayard, 2004–9. A sample of more recent climate history: G. Endfield, *Climate and Society in Colonial Mexico: A Study in Vulnerability*, Oxford and New York, Wiley-Blackwell, 2008; F. Mauelshagen, *Klimageschichte der Neuzeit 1500–1900*, Darmstadt, Wissenschaftliche Buchgesellschaft, 2009; S. White, *Climate of Rebellion*, New York, Cambridge University Press, 2011; W. Behringer, *A Cultural History of Climate*, Malden, MA, Polity, 2010; S. Johnson, *Climate and Catastrophe in Cuba and the Atlantic World in the Age of Revolution*, Chapel Hill, UNC Press, 2011; H. H. Lamb, *A History of Climate Changes*, 4 vols., London, Routledge, 2011 (these volumes contain reprints of Lamb's pioneering work from 1966 to 1988); a fascinating essay that attributes great significance to climate change is R. Bulliet, *Cotton, Climate, and Camels in Early Islamic Iran*, New York, Columbia University Press, 2011.

6 The new standard here is J. Radkau, *Die Ära der Ökologie: Eine Weltgeschichte*, Munich, Beck, 2011.

7 I. G. Simmons, *Changing the Face of the Earth: Culture, Environment, History*, New York, Blackwell, 1989; A. Mannion, *Global Environmental Change: A Natural and Cultural Environmental History*, Harlow, Longman, 1991; C. Ponting, *A Green History of the World*, Harmondsworth, Penguin, 1991. For Simmons' latest entry: *Global Environmental History*, Chicago, University of Chicago Press, 2008.

8 B. de Vries and J. Goudsblom, *Mappae Mundi: Humans and Their Habitats in Long-Term Socio-Ecological Perspective*, Amsterdam, Amsterdam University Press, 2002.

9 D. Vasey, *An Ecological History of Agriculture: 10,000 B.C. to 10,000 A.D.*, Lafayette, IN, Purdue University Press, 1992; V. Smil, *Energy in World History*, Boulder, CO, Westview, 1994; G. Leigh, *The World's Greatest Fix: A History of Nitrogen and Agriculture*, Oxford, Oxford University Press, 2004; J. R. McNeill and V. Winiwarter (eds.), *Soils and Societies: Perspectives from Environmental History*, Isle of Harris, White Horse Press, 2006; A. Mannion, *Carbon and Its Domestication*, Dordrecht, Springer, 2006; D. Montgomery, *Dirt: The Erosion of Civilizations*, Berkeley, University of California Press, 2007.

10 B. L. Turner, W. C. Clark, R. W. Kates, et al. (eds.), *The Earth as Transformed by Human Action: Global and Regional Changes in the Biosphere over the Past 300 Years*, New York, Cambridge University Press, 1990.

11 S. J. Pyne, *World Fire: The Culture of Fire on Earth*, Seattle, University of Washington Press, 1995; R. Guha, *Environmentalism*, New York, Longman, 2000.

12 J. Radkau, *Natur und Macht: Eine Weltgeschichte der Umwelt*, Munich, Beck, 2000; the English translation, by T. Dunlap, is *Nature and Power: A Global History of the Environment*, New York, Cambridge University Press, 2008.

13 Radkau in his youth read Toynbee with admiration. See his essay on his own work, "Nature and Power: An Ambiguous and Intimate Connection," *Social Science History*, forthcoming.

14 S. Sörlin and A. Öckerman, *Jorden en ö*, Stockholm, Natur och Kultur, 1998; J. D. Hughes, *An Environmental History of the World: Humankind's Changing Role in the Community of Life*, London, Routledge, 2001; J. Radkau, *Mensch und Natur in der Geschichte*, Leipzig, Klett, 2002; S. Mosley, *The Environment in World History*, London, Routledge, 2006; V. Winiwarter and M. Knoll, *Umweltgeschichte*, Cologne, Böhlau, 2007; A. Penna, *The Human Footprint: A Global Environmental History*, Malden, MA, Blackwell, 2009.

15 J. F. Richards, *The Unending Frontier: An Environmental History of the Early Modern World*, Berkeley, University of California Press, 2003; J. R. McNeill, *Something New under the Sun: An Environmental History of the Twentieth-Century World*, New York, Norton, 2000.

16 M. Williams, *Deforesting the Earth: From Prehistory to Global Crisis*, Chicago, University of Chicago Press, 2003; J. L. A. Webb, *Humanity's Burden: A Global History of Malaria*, New York, Cambridge University Press, 2009.

17 Three from a range of examples: A. Hornborg, J. R. McNeill, and J. Martinez-Alier (eds.), *Rethinking Environmental History: World-System History and Global Environmental Change*,

Lanham, MD, Altamira Press, 2007; E. Burke III and K. Pomeranz (eds.), *The Environment and World History*, Berkeley, University of California Press, 2009; T. Myllyntaus (ed.), *Thinking through the Environment: Green Approaches to Global History*, Cambridge, White Horse Press, 2011.

18 W. Beinart and L. Hughes, *Environment and Empire*, New York, Oxford University Press, 2007.

19 A. W. Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900–1900*, New York, Cambridge University Press, 1986.

20 D. Chakrabarty, "The Climate of History: Four Theses," *Critical Inquiry* 35, 2009, pp. 197–222.

21 In the US, where the ethnic origins of populations plays a role in the formation of political blocs, and where political blocs often interest themselves in school curricula, world history is the easiest compromise among the possible ways of presenting history to young people because – in theory at least – it leaves no one's ancestors out.

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Part I

Times

Chapter One

Global Environmental History: The First 150,000 Years

J. R. McNeill

If, as scholars of human evolution suppose, our species emerged about 150,000 years ago, then roughly 97% of human history took place before the first cities and civilization. This chapter will briefly explore global environmental history over that very *longue durée*. It will sketch some of the ways in which the changing earthly environment affected human affairs, including almost ending them entirely about 73,000 years ago, and will outline some of the ways in which human actions changed the environment. By and large, in the 140 millennia before farming, environmental change affected human affairs more than human affairs affected the environment. But with the transition to agriculture beginning about 10,000 years ago, that began to change fundamentally: our numbers and technologies attained new levels so that, when combined with our long-standing heedlessness, we became an increasingly important force in shaping the global environment.

The Environment Shapes Paleolithic Humans and Human Affairs

About 7 million years ago our ancestors diverged, genetically speaking, from other apes. After another couple of million years, later ancestors began to walk upright (bipedalism) and develop big brains all out of proportion to their bodies. Climate change, according to prevailing interpretations, likely played a role in these fateful departures. In East Africa, where it all happened, drier conditions some 6 to 8 million years ago reduced the domain of forest and encouraged the spread of grassy savanna. This new environment rewarded upright posture and bipedalism, which allowed hominins (now the preferred term for humans plus their ancestors) to see longer distances and to move faster in open terrain. Standing upright also made it easier to dissipate heat under the tropical sun, an important task if one is obliged to keep moving to stay away from predators. East African climate also apparently became more unstable, with

A Companion to Global Environmental History, First Edition. Edited by J. R. McNeill and Erin Stewart Mauldin.

rapidly alternating wet and dry phases. This instability, the thinking goes, rewarded flexible behavior and thereby big brains. So, if this line of reasoning is correct, climate change helped shape the human animal in basic ways.[1]

Climate change continued to influence human affairs in subsequent millennia. Beginning about 3 million years ago, the Earth entered a period – in which we still live – of alternating glacial and interglacial phases. In our African homeland, this oscillating climate rhythm appeared as wetter and drier phases, because it was never so cold as to encourage glaciation (outside of the highest mountains). When hominins left Africa, which some did more than a million years ago, they had to adjust to ice ages that in Eurasia involved much colder temperatures, as well as a drier, windier, and more unstable climate.

Migration

Our own species, *Homo sapiens sapiens*, evolved within Africa and by perhaps 150,000 years ago had emerged as a distinct species. A few intrepid populations walked out of Africa, perhaps 100,000 years ago. As they crossed to Arabia and Southwest Asia, they too encountered colder climate. Their migrations coincided with the early millennia of a new cold phase, an ice age that lasted from about 110,000 to 12,000 years ago. This latest ice age was not only much colder and dryer than modern climate, but in most parts of the world far more unstable. For decades or centuries comparatively sudden cooling or warming might occur, in swings of average temperatures of 5 to 10 degrees Celsius (9 to 18 degrees Fahrenheit). The slender evidence suggests these swings were smaller in Africa than on other continents. Elsewhere, the incentives to migrate, either to avoid the worst of the cold and drought or to take advantage of warming and moisture, were often strong. Staying put for centuries was usually a poor gamble because climate was too unstable.

The best aspect of ice-age conditions (for humans) was lower sea levels. This gave terrestrial species about 25 million more square kilometers to work with – the equivalent of an additional continent the size of North America. It was possible to walk across most of Indonesia, and from Australia to New Guinea, from Korea to Japan, and from Britain to France. The unfortunate part of this for historians and archeologists is that probably most people lived most of their lives in these zones, helping themselves to seafood found along the ancient shores, and all archeological remains of their existence vanished beneath the waves when sea levels rose sharply around 22,000 to 8,000 years ago.

The most challenging moment of the last ice age came around 74,000 to 70,000 years ago when a giant volcanic eruption (of Mt. Toba, on the island of Sumatra in what is now Indonesia) spewed enough dust and ash into the skies to block sunlight and lower temperatures by 5 to 15 degrees Celsius for 6 to 10 years. It may have tipped climate into another regime; the next thousand years were especially cold on average. Toba was the biggest volcanic eruption in the last 2 million years, 280 times the size of Krakatoa (1883) and about 5,000 times larger than Mt. St. Helens (1980), as measured by the quantity of tephra – rock, magma, and other material – thrown heavenward. Ash fell from the sky as far away as Arabia and the east coast of Africa. In some places in India the resulting tephra layer was, and is, six meters thick!

The Toba catastrophe played havoc with plant and animal life. The fossil pollen record shows collapses of vegetation in many parts of Asia, leaving animal species with