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## PERSPECTIVES ON THE ENVIRONMENTAL HISTORY OF CHINA

In the decades since the late 1970s, China's environmental crisis has developed into one of the most pressing challenges to emerge from the country's rapid economic rise. Poisonous air is endangering the health of millions of Chinese, water pollution and water scarcity are affecting economic growth, overgrazing of pasture and overcultivation of cropland accelerate land degradation and desertification. In fact, China has become one of the leading polluters in the world.<sup>1</sup> The current environmental situation is the result not only of policy choices made today but also of attitudes, institutions, and approaches that have evolved during the past centuries. Contemporary environmental issues such as industrial waste, carbon emission, and species extinction have to be viewed in a broader historical context.

In 1988, Donald Worster summed up the founding generation's definition of environmental history as "the interactions people have with nature in past times."<sup>2</sup> Since the 1980s, environmental history has won widespread recognition within the mainstream of historical scholarship. Environmental historians ask how non-human nature has changed over time and how factors like climate, disease, and natural disasters have an impact on societies. In turn, they examine the ways in which human activities change the environment. Thus, environmental history adds grounding and perspective to the more classic themes addressed by historians, such as economics, politics, law, philosophy, and the arts.

In the 1990s, Mark Elvin and Liu Ts'ui-jung pioneered the introduction of environmental issues to the study of Chinese history.<sup>3</sup> Since then, environmental history has attracted the attention of a growing number of historians in China and in the West – developing into a dynamic and growing field in its own right.<sup>4</sup> A broad array of environmental

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<sup>1</sup>See for examples Elizabeth C. Economy, *The River Runs Black: The Environmental Challenge to China's Future* (Ithaca: Cornell University Press, 2004); Judith Shapiro, *China's Environmental Challenges* (Cambridge: Polity Press, 2012); Vaclav Smil, *China's Environmental Crisis: An Inquiry into the Limits of National Development* (New York: M.E. Sharpe, 1993).

<sup>2</sup>Donald Worster, ed., *The Ends of Earth: Perspectives in Modern Environmental History* (New York: Cambridge University Press, 1988), vii.

<sup>3</sup>Mark Elvin and Liu Ts'ui-jung, eds., *Sediments of Time: Environment and Society in Chinese History* (Cambridge: Cambridge University Press, 1998).

<sup>4</sup>Bao Maohong 包茂红, *Huanjing shixue de qiuyuan he fazhan* 环境史学的起源和发展 [The Development of Environmental History] (Beijing: Beijing daxue chubanshe, 2012), 157–85.

topics has come to enrich our understanding of the history of China from ancient times onwards.

In the past, discussion of the relationship between Chinese society and its natural environment focused almost exclusively on the traditional philosophy of nature and on environmental ethics. Daoism's love for untamed nature, for example, was consistently emphasized.<sup>5</sup> Whereas Buddhism was associated with the healing effect that nature has on human beings, an obligation to handle nature gently was identified in state-centered Confucianism. Western Sinology regarded "harmony with nature" to be a central philosophical tenet within Chinese scholarly culture. Classical literature, art, and landscape architecture were scrutinized for references to an alleged ancient Chinese longing for nature.<sup>6</sup> Such natural elements in religion, mythology, and aesthetics, however, had no immediate relevance for the actual ways in which humans treated the physical environment. The destructive consequences of centuries of settlement and agrarian exploitation tended to be overlooked in mainstream historiography, and the fact that they could not easily be squared with the conclusions drawn in intellectual history was often ignored.

Where the environmental history of China touches older historiographical concerns is in the connection between nature and power. From the perspective of environmental history, the state has always played a central role. Time and again, China's imperial governments tried to counter an environmental "catastrophe in slow motion" by reordering land and water.<sup>7</sup> Environmental issues were documented as early as the Qin dynasty.<sup>8</sup> Elaborate forms of an institutionalized environmental policy, however, can be traced back only to the eighteenth century, when the Qing government established a system of disaster relief consisting of granaries, soup kitchens, and shelters, supported by monetary donations from private sources.<sup>9</sup>

The imperial era is generally rich in written sources on topics that would nowadays be categorized as environmental. State documents as well as local gazetteers make possible a detailed reconstruction of agrarian, climatological, and other facts and connections, providing a rich and variegated picture of China's environmental history.<sup>10</sup> Aspects of

<sup>5</sup>Lambert Schmidhausen, "Heilsversprechende Aspekte der Natur im Buddhismus," in *Raum-zeitliche Vermittlung der Transzendenz. Zur 'sakramentalen' Dimension religiöser Tradition*, ed. Gerhard Oberhammer and Markus Schmücker (Vienna: Verlag der Österreichischen Akademien der Wissenschaften, 1999), 229–62.

<sup>6</sup>See Herbert Franke, "Geschichte und Natur. Betrachtungen eines Asienhistorikers," in *Natur und Geschichte*, ed. Hubert Markl (Munich: Oldenbourg, 1983), 56–69; Heiner Roetz, *Mensch und Natur im Alten China: Zum Subjekt-Objekt-Gegensatz in der klassischen chinesischen Philosophie. Zugleich eine Kritik des Klischees vom chinesischen Universalismus* (Frankfurt am Main: Lang, 1984), 113ff.

<sup>7</sup>Elvin and Liu, *Sediments of Time*, 2n1.

<sup>8</sup>Duan Wei 段伟, *Rangmie yu jianmie: Qin Han shehui ziran miehai yingdui shidu xingcheng huan* 禳灾与 减灭: 秦汉社会自然灾害应对制度的形成 [Disaster Relief and Mitigation: The Formation of the Social and Natural Disaster Response System in the Qin and Han Dynasties] (Shanghai: Fudan University Press, 2008); Wang Zijin 王子今, *Qin Han shiqi shengtai huanjing yanjiu* 秦汉时期生态环境研究 [Research on Environmental Destruction During the Qin and Han Period] (Beijing: Beijing University Press, 2007).

<sup>9</sup>Pierre-Étienne Will and R. Bin Wong, *Nourish the People: The State Civilian Granary System in China, 1650–1850* (Ann Arbor: University of Michigan Press, 1991).

<sup>10</sup>Such as David Pietz, *The Yellow River: The Problem of Water in Modern China* (Cambridge, MA: Harvard University Press, 2015); Kenneth Pomeranz, *The Making of a Hinterland: State, Society and Economy in Inland North China, 1853–1937* (Berkeley, CA: University of California Press, 1993); Keith

change over time, such as deforestation and reforestation, soil erosion and desertification, as well as the rise and retreat of epidemics and long-term shifts in sanitary conditions, testify to the dense and dynamic interaction between social and natural developments.<sup>11</sup>

The present collection of essays aims at providing insights into the methodology and topical diversity of the study of China's environmental history, always keeping in mind the different, though entangled, trajectories of natural and social processes. Each article not only addresses a specific historical context and a particular regional focus but also contributes to the development of a systematic theme that is of broad relevance to environmental history.

Early precursors of current environmental history are to be found in interdisciplinary academic work on the Chinese environment starting in the 1920s. Characteristic of Republican China was the close connection between geography and archeological research. The specific term "environmental archaeology," however, did not appear until the late twentieth century.<sup>12</sup> Since then, increased sharing of expertise among archeologists, botanists, and zoologists, among others, has allowed for a multi-faceted understanding of ancient environmental conditions in China and their interaction with human societies. Archeology, of course, plays a diminished role with respect to later periods. Yet the fact that the environmental sciences in modern China were committed to interdisciplinary vistas from the very beginning has provided an excellent basis for the field's recent growth.

In "Wild Mammals of Ancient North China," Brian Lander and Katherine Brunson present an examination of the fundamental and necessary role zoo-archaeological research plays in our understanding of how the elimination of lowland ecosystems through human activity was reflected in the disappearance of wild animals. By using

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Schoppa, *Xiang Lake: Nine Centuries of Chinese Life* (New Haven, CT: Yale University Press, 1989); Wang Daxue 王大学, *Ming Qing Jiangnan haitang de jianshe yu huanjing* 明清江南海塘的建设与环境 [The Construction and Environment of Dykes in Min-Qing Jiangnan] (Shanghai: Shanghai Renmin Chubanshe, 2008); Wang Jian'ge 王建革, *Jiannan huanjing shi yanjiu* 江南环境史研究 [Research on the Environmental History of Jiangnan] (Beijing: Kexue chubanshe, 2016).

<sup>11</sup>See Peter Ho, "The Myth of Desertification in China's Northwestern Frontier (1929–1960)," *Modern China* 26 (2000), 348–95; Lu Xiqi/Zhang Jianmin 鲁西奇 / 张建民, eds., *Lishi shiqi Changjiang zhongyou diqu renlei huodong yu huanjing bianqian zhuanti yanjiu* 历史时期长江中游地区人类活动与环境变迁专题研究 [Research on Human Activity and Long-Term Environmental Change in the Middle Yangzi Region] (Wuhan: Wuhan Daxue Chubanshe, 2011); E. Elena Songster, "Cultivating the Nation in Fujian's Forests: Forest Policies and Afforestation Efforts in China, 1911–1937," *Environmental History* 3 (2003), 452–73; Wang Jiange 王建革, *Chuantong shehui moqi Huabei de shengtai shehui* 传统社会末期华北的生态社会 [Environment and Society in Late Traditional North China] (Beijing: Sanlian, 2009); Dee Mack Williams, "The Desert Discourse of Modern China," *Modern China* 23 (1997), 328–55; Yang Weibing 杨伟兵, *Yungui gaoyuan de tudi liyong yu shengtai bianqian (1659–1912)* 云贵高原的土地利用与生态变迁 [Land Use and Environmental Change in the Yunnan and Guizhou Plateau] (Shanghai: Shanghai Renmin Chubanshe, 2008). See also Judith Banister, "Population Public Health and the Environment in China," *China Quarterly* 156 (1998), 986–1015; Kerrie L. MacPherson, "Cholera in China, 1820–1930: An Aspect of Internationalization of Infectious Disease," in *Sediments of Time*, ed. Elvin and Liu, 487–519; Micah S. Muscolino, *Fishing Wars and Environmental Change in Late Imperial and Modern China* (Cambridge, MA: Harvard University Press 2009).

<sup>12</sup>Umberto Albarella, ed., *Environmental Archaeology: Meaning and Purpose* (London: Kluwer Academic Publishers, 2001); see also Peter Wei Ming Jia, *Transition from Foraging to Farming in Northeast China* (Oxford: Archaeopress, 2007), 1, 16–19.

new kinds of data beyond textual sources, they are able to challenge established beliefs about early Chinese history and culture.<sup>13</sup> Though classical texts and cultural artifacts provide rich insight into how animals and the human–animal relationship were perceived in ancient Chinese society, they represent landscapes and environments from the human perspective alone and are therefore rather unreliable when it comes to identifying species and assessing the distribution of animals.<sup>14</sup>

Lander and Brunson remove humans from the center of their story. In providing an overview of wild mammals they emphasize the wide variety of China's habitats, ranging from tropical to boreal forests, from extensive grasslands to deserts—the precondition for an uncommon diversity of mammal fauna. Though the earliest knowledge about animals was accumulated through human activities like fishing or hunting,<sup>15</sup> only zoo-archaeology is able to interpret ambiguous depictions of animals and clarify what animals ancient authors may have been aware of.<sup>16</sup> As the authors demonstrate, zoo-archaeologists have only begun to go beyond domestication to think about the history of wild mammals.<sup>17</sup> Lander and Brunson remind us that many of the wild species found in North China once ranged across Eurasia. Climate warming created opportunities for Neolithic peoples to explore newly accessible natural resources and develop farming communities. The emergence of agriculture represented a profound shift in the human relationship to the environment. Put simply, the environment was now formed in part by human action.<sup>18</sup> The disappearance of North China's wild mammals resulted from the destruction of the natural ecosystems by the expansion of tax-yielding farms.<sup>19</sup>

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<sup>13</sup>Brian Lander has already demonstrated this correcting role of archaeological discoveries in a case study of the Central Yangzi region. See “State Management of River Dikes in Early China: New Sources on the Environmental History of the Central Yangzi Region,” *T'oung Pao* 100 no. 4–5 (2014), 325–62.

<sup>14</sup>For the ancient Chinese perception of animals, see Roel Sterckx, *The Animal and the Daemon in Early China* (Albany: State University of New York Press, 2002). An exception may be the classical work *Huainanzi*, which has been convincingly analysed by John Major. As he concludes, the authors of this text turned to the world of animal behavior to make important metaphorical points about the world of human society, especially the nature of a sage government: John S. Major, “Animals and Animal Metaphors in *Huainanzi*,” *Asia Major* 21, no. 1 (2008), 133–51, here 149.

<sup>15</sup>Edward H. Schafer, *The Golden Peaches of Samarkand: A Study of T'ang Exotics* (Berkeley: University of California Press, 79–91).

<sup>16</sup>Though China's 556 species of mammals represent over ten percent of all mammals on earth, they have only recently been catalogued. Early investigations were published by Glover M. Allen, *The Mammals of China and Mongolia*, 2 vols, ed. W. Granger (New York: American Museum of Natural History, 1938–1940).

<sup>17</sup>Because of the similarity between wild and domestic species, it is often impossible to tell their remains apart. On the early domestication of animals, see Yuan Jing, “The Origins and Development of Animal Domestication in China,” *Chinese Archeology* 8 (2008), 1–7. For a case study of this type of domestication process, see Dong Y. Yang et al., “Wild or Domesticated: DNA Analysis of Ancient Water Buffalo Remains from North China,” *Journal of Archeological Science* 35 (2008), 2778–85.

<sup>18</sup>See Yongqiang Zong et al., “Holocene Environmental Change and Neolithic Rice Agriculture in the Lower Yangtze Region of China: A Review,” *The Holocene* 22, no. 6 (2011), 623–635. The growing role of human modification is emphasized by Yijie Zhang and Tristram R. Kidder, “Archeology of the Anthropocene in the Yellow River region, China, 8000–2000, cal. BP,” *The Holocene* 24, no. 11 (2014), 1602–23.

<sup>19</sup>Two recent case studies of Northwestern China are Arlene M. Rosen, “The Impact of Environmental Change and Human Land Use on Alluvial Valleys in the Loess Plateau of China during the Middle Holocene,” *Geomorphology* 101 (2008), 298–307 and Haiming Li et al., “Human Settlement and Its Influencing Factors

To understand this process, we have to return to the history of the extinction of individual species, as pioneered by the historical geographer Wen Huanran and his colleagues in the 1940s. They referred to standard histories, local gazetteers, and recent archeological discoveries to identify sites in which plants and animals had previously existed. This literature describes how large mammals suffered from extensive range contractions and finally disappeared.<sup>20</sup> Wen argued that human action, such as cutting down forests for agriculture or hunting, reinforced the independent effects of climate change. In his view, the extinction of mammals should be seen as a sensitive indicator of environmental change.<sup>21</sup>

Lander and Brunson represent a new stage in the study of Chinese mammals.<sup>22</sup> They contribute to the reconstruction of the vanished ecosystem of North China by dividing the mammals into common-sense groupings. The article also underlines the fact that environmental degradation long predated Western technological and industrial influences on China. It is up to further studies to explain—by means of additional zoo-archaeological research combined with a critical analysis of references in China's abundant historical literature—which factors had driven specific species to extinction, at what time this happened, and what the environmental consequences of their extirpation were.

Continuous environmental destruction can also be related to a specific land ethic in imperial China that minimized the significance of woodland and pastures. Since Chinese rulers regarded the cleansing of dangerous animals from forests and the extension of agricultural land as one of their principal tasks, deforestation began early in Chinese history.<sup>23</sup> By 900 CE, North China had become largely deprived of its forest cover. Moreover, nomadic peoples brought grazing animals with them, precluding the return of forests to North China.<sup>24</sup>

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during the Historical Period in an Oasis–Desert Transition Zone of Dunhuang, Hexi Corridor, Northwest China,” *Quaternary International* 458 (2017), 113–22. Moreover, the impact of hunting cannot be underestimated. In the course of growing market relations and long-distance trade, rare items as well as luxury animal products were sent to other rulers as tribute. Recent studies indicate the interactive effect of climate change and human population size to the range shift of wild mammals. For an example, see Xinhai Li et al., “Human impact and climate cooling caused range contraction of large mammals in China over the past two millennia,” *Ecography* 38 (2015), 74–82.

<sup>20</sup>Wen Huanren, *Zhongguo lishi shiqi zhiwu yu dongwu bianqian yanjiu* 中国历史时期植物与动物变迁研究 [Changes in Plants and Animals in China During Different Historical Periods], ed. Wen Rongshen (Chongqing: Chongqing, 1995). The findings of such early scientific investigations were also published by Glover Allen in *The Mammals of China and Mongolia*.

<sup>21</sup>Wen Huanren, *Zhongguo lishi shiqi*, 185–219.

<sup>22</sup>While Chinese mammalogy was only institutionalized in the early 1950s, the first comprehensive guidebook was published only half a century later, in 2008. See Andrew T. Smith and Yan Xie, eds., *A Guide to the Mammals of China* (Princeton, NJ: Princeton University Press, 2008). It is based on the unpublished work of Wang Sung. While Brian Lander concentrates on North China, R.S. Hoffmann offers an overview of the distribution of mammals in the southern boundary of the Palaeartic realm: R.S. Hoffmann, “The Southern Boundary of the Palaeartic Realm in China and adjacent countries,” *Acta Zoologica Sinica* 47 (2001), 121–31. Xie Yan published a statistical analysis to identify aggregations of biogeographic units based on mammal distributions. See Xie Yan, John MacKinnon, and Dianmo Li, “Study on Biogeographical Divisions of China,” *Biodiversity and Conservation* 13 (2004), 1391–1417.

<sup>23</sup>Thomas R. Trautmann, *Elephants and Kings: An Environmental History* (Chicago: University of Chicago Press, 2015), 306–313.

<sup>24</sup>However, for the remaining forest areas Nicholas Menzies describes six forms of traditional forest management: imperial hunting preserves in the Northeast, temple and monastery forests, local commons forests,

One example of a temporary interruption in China's long-term history of fatal deforestation is described in "Frontier, Fortification, and Forestation: Defensive Woodland on the Song–Liao Border in the Long Eleventh Century" by Yuan Julian Chen. She examines the history of the most extensive forest fortification in imperial Chinese history. In a period of heightened government activism, the Northern Song dynasty (960–1127) enlarged its army in order to combat their nomadic rival in the North, the Kitan Liao (916–1125). Song rulers ordered the digging of ponds and the planting of elms and willows as a means of military defense. This would strengthen the endangered territorial link between the borderland and the capital, Kaifeng, through ecological engineering. The demarcation of the artificial border between the states created a man-made landscape. The frontier ponds, which were built by diverting seawater, rerouting rivers and constructing dams and dikes, did not, however, prevent armies from passing through. Instead they attracted mosquitos and biting black flies, which spread unfamiliar infectious diseases.<sup>25</sup>

As Yuan Chen concludes, using defensive woodland provided no long-term results. Though the government promised rent reduction to farmers who participated in borderland forestation and planted agricultural species in the defensive woodlands, many local people opposed the Sericulture Promotion Act and demanded that the newly created forest-scapes be converted back into farming areas. In fact, the artificial border reforestation could only protect the Song state's northern border for a century and a half. Liao sabotage, destruction by local residents, and the Song army's northern offensive gradually returned the Song–Liao borderland to its treeless and barren original state. When the army of the Jin dynasty (1115–1234) arrived on the spot, it was able to march directly through to the Song capital Kaifeng. Thus, Yuan Chen argues, the extinction of the defensive border forest also symbolized the collapse of both states. Nevertheless, the environment and specific land formations represented factors that were strategically decisive for the Southern Song dynasty in the outcome of the wars against the Jin rulers. Jin Liu and Lei Kang describe the topography of the contested area of Huainan as a natural defense for the Southern Song state. The invading Jin army failed to adapt to the humid climate of the South, its soldiers suffered from disease, hunger, and lack of supplies.<sup>26</sup>

The real environmental drama of the Song period, however, was the crash of the Yellow River into Hebei in 1048, which destabilized the weak local water system for the next eighty years and imposed a totally new landscape onto the region by two means—not only water, but also an abundance of silt.<sup>27</sup> Though contemporaries in the eleventh century failed to recognize the environmental connections, the flooding disaster and the hydraulic challenges in Hebei were closely related to ongoing deforestation and

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trees as agricultural products, forests as sources of forest products like mushrooms and old-growth logging. See Nicholas Menzies, *Forest and Land Management in Imperial China* (New York, NY: St. Martin's Press, 1974).

<sup>25</sup>Ling Zhang, "Ponds, Paddies and Frontier Defence: Environmental and Economic Changes in Northern Hebei in Northern Song China (960–1127)," *Journal of Medieval History* 14 no. 1 (2011), 21–43.

<sup>26</sup>Jin Liu and Lei Kang, "The Effect of Environment on the War between the Song and the Jin States," in *Environmental History in East Asia: Interdisciplinary Perspectives*, ed. Ts'ui-jung Liu (London: Routledge, 2014), 91–99.

<sup>27</sup>Ling Zhang, *The River, the Plain, and the State: An Environmental Drama in Northern Song China, 1048–1128* (Cambridge: Cambridge University Press, 2016).



massive silt creation in the northwestern frontier region of the Song state. In her extensive studies, Ling Zhang interprets the artificially altered landscapes of the Song period as evidence of the far-reaching impact of human environmental manipulation on the region's ecology. The primary result, she finds, was the divergence of North and South China along two contrasting paths of economic development.<sup>28</sup>

The Northern Song capital of Kaifeng had not only been part of what Yuan Chen describes as a defensive strategy. At the same time, it had its own urban environmental issues, as discussed by Lik Hang Tsui in "Complaining about Lived Spaces: Responses to the Urban Environment of Northern Song Kaifeng." The metropolis of nearly 1.5 million inhabitants suffered from extreme weather conditions, which were interpreted at court as signs of the auspiciousness or inauspiciousness of imperial policy.<sup>29</sup> The essay explores the dark sides of unprecedented urban development from the subjective perspective of the famous scholar-official Ouyang Xiu (1007–1072), who lived in the capital intermittently during several phases of his career. Tsui combines the scholar's first-hand accounts of Kaifeng with complementary records related to the urban setting. Above all, three challenges in everyday life related to extreme weather were constant cause for complaint in Ouyang Xiu's poems and letters: floods, epidemics, and high food prices. As a result of these, his family lost its home, illness prevented him from working, and Kaifeng's living costs became unaffordable.

Ouyang Xiu's emotional descriptions create the impression that the Song government did not take adequate measures to counteract the negative effects of a rapidly changing urban environment. Only in 1076, shortly after his death, did the imperial government adopt a new approach in addressing the increasingly frequent waves of epidemics by establishing an Imperial Pharmacy to serve the general public.<sup>30</sup>

As already indicated by Yuan Chen for the Song period, pastoralism and farming were originally geographically separated activities. A shift from a hunter-gatherer lifestyle to farming, commonly associated with the "agricultural revolution" of the Neolithic period,<sup>31</sup> had occurred only in the Chinese plains. The domestication of the horse had opened up the resources of the grasslands, drawing people from the fringe of the Eurasian steppes into the core spaces of the interior to become nomadic pastoralists.<sup>32</sup> The two ways of life were often hostile to one another, but the two economies also fulfilled complementary roles in giving rise to relations of exchange.<sup>33</sup> State building during the Qing dynasty (1644–1911) finally integrated both worlds into a multicultural empire stretching from the wet zone of China proper to the arid Inner Asian steppe. The early strategy of

<sup>28</sup>Ling Zhang, "Ponds, Paddies and Frontier Defence," 42.

<sup>29</sup>Huiping Pang, "Strange Weather: Art, Politics, and Climate Change at the Court of Northern Song Emperor Huizong," *Journal of Song-Yuan Studies*, 39 (2009), 1–41, here 2–3, 24.

<sup>30</sup>See Asaf Goldschmidt, "Commercializing Medicine or Benefiting the People—the First Public Pharmacy in China," *Science in Context* 21 no. 3 (2008), 311–50.

<sup>31</sup>Robert B. Marks, *China: Its Environment and History* (Lanham, MD: Rowman & Littlefield, 2012), 23.

<sup>32</sup>See Thomas J. Barfield, *The Nomadic Alternative* (Englewood Cliffs, NJ: Prentice-Hall, 1993), 133–34.

<sup>33</sup>Jing Yuan, Han Jian-Lin and Roger Blench, "Livestock in Ancient China: An Archeological Perspective," in *Past Migrations in East Asia: Matching Archeology, Linguistics and Genetics*, ed. Alicia Sanchez-Mazas et al. (London: Routledge, 2008), 84–104, here 88; see also Nicola Di Cosmo, "Ancient Inner Asian Nomads: Their Economic Basis and Its Significance in Chinese History," *Journal of Asian Studies* 53, no. 4 (1994), 1092–1126.

excluding Han Chinese from borderland regions was gradually abandoned after the mid-1800s. The Qing empire represents just one component of a worldwide expansion of agricultural frontiers throughout the eighteenth and nineteenth centuries.<sup>34</sup> Qing military conquests paved the way for more intensive settlement beyond the Great Wall and the conversion of grasslands into cultivated fields. Han Chinese migrated into the pastoral regions in search of land and natural resources, thereby transforming ecosystems and societies.<sup>35</sup>

Though the main force behind the creation of an agricultural steppe were Han Chinese farmers, the Qing state also contributed actively to this process in different ways. In “Cultivating Torghut Mongols in a Semi-Arid Steppe” David Bello challenges the view that the Qing ruled their multiethnic empire through strict cultural and economic separation. Instead, the imperial government demonstrated considerable flexibility in managing its expanding frontiers. Bello describes how, on the local level, the governor of Shaanxi even introduced pastoralism to Han Chinese farmers along the province’s Mongolian frontiers to help them adapt to local water scarcity and the area’s overall climatic aridity. In this example, the ecological factors of water and climate were what determined a rational choice between pastoralism and agriculture, not any policy of ethnic separation. At the same time, security issues, as opposed to hydrological fragility, were the primary motivation behind the central government’s attempt to convert the pastoral Torghut Mongols to steppe farming after they had returned to Xinjiang from their Russian exile in 1771. The Torghuts, however, deceived Qing officials by over-reporting their harvest while secretly continuing to practice pastoralism. Cultivation was not only impeded by the typical borderland obstacle of limited water resources, but also by ingrained human preferences, in this case Torghut reluctance to farm. For Bello, the two cases are significant because they illustrate how natural disasters and economic crises provided welcome opportunities to demonstrate imperial wisdom and flexibility by converting a people to new modes of production. Thus he questions the thesis advanced by the New Qing Historians that culturalist statecraft was predominant at the imperial frontiers of the Manchu state.<sup>36</sup>

Andrea Janku’s contribution, too, has a geographic focus on the northwestern province of Shaanxi. In “Drought and Famine in Northwest China: A Late Victorian Tragedy?” she asks why the violence of the Muslim wars during the 1860s received much more attention than the nameless victims of drought and famine of the 1870s. While the Qing rulers perfected their military logistics in fighting local resistance on the northwestern frontiers, civilian rural relief was badly neglected. This is all the more surprising since the North China famine of 1876 to 1879 was one of the great mortality crises in world history, extending over five provinces and affecting a population of more than one hundred

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<sup>34</sup>James Reardon-Anderson, “Land Use and Society in Manchuria and Inner Mongolia during the Qing Dynasty,” *Environmental History* 5, no. 4 (2000), 503–30, here 505–07.

<sup>35</sup>However, Han Chinese farmers did not enter barren wasteland. Even today, there are conflicting attitudes toward space and the natural environment between Han Chinese farmers and Mongolian nomads. See Dee Mack Williams, *Beyond Great Walls: Environment, Identity, and Development on the Chinese Grasslands of Inner Mongolia* (Stanford, CA: Stanford University Press, 2002).

<sup>36</sup>Ruth W. Dunnell et al., eds., *New Qing Imperial History: The Making of Inner Asian Empire in Qing Chengde* (London: Routledge, 2004).



million people. Facing major internal rebellions, fiscal crisis, and colonial aggression at the time, the late Qing state proved unable to prevent the death of nine to thirteen million people by starvation or famine-related diseases.<sup>37</sup> Janku notes that this unprecedented disaster was only partly caused by a drought related to a global shift in weather patterns known as the El Niño Southern Oscillation (ENSO). The lack of any response on the part of the Qing state played an even greater role.<sup>38</sup> Drawing on local gazetteers and the writings of two literati, Janku offers a contrasting picture of the contradictory dynamics playing out at the micro-level of the Guanzhong region in Shaanxi province. Whereas the first author, a native of the region familiar with droughts and famines, by and large ignored the actual disaster in his work, the second author, an outsider who was employed in the provincial administration, left a startling account of the famine.<sup>39</sup> Janku considers the natural hazards and the conflicts between the Han and Muslim populations to have mutually reinforced each other's effects. Against the background of a general decline of government activity throughout the nineteenth century, the protracted military campaigns of the 1860s limited the Qing state's disaster relief capacities and drained the provinces in the Northwest of their resources. Thus the increased vulnerability of local communities such as Guanzhong to disaster is only one example of the weakening governability of many parts of the country caused by Qing imperial overreach.

In her chronologically extensive study, Lillian Li also relates the diverse attitudes of Qing officials in the late 1870s to the insufficiency of the long-established Chinese practice of attributing the occurrence of natural disasters and famine to an interaction between Heaven, humans, and natural forces.<sup>40</sup> Kate Edgerton-Tarpley has revealed how a faction of metropolitan officials known as *Qingliu* (pure stream) even warned that the North China famine would be the most urgent crisis facing the Qing state.<sup>41</sup> Reformers and intellectuals in the treaty ports regarded the famine as a wake-up call for the Qing government. They recommended the introduction of modern science and technology to control nature and address disasters.<sup>42</sup> Irrespective of the debates about the late Qing government's misguided priorities, it had become clear that the eighteenth-century method of famine relief through the interregional transfer of grains, coordinated from the imperial center, was by the late nineteenth century no longer adequate. New ideas or policy tools had to be found to cope with famine disasters.

<sup>37</sup>Kathryn Edgerton-Tarpley, *Tears from Iron: Cultural Responses to Famine in Nineteenth-Century China* (Berkeley: University of California Press, 2008), 13–66.

<sup>38</sup>Peter C. Perdue, "Is There a Chinese View of Technology and Nature?" in *The Illusory Boundary: Environment and Technology in History*, ed. Martin Reuss and Stephen H. Cutcliffe (Charlottesville: University of Virginia Press, 2010), 101–19, at 110. In fact, the nation-wide state granary system, established by the Qing government in the eighteenth century, was in decay, and the resources and capacities of the private charity granaries managed by gentry and merchants were still at a preliminary stage of development. Moreover, transporting the relief grain overland to Shaanxi was extremely slow and expensive.

<sup>39</sup>Their emotionality (though different in kind) recalls the emotional rhetoric of dismay described by Kathryn Jean Edgerton-Tarpley, "From 'Nourish the People' to 'Sacrifice for the Nation': Changing Responses to Disaster in Late Imperial and Modern China," *The Journal of Asian Studies* 73, no. 2 (2014), 447–69, at 452.

<sup>40</sup>Lilian M. Li, *Fighting Famine in North China: State, Market, and Environmental Decline, 1690s–1990s* (Stanford, CA: Stanford University Press, 2007), 2, 13.

<sup>41</sup>Edgerton-Tarpley, *Tears from Iron*, 94–98.

<sup>42</sup>Peter Buck, *American Science and Modern China: 1876–1936* (Cambridge: Cambridge University Press, 1980), 171–208.

This tension between traditional methods and modern challenges is similarly reflected in Cao Mu's article "A Flow of Wealth: Wastewater Disposal in Republican Tianjin." Tianjin's history began with the construction of a walled city in 1404, tasked with protecting Beijing, the new imperial capital of the Ming dynasty (1368–1644). Conveniently located on the banks of the Hai river and on the Grand Canal, the city soon developed into the central trading hub in North China. Water transportation became a key factor in the rise of Tianjin. But urbanization and population growth made the disposal of wastewater an increasingly pressing issue. The moat system, built under Ming rule to supply the city with fresh water from the Hai river, deteriorated into a sewer; wastewater gathered in puddles, ponds, and ditches throughout the metropolitan area.

Cao Mu quotes Western observers, from the Macartney mission in the late eighteenth century to treaty port representatives of the early twentieth century, who all complained about the unsanitary, harmful living conditions in the city. From the perspective of foreigners and Chinese reformers alike, the introduction of modern sanitary methods was long overdue. But this is not the story Cao Mu reveals in her essay. Based on solid archival research, she examines the role of the traditional drainage methods as a symbol of a characteristic Chinese attitude toward waste management. Because waste was generally valued in imperial Chinese society as potential fertilizing matter, its negative effects, such as stench and unhealthiness, were quietly accepted. Cao Mu considers urban wastewater management to have functioned relatively well in Tianjin. She describes the different ways of handling it, including wastewater carriers, dumping sites and dustpans, all of which were important elements in the drainage process. Private and public ditches, canals and ponds were linked to four drainage rivers. The traditional manure trade transformed waste into a valuable resource. Cao Mu explains the long-term survival of these traditional methods with reference to the ideal embodied by the ancient philosophical concept of *Sancai*—the interdependence between heaven, humans, and nature. In fact, the traditional feces-manure energy cycle survived up until the early period of the Chinese Republic. It was supplemented by modern public lavatories, thus developing into a hybrid system of sanitation.<sup>43</sup> While Ruth Rogaski has emphasized the growing importance of a transnationally disseminated "hygienic modernity," Cao Mu recalls and reassesses the local traditions of drainage management.

Taken together, this collection of six articles points to diverse options and opportunities for examining the interaction between society and the natural environment in the long-term development of China. Despite the wide range of research expertise, time periods, and regions represented in this issue, it remains impossible for one collection to cover the full range of topics and approaches within environmental studies.<sup>44</sup> But we hope that the papers assembled here will convince readers of the fruitfulness of an environmental perspective and will serve to inspire further research.

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<sup>43</sup>Cao Mu also describes the slow progression from the old practices of feces disposal to a modern westernized sanitary system using the example of the introduction of public lavatories in Tianjin. See Cao Mu, "The Public Lavatory of Tianjin: A Change of Urban Faeces Disposal in the Process of Modernization," *Global Environment* 9 (2016), 196–218.

<sup>44</sup>See Andrew C. Isenberg, ed., *The Oxford Handbook of Environmental History* (Oxford: Oxford University Press, 2014).