

Climate Change, Human History, and Resilience in Premodern Japan: A Brief Survey of the Existing English-Language Literature, with Implications for the Publication of Research Results from the “Historical Climate Adaptation Project”

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This working paper is intended as a rough guide and commentary regarding the planned publication in English of results from the Historical Climate Adaptation Project (hereafter HCAP) currently underway at the Research Institute for Humanity and Nature (RIHN) in Kyoto under the direction of Takeshi Nakatsuka.¹⁾ The purpose of this ambitious project, as described on its website, is to seek ways of adapting to climate change through precise reconstructions of past climate change and societal response over the course of Japan’s long history. The project is organized into six research groups—Paleoclimatology, Climatology, Prehistory/Ancient History, Medieval History, Early Modern History, and Categorization and Synthesis—acting in collaboration to achieve the team’s overall goal. Members come from a variety of fields, particularly climate science, history, and archaeology. Their research consists of three steps: (1) reconstructing and understanding past climate variations during the last several millennia in Japan at high temporal and spatial resolutions; (2) categorizing the relationship between society and climate in each region and period by means of detailed chronological comparisons of climate variation and societal response; and (3) synthesizing the various historical cases in order to identify common factors that determine the resilience or

vulnerability of human societies to climate change irrespective of time or location.²⁾

Although detailed results of the project will be published Japanese in the form of a six-volume series, disseminating major findings in English is also a priority. At present the plan is to produce a one-volume collection of essays through a university press in the United States or the United Kingdom. Because HCAP is a work in progress, I am unable to describe the probable content of such a volume at present. What I can do is provide some background by outlining the conclusions and implications of previous English-language publications and identifying some of the important hypotheses or themes that might usefully be addressed by HCAP. For reasons of space (and also lack of professional expertise) I will omit discussion of climate change per se (step one of the project), focusing instead on how such change has or has not influenced human events (step two) and what factors are likely to increase or reduce social resilience (step three).

Before proceeding to the Japanese case, let me note that there is a large and growing literature on climate history in English. Very crudely, works in this genre can be categorized as follows:

1. Those that attempt to synthesize world history as a whole from a climatic perspective. The best, or at any rate most thorough and recent, example is John Brooke's *Climate Change and the Course of Global History*, which is based on the detailed reconstructions of past climate obtained from proxy data over the course of the past several decades.³⁾
2. Those that also address world history from a climatic perspective but limit their purview to a particular time period of perceived importance. One favorite example is the Pleistocene/Holocene transition and the emergence of agriculture; an important (relatively) recent work on this topic is William Burroughs' *Climate Change in Prehistory: The End of the Reign of Chaos*.⁴⁾ Another is the Little Ice Age and its relationship to the "seventeenth-century crisis," the subject of Geoffrey Parker's *Global Crisis: War, Climate Change and Catastrophe in the Seventeenth Century*.⁵⁾ (Archaeologist Brian Fagan has also penned semi-popular books on both topics as well as on the Medieval Warm Period, now more commonly referred to as the Medieval Climate Anomaly.⁶⁾)
3. A final category of works focuses on climate change in a particular region. Any number of examples could be cited, but one popular theme is the relationship between drought and the collapse of the Classic Maya during the Medieval Climate Anomaly.⁷⁾ The hoped-for book from the HCAP project will also fall into this category of regional studies.

Although implicit in the above remarks, it is probably worth noting that most of the research on climate change in world history takes the view that important developments in human history were, if

not caused outright, at least influenced by climate change. Some such developments, like the emergence of agriculture, were positive; others, like the collapse of the Maya or the political turmoil of the seventeenth century, were negative. But there seems to be at least a consensus that climate was important in human affairs.

What about Japan? Interestingly, professional historians writing on Japan have had almost nothing to say about climate change or its possible role in human affairs. There are many works on topics that one would think have some relationship to climate, including demographic history, economic history, and agricultural history. But as a rule the authors ignore climate and its effects, at least over the long term. Owing to space constraints I will give just one example, William Wayne Farris, a well-respected historical demographer and the author of *Japan's Medieval Population and Daily Life and Demographics in Ancient Japan*.⁸⁾ These books contain numerous descriptions of famines resulting from drought or excessive precipitation, and provide strong evidence (as if any were needed) that extreme weather conditions can wreak havoc with human society on a scale of months or perhaps years. But Farris gives no hint that climatic conditions, or climate change, played a significant role in the development of Japanese society over the long term. In essence, his thesis is that the country's population was stagnant during the period of classical civilization but grew rapidly in medieval times, starting around 1280. The reasons for this demographic shift, Farris argues, were changes in disease ecology (specifically, increased human resistance to imported pathogens as the latter became endemic) coupled with better agricultural technology. In short, weather affects people's lives but climate is not an important agent in long-term historical change.⁹⁾ As noted above, this point of view seems to be the norm among historians of Japan, at least, those writing in

English.¹⁰) My guess is that as professional analysts of the human past, historians tend to favor nuanced explanations involving individual or collective human actions, not the monolithic, faceless effects of outside forces.

The situation is quite different when we look at research in other disciplines such as archaeology, geography, and paleoclimatology. In archaeology, a somewhat extreme form of environmental, or climatic, determinism is provided by the work of Yoshinori Yasuda.¹¹) But even mainstream archaeologists would agree, for example, that the emergence of the Neolithic, pottery-making Jōmon culture around 14,500 BCE was related in some way (although how is not exactly clear) to the climatic transition from the cold Pleistocene to the warm Holocene.¹²) Likewise, archaeologists tend to see a causal connection between warm, stable climatic conditions and population growth during the Jōmon period.¹³) Connections have also been drawn between cold conditions in the Yayoi period, immigration from the Asian mainland, and the emergence of full-blown agriculture, and between cold conditions at the start of the Kofun period and the rise of state-level political organization.¹⁴)

Natural scientists share with archaeologists a predilection for identifying correspondences between climatic trends and societal change. An early example is geomorphologist Sakaguchi Yutaka, who published widely in the 1980s and 1990s on fossil pine pollen from a core taken at Ozegahara Bog in Gunma Prefecture. Sakaguchi used the pollen to reconstruct temperatures over the past eight thousand years. He also speculated about the role of climate change in Japanese history, among other things presciently noting the correspondence between the onset of cold times and the emergence of the state.¹⁵)

More recently, paleoclimatologists, including those at HCAP, have begun to take part in this debate. Project leader Takeshi Nakatsuka recently

contributed a short paper to the special issue on “tipping points” in *Past Global Changes Magazine*.¹⁶) The paper, which summarizes material previously published in more detail in Japanese, compares high-resolution (annual-level) temperature reconstructions with the historical record in Japan. The conclusion is that “multi-decadal temperature variability is closely associated with famines and warfare in Japan, resulting in significant societal changes.”¹⁷) Specifically, Nakatsuka argues that:

Multi-decadal variability in the East Asia summer temperature appears to have been enhanced during the 12-15th centuries in medieval Japan, and was associated with numerous famines and wars which culminated in the Sengoku period, characterized by near-constant warring states and societal unrest in the 16th century . . . The comparison between temperature and historical events demonstrates that abrupt cooling after 10-20 years of long warmth often caused famines characterized by unprecedented numbers of deaths . . . and sustained periods of warfare.¹⁸)

Regarding mechanisms, Nakatsuka speculates that an “increase in rice yields during the warm period might have led to overpopulation, resulting in a society poorly prepared for the following cold period and the inevitable decline in agricultural yields.”¹⁹) He gives several specific examples, including the Kangi mega-famine of 1230-1231 CE and the Kanshō famine of 1459-60 CE, which precipitated a long period of extreme sociopolitical disturbance.

A second, even more recent, example is a detailed paper by Hodaka Kawahata of the University of Tokyo and colleagues.²⁰) Their research makes use of coastal sedimentary cores from Hiroshima Bay to reconstruct sea surface

temperatures in western Japan over the past several thousand years, and finds a “long-term trend of declining SSTs [that] can be attributed mainly to changes in solar radiation and sea level and, to a lesser extent, changes in the Asian monsoon.”²¹⁾ However they also provide an extended discussion of the relationship between climate change and social change, concluding that “[c]old periods appeared to coincide with major shifts in social systems in Japan.”²²⁾ Examples given by the authors of societal changes associated with cold conditions are: (1) large-scale immigration from Asia and the shift from foraging to rice-based agriculture in the last millennium BCE; (2) renewed immigration and emergence of a centralized, aristocratic state in the fifth through eighth centuries CE; (3) the breakdown of the ancient state and the shift to militarized, decentralized society beginning in the twelfth century; and (4) the collapse of military rule and the emergence of a modern state in the nineteenth century. The authors also note, conversely, an association between the warm climate centered on the ninth century and a “relatively peaceful Imperial and aristocratic political system.”²³⁾

As is clear from these examples, archaeologists and natural scientists are much more inclined than historians to emphasize the importance of climate change in human history. Some of the associations they identify are indeed intriguing, and at least two—the relationship between cold conditions and the transition to agriculture, on the one hand, and the emergence of the state, on the other—find support in the general literature on climate history.²⁴⁾ Kawahata and colleagues state that “[a]lthough . . . temperature fluctuations appear to be linked to changes in the general social system, we do not know the precise mechanisms of change.”²⁵⁾ That is true, and in the absence of plausible mechanisms it is possible that some of the alleged correspondences are no more than

random coincidences. But the chances of that can be reduced, and the case for causality strengthened, by identifying statistically significant associations between climate-related phenomena and historical events or trends—the approach followed by Nakatsuka. Of course, this approach only works for relatively frequent, recurring events such as famines and wars, not for rarer (or one-time) events such as the emergence of agriculture or the rise of the state. Clearly more research is needed on the topic of causation.

Let me now move on to a discussion of factors that might potentially influence societal resilience to climate change (step three of the HCAP agenda). To my knowledge, few if any works on Japanese history address the topic of resilience directly. That said, many authors have provided important indirect hints. In my reading, at least four factors promoting resilience can be identified in the existing English-language literature: good governance, technological innovation, diversity or redundancy, and living within limits.

The positive correlation between good governance (however defined) and resilience is perhaps obvious but still worth noting. Long ago, Conrad Totman argued that enlightened government policy, specifically in the area of silviculture, saved early modern Japan from ecological ruin.²⁶⁾ More recently, Osamu Saitō’s quantitative study of famines during the medieval and early modern periods found a long-term decrease in frequency and severity despite worsening climatic conditions. Saitō attributed the decline in crippling famines to institutional factors, specifically better governance by local lords.²⁷⁾ As a final example, Geoffrey Parker claims that Japan was exceptional among Eurasian states in not succumbing to the “seventeenth-century crisis.” He attributes Japan’s successful navigation of the Little Ice Age to two factors: good government

policy (including social controls, encouragement of economic growth, and avoidance of costly foreign entanglements), and “underpopulation” (on which, see below).²⁸⁾

Another fairly obvious factor promoting societal resilience is technological innovation. Above, I cited the work of William Wayne Farris as an example of research that indirectly argues for the unimportance of climate change over the long term. However, there is another way to read Farris’s work. As noted, he argues that improved agricultural technology was one (although not the only) factor behind rapid population growth in the medieval period. If that is true, one might reasonably conclude that technological improvements made human society more resilient to natural conditions, climate included. Of course, it is also true that technological “fixes” sometimes have unintended, negative, consequences; any number of examples could be given, particularly from the industrial period. So it would be wrong to claim that there is always a one-to-one correspondence between more sophisticated technology and societal resilience. But at least, the technological factor cannot be ignored.

A third factor is diversity or redundancy: not putting all of one’s eggs in the same basket. Charlotte von Verscheur’s recent book on agriculture from the eighth through seventeenth centuries downplays the importance of rice agriculture and emphasizes the great variety of crops and subsistence strategies employed by premodern Japanese; as a whole, the book constitutes an argument to the effect that diversity promotes sustainability.²⁹⁾ A similar idea would seem to lie behind the literature on *satoyama*, the managed landscapes that were a defining feature of early modern, and indeed modern, rural society. *Satoyama* consisted of villages and surrounding fields, grasslands, woodlands, and wetlands; their biological diversity and the diverse subsistence

strategies employed by their human members is thought to have promoted sustainability and resilience.³⁰⁾

A fourth factor is living within limits or the environment’s carrying capacity. As noted above, Geoffrey Parker claims that “underpopulation” was one reason that Japan did not succumb to the general “seventeenth-century crisis” induced elsewhere by global cooling. The exact population figures used by Parker can be debated, but all researchers would probably agree that Japan was under no significant Malthusian pressures in the seventeenth century. That changed in the eighteenth century when the country’s population reached 30 million and ceased to grow. The fact that Japanese society essentially reached its ecological limits (given premodern technology) helps to explain why it became less resilient to the climatic challenges of the ongoing Little Ice Age, the famines of the late eighteenth and early nineteenth centuries being cases in point.

In addition to these rough hypotheses derived from the previous English-language research on Japan, the general literature on resilience also offers numerous ideas available for testing. In their classic *Resilience Thinking*, Brian Walker and David Salt note that “[s]tudies of a variety of social-ecological systems . . . suggest three factors that probably play an important role in maintaining [general resilience] are diversity, modularity, and the tightness of feedbacks.”³¹⁾ They go on to argue that a resilient world would value: (1) “diversity,” which “is a major source of future options and a system’s capacity to respond to change and disturbance”; (2) “ecological variability” (which would seem to be another aspect of diversity); (3) “modularity,” which buffers systems from shocks; (4) “acknowledging slow variables” in order to allow systems to absorb greater disturbances and avoid undesirable shifts; (5) “tight feedbacks” that “allow us to detect

thresholds before we cross them”; (6) “social capital,” that is, the “capacity of . . . people . . . to respond, together and effectively, to change any disturbance”; (7) “innovation,” which allows flexible adaptation to change; (8) “overlap in governance,” that is, institutional redundancy; and (9) “ecosystem services,” whose true costs, the authors argue, are not often properly accounted.³²⁾ The similarity of some of these concepts to the rough hypotheses derived above from the historical literature on Japan is obvious.

The value of HCAP is that it will allow us to test for the first time these and other ideas about what factors have increased, or conversely reduced, societal resilience to climate change over the long course of Japanese and history and prehistory. It may be possible to refine, or further generalize, some of the above hypotheses, or to propose news ones that are better supported by the historical and archaeological record. If so, the project will have implications not limited to climate change in premodern Japan but of significance for the broader search for ways to increase societal resistance to shocks of all kinds.

Notes

- 1) The full, formal name of the project is “Societal Adaptation to Climate Change: Integrating Palaeoclimatological Data with Historical and Archaeological Evidences.” The project’s English-language website is http://www.chikyu.ac.jp/nenrin/index_e.html; the Japanese-language version is <http://www.chikyu.ac.jp/nenrin/>.
- 2) In addition to the websites cited in the previous note, see: <http://archives.chikyu.ac.jp/archives/AnnualReport/Viewer.do?prkbn=P&id=105&jekbn=E>.
- 3) John L. Brooke, *Climate Change and the Course of Global History: A Rough Journey* (London: Cambridge University Press, 2014).
- 4) William James Burroughs, *Climate Change in Prehistory: The End of the Reign of Chaos* (Cambridge: Cambridge University Press, 2005).
- 5) Geoffrey Parker, *Global Crisis: War, Climate Change and Catastrophe in the Seventeenth Century* (New Haven: Yale University Press, 2013).
- 6) Brian Fagan, *The Long Summer: How Climate Changed Civilization* (New York: Basic Books, 2004); *The Little Ice Age: How Climate Made History 1300-1850* (New York: Basic Books, 2000); *The Great Warming: Climate Change and the Rise and Fall of Civilizations* (New York: Bloomsbury Press, 2008).
- 7) See, for example, Richardson B. Gill, *The Great Maya Droughts: Water, Life, and Death* (Albuquerque: University of New Mexico Press, 2000); Norman Hammond, “Climate, Crisis, Collapse, and Ancient Maya Civilization: An Enduring Debate,” in *Climate Crises in Human History*, ed. A. Bruce Mainwaring, Robert Francis Giegengack, and Claudio Vita-Finzi (Philadelphia: American Philosophical Society, 2010), 189-196.
- 8) William Wayne Farris, *Japan’s Medieval Population: Famine, Fertility, and Warfare in a Transformative Age* (Honolulu: University of Hawai’i Press, 2006); *Daily Life and Demographics in Ancient Japan* (Ann Arbor: Center for Japanese Studies, University of Michigan, 2009).
- 9) In *Japan’s Medieval Population*, Farris refers several times to what he calls the “Muromachi Optimum” of 1370–1450, but the meaning of “optimum” is never clearly defined. My sense is that Farris uses it not in its climatological sense but as a catch phrase for overall good conditions for demographic growth.
- 10) One exception is the present author. Bruce L. Batten, “Climate Change in Japanese History and Prehistory: A Comparative Overview,” Edwin O. Reischauer Institute of Japanese Studies Occasional Paper 2009–01 (Cambridge, MA: Harvard University, 2009), <http://rijs.fas.harvard.edu/pdfs/batten.pdf>.
- 11) Yoshinori Yasuda, ed., *Forest and Civilisations* (New Delhi: Roli Books, Lustre Press, 2001); Yoshinori Yasuda and Vasant Shinde, eds., *Monsoon and Civilization* (New Delhi: Roli Books, Lustre Press, 2004).
- 12) Junko Habu, *Ancient Jomon of Japan* (Cambridge: Cambridge University Press, 2004), 42-46.
- 13) Keiji Imamura, *Prehistoric Japan: New Perspectives on Insular East Asia* (Honolulu: University of Hawai’i Press, 1996), 158.
- 14) Koji Mizoguchi, *The Archaeology of Japan: From the Earliest Rice Farming Villages to the Rise of the State* (Cambridge: Cambridge University Press, 2013), 43-

- 52.
- 15) Yutaka Sakaguchi, "Warm and Cold Stages in the Past 7600 Years in Japan and Their Global Correlation—Especially on Climatic Impacts to the Global Sea Level Changes and the Ancient Japanese History—," *Bulletin of the Department of Geography, University of Tokyo* 15 (1983): 20-21.
- 16) Takeshi Nakatsuka, "Multi-Decadal Climate Variability as Triggers of Societal Regime Shifts in Japan," *Past Global Changes Magazine* 24, no. 1 (2016): 18-19.
- 17) *Ibid.*, 18.
- 18) *Ibid.*, 18-19.
- 19) *Ibid.*, 19.
- 20) Hodaka Kawahata, Megumi Matsuoka, Ami Togami, Naomi Harada, Masafumi Murayama, Yusuke Yokoyama, Yosuke Miyairi, Hiroyuki Matsuzaki, and Yuichiro Tanaka, "Climatic Change and Its Influence on Human Society in Western Japan During the Holocene," *Quaternary International* (2016), <http://dx.doi.org/10.1016/j.quaint.2016.04.013>.
- 21) *Ibid.*, 1 (abstract).
- 22) *Ibid.*, 14.
- 23) *Ibid.*, 14.
- 24) On the origins of agriculture, see Brooke, *Climate Change*, 121-164. On those of the state, see *Ibid.*, 165-212.
- 25) Kawahata, et al., "Climatic Change," 14.
- 26) Conrad Totman, *The Green Archipelago: Forestry in Preindustrial Japan*. Berkeley: University of California Press, 1989.
- 27) Osamu Saito, "Climate, Famine, and Population in Japanese History: A Long-Term Perspective," in *Environment and Society in the Japanese Islands: From Prehistory to the Present*, ed. Bruce L. Batten and Philip C. Brown (Corvallis: Oregon State University Press, 2015), 213-229.
- 28) Parker, *Global Crisis*, 484-506. Also note that governance (particularly "multilayered governance") is an important theme running through a recent Japanese series on environmental history: Yumoto Takakazu, ed., *Shirizu Nihon rettō no san-man go-sen nen*, 6 vols. (Bun'ichi Sōgō Shuppan, 2011).
- 29) Charlotte von Verschuer, *Rice, Agriculture, and the Food Supply in Premodern Japan* (London: Routledge, 2016).
- 30) See the essays in K. Takeuchi, R.D. Brown, I. Washitani, A. Tsunekawa, and M. Yokohari, eds. *Satoyama: The Traditional Rural Landscape of Japan* (Tokyo: Springer, 2003).
- 31) Brian Walker and David Salt, *Resilience Thinking: Sustaining Ecosystems and People in a Changing World* (Washington, DC: Island Press, 2006), 121.
- 32) *Ibid.*, 145-148.

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